

ESSENTIAL



Mathematics

Basic 7

Facilitator's Guide



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Basic 7

Facilitator's Guide

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INTRODUCTION

"Essential Mathematics Teacher Guide" is a comprehensive and invaluable resource designed to empower junior high school teachers in their quest to inspire a love for mathematics and foster mathematical proficiency among final year students. This teacher guide is carefully written to support you in delivering engaging and effective math instruction that equips your students with the foundational skills and critical thinking abilities they need to succeed not only in their academic journey but also in their future endeavors.

Mathematics is often referred to as the universal language, a language that transcends cultural boundaries and offers a powerful lens through which we can understand and interact with the world. At the junior high school level, it becomes crucial to nurture students' mathematical curiosity and provide them with a solid foundation upon which they can build their mathematical prowess and prepare adequately for their transition to senior high school or the world of work. This guide is designed to be your compass on this journey.

Key Features of “Essential Mathematics Teacher Guide”

Comprehensive Curriculum Coverage: This guide covers the essential topics in the Common Core Programme Mathematics Curriculum for Junior High Schools in Ghana, from concepts of number to algebra, geometry, measurement and data. It provides a clear roadmap for structuring your lesson to ensure a well-rounded mathematics learning for your students.

Pedagogical and Assessment Strategies: The guide offers you the opportunity to discover innovative teaching and assessment approaches that make math come alive in your classroom. Explore ways to create a nurturing and inclusive learning environment where every student feels empowered to participate and excel. Besides, it aids you to tailor your teaching methods based on the insights gained from ongoing assessment, enabling you to provide targeted support to your students.

Differentiation: The guide creates the avenue to recognize the diverse needs of your students and gain insights into how to differentiate instruction to accommodate various learning styles and abilities. This guide offers practical tips for reaching every learner effectively.

Technology Integration: Embrace the digital age and leverage technology to enhance your math instruction. It suggests teaching and learning activities that infuses technological tools and resources and how to incorporate these to engage students and promote deeper understanding.

Real-World Applications: Show your students the real-world relevance of mathematics by incorporating practical examples and projects that resonate with learners' everyday experiences. Foster their problem-solving skills and critical thinking by connecting math to everyday life.

Our aim is to provide you with the guidance and support you need to inspire your students, instill in them a passion for mathematics, and help them reach their full mathematical potential. Together, we can open the doors to a world of mathematical discovery and achievement for your junior high school students.

Sub-strand 1: Number and numeration systems

Module 1

Place value

Content standard

B7.1.1.1 Demonstrate understanding and the use of place value for expressing quantities recorded as base ten numerals as well as rounding these to given decimal places and significant figures.

Indicator

B7.1.1.1 Model number quantities more than 1,000,000,000 using graph sheets, isometric papers and multi-base blocks.

Learning expectations: In this module, learners will learn how to:

Model quantities using:

- graph sheets
- multi-base blocks
- multiples of 10s, 50s, 100s etc.

Essential for learning: Learners can count forwards and backwards by 100s, 200s and so on up to 5,000.

Resources: Graph sheets, multi-based blocks.

Keywords: quantities, model, multi-base blocks

Competencies: Critical thinking and problem-solving, communication and collaboration

Starter: Refer learners to page 2 of the Learner's Book. Ask them to fill in the missing numbers by skip counting by 25s and by 50s.

Main idea 1

Model number quantities using graph sheets

LB page 2

Activity 1

Ask learners to work in pairs. Give each pair graph sheets. Write a number, for example, 11,500,000 on the board. Guide learners to define a value for a square box. For example, a square box (□) represents 100,000 (hundred thousand) ; so, ten square boxes (□□□□□□□□□□) will represent 1,000,000 (one million).

So, 11,500,000 will have 11 of the ten square boxes and 5 of the square boxes.

Activity 2

Write another number, for example, 10,500,000 on the board and ask learners to model it using their graph sheets. Let learners work in convenient groups.

Refer learners to the Worked examples on page 3. Write the questions on the board and ask learners to model each number using their graph sheets.

Review exercise

Differentiated lessons

Remedial activity

Learners work in pairs to model 10,100,000.

Challenging activities

In pairs, ask learners to model these numbers.

1. 31,400,000

2. 33,500,000

Assessment tasks ----- LB page 3

Learners use graph paper to model numbers. Solutions start on page 4 in this book.

Suggested homework

Use graph sheets to model the numbers: 1. 15,200,100 2. 22,500,200

Main idea 2

Model number quantities using multi-base blocks LB page 3

Activity 1

Ask learners to work in convenient groups. Give each group the multi-base blocks (at least five of each block for a group).

Assist learners to define the blocks; for example:

- 1 small cube represents 100,000
- 1 strip of cubes represents 1,000,000
- 1 square of cubes represents 10,000,000
- 1 large cube represents 100,000,000.

Activity 2

Write a number, for example, 113,400,000 on the board.

Ask the learners to model the number using the multi-base blocks. Ask learners to look at how a few other learners have modelled the number. They correct their models if necessary. Repeat this activity with different numbers. Below are two examples.

1. 224,300,000

2. 442,300,000

Activity 3

Refer learners to Worked example on page 5. Discuss the Worked examples with them. Ask learners to write their own examples and model each number.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to model these numbers.

1. 15,300

2. 22,700

Challenging activities

Ask learners to model these numbers in pairs.

1. 321, 400, 000

2. 425, 200,000

Assessment tasks ----- LB page 5

Learners use multi-base blocks to model four numbers. Solutions are given on page 5 in this book.

Suggested homework

Model these numbers with multi-base blocks.

1. 15,600,200

2. 28,600,500

Main idea 3

Modelling number quantities using multiples of 10s, 50s, 100s, etc. **LB page 5**

Activity 1

Revise previous lesson with learners.

Place learners into convenient groups. Ask them count forward and backwards by multiples of 50s and 100s up to 5,000.

Activity 2

Write a number ; for example, 12,420 on the board. Demonstrate with learners how to model the number.

Ask learners to think of a number which when multiplied by 50 will give a number close to 12,000. The number is 200, which is ($50 \times 200 = 10,000$). They should think of another number which when multiplied by 100 will give the remaining 2,000; that is ($20 \times 100 = 2,000$).

Then ask learners to consider other multiples of 50, 10 or 100 to get the remaining 420. So, $12,420 = (50 \times 200) + (20 \times 100) + (8 \times 50) + (2 \times 10)$.

To work in their previous groups to model the following numbers using multiples.

1. 46,430

2. 15,450

Activity 3

Refer learners to page 5 of the Learner's Book. Go through the Worked examples at the bottom of the page with learners. In their groups, ask learner to write their own numbers and model each one.

Review exercise

Differentiated lessons

Use multiples of 50s, 100s, 200s to model these numbers.

Remedial activity

Model this number in pairs 850.

Challenging activities

Model these numbers 24 and 250.

Assessment tasks ----- LB page 5

Learners use multiples to model numbers.

Suggested homework

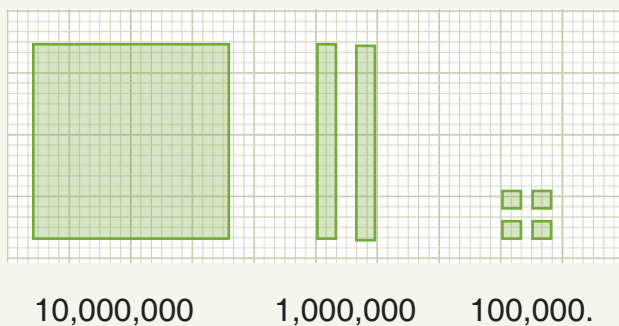
Use multiples of 50s, 10s, 50s, 100s and 200s to model these numbers.

Answers to Assessment tasks

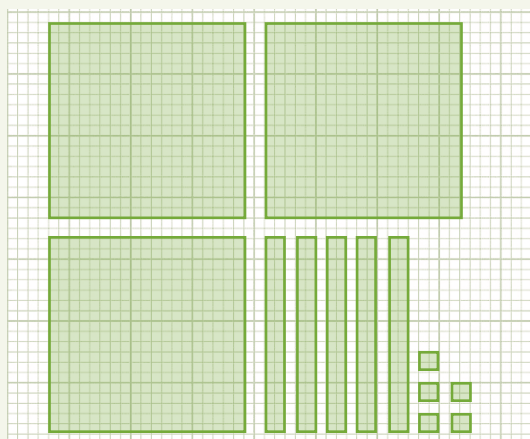
Main Idea 1

(LB page 3)

Key

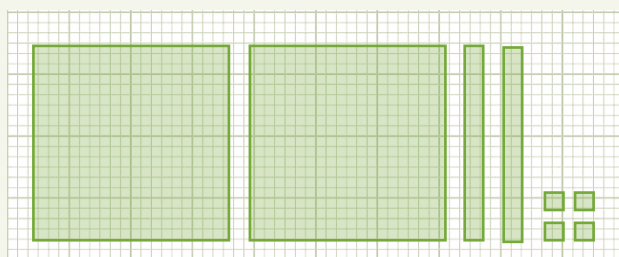


1.



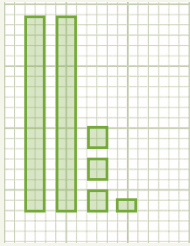
= 35,500,000

2.



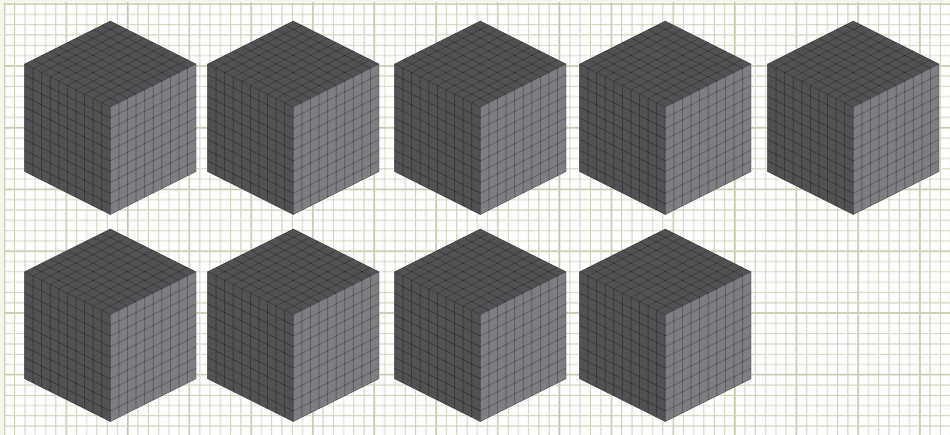
= 22,400,000

3.



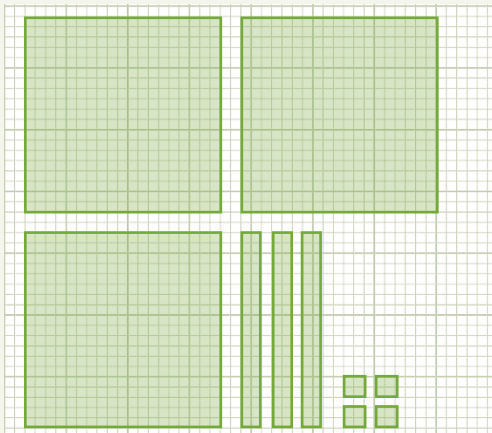
= 4,350,000

4.



= 1,000,000,000

5.



= 33,400,000

6.



= 99,200,000

Main Idea 2

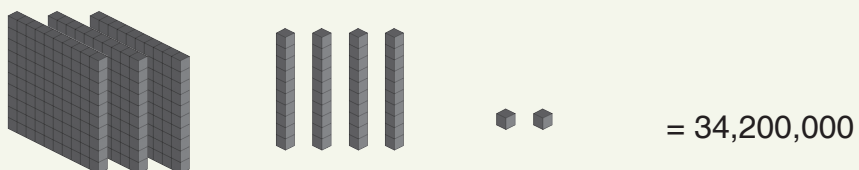
(LB page 5)

Key: 1 block = 100,000,000
1 cube/unit = 100,000

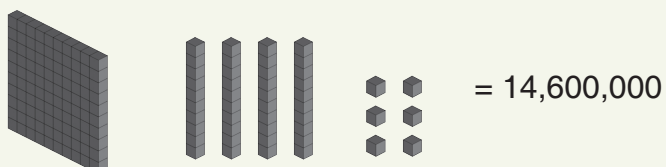
1 flat = 10,000,000

1 long/rod = 1,000,000

1.



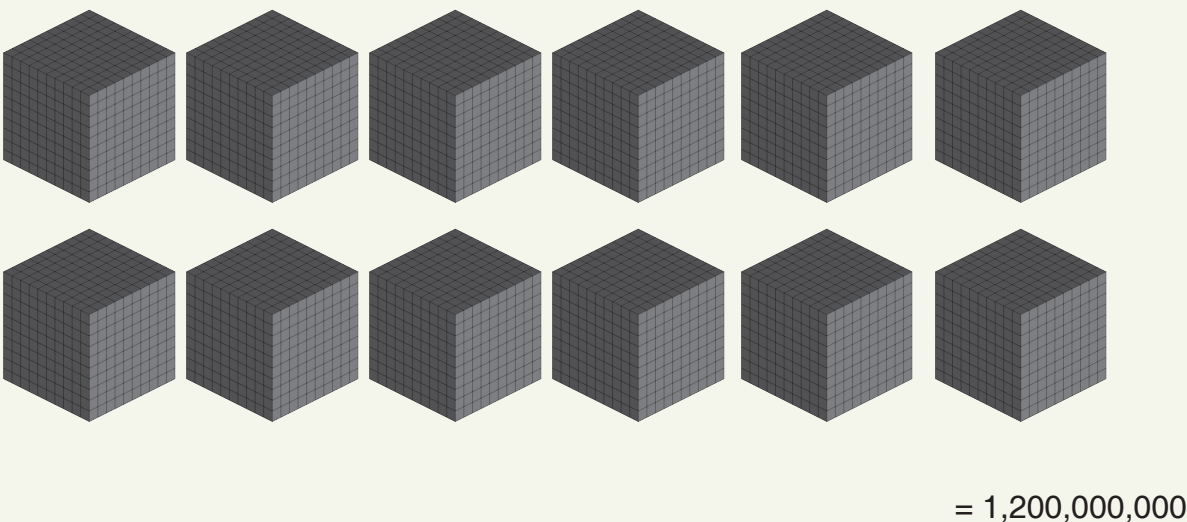
2.



3.



4.



Main Idea

(LB page 5)

Question 1- 4

Check each learner's answers to the four questions..

Sub-strand 1: Number and numeration systems**Module 2****Comparing and ordering whole numbers****Content standard**

B7.1.1.1 Demonstrate understanding and the use of place value for expressing quantities recorded as base ten numerals as well as rounding off these numbers to a given number of decimal places and significant figures.

Indicator

B7.1.1.2 Compare and order whole numbers greater than 1,000,000,000 and represent the comparison using $>$, $<$, or $=$.

Learning expectations: In this module, learners will learn how to:

- Skip count in 1,000s; 100,000s; 1,000,000s, etc.
- Find numbers that are more than or less than a given number.

Essential for learning: Learners can skip count in 50s, 100s and so on and can compare two numbers within 1,000 of each other.

Keywords: skip counting, more than, less than, place value

Resources: Multi-base blocks, place value chart, symbols of $<$, $=$, $>$, numeral cards

Competencies: Critical thinking and problem-solving, communication and collaboration

Starter: Refer learners to page 6 of the Learner's Book. Ask them to fill in the missing numbers and name the number that the blocks display.

Main idea 1

Finding more than or less than a given number

LB page 6

Activity 1: Write a number; for example **1.** 685 and 658 **2.** 12,423 and 12,432 and **3.** 30,687 and 30,786 on the board. Ask learners to determine which number in each question is less than, greater than or equal to the other number.

Activity 2: Draw the place value frame on the board. Work through the Worked example on page 7 in the Learner's Book step by step with learners.

Activity 3: In pairs, ask learners to each number write two numbers. They exchange numbers and compare them to determine which number is less than, more than or same as compared to the second number.

Activity 4: Write some numbers on the board and ask learners in their groups to compare and order the numbers in ascending and descending orders. For example, 31,667, 30,345, 30,348 and 31,706. Ask the groups to present their answers for others to check.

Review exercise

Differentiated lessons

Remedial activity

Compare and order these numbers in ascending order and descending orders:
21,688, 22,868, 21,687 and 22,886.

Challenging activities

In pairs, write four numbers and arrange the numbers in ascending and descending order.

Assessment tasks -----LB page 8

Learners use place values to compare numbers.

Main idea 2

Comparing numbers using the symbols $>$, $<$ and $=$ **LB page 8**

Activity 1: Place learners in convenient groups. Give each group numeral cards and symbol cards. For example: **A** 787,232 **B** 787,230 $<$, $=$, $>$
Ask learners to compare the two numbers. Compare the hundred thousands first, then the ten thousands and the thousands, the two numbers are the same. Again comparing the hundred and the tens. Up to the tens, the two numbers are the same. There is a difference in the ones columns. A is 2 more than B and B is 2 less than A. So comparing the two numbers using the symbols: $787,232 > 787,230$ or $787,230 < 787,232$.

Activity 2: Refer learners to page 7 of the Learner's Book. Go through the worked examples step by step with them.

Write the Worked examples on the board. Let learners solve them in their groups. They compare their answers with other groups and correct answers as necessary.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to compare the numbers 68,521 and 86,428 using the symbols.

Challenging activities

In pairs, ask learners to write two numbers with six digits and use the symbols to compare the two numbers.

Assessment tasks -----LB page 10

Learners compare numbers and compare and order numbers.

Suggested homework

Compare the numbers using the symbols $<$, $=$ and $>$.

1. 987,245 and 899,876
2. 22,685,221 and 23,892,001
3. 17,001,285 and 17,100,585

Main idea 3

Identifying position of numbers

LB page 11

Activity 1: Review the previous lesson with learners. Ask learners to work in pairs. Copy this number chart on the board. Ask learners to select a number from the chart; for example, 16,777.

Select a number from the chart.

60,232	92,999	70,334	50,786
22,984	60,685	78,031	13,608
21,982	98,685	16,777	33,285

Ask groups to describe the chosen number in relation to the other numbers. Learners ask their partners the following questions:

1. Which numbers are directly above the selected number?
2. Which number is two steps to the left of 16,777?
3. Write two numbers that are greater than 16,777.
4. Which numbers are less than the selected number?
5. Find the difference between the first number and the selected number.

Review exercise

Draw the following table on the board.

6,850,968	7,238,099	9,928,500
5,496,788	3,865,421	3,868,193
3,060,905	6,388,964	7,630,428

In mixed ability groups, ask learners to answer the following questions. They display their work on the board so that others can check their answers.

1. Choose one number in the table.
2. Write the numbers to the right or to the left of your number.
3. Write two numbers that are below or above your chosen number.

Assessment tasks -----LB page 12

Learners use a number chart when answering questions.

Suggested homework:

Copy this table in your exercise book. Select a number and describe it in four different ways.

78,592	78,691
34,055	10,999
78,654	78,564

Answers to Assessment tasks

Main Idea

(LB page 8)

1. $5,897,789 > 5,890,789$; 7,000 more
 $5,890,589 < 5,890,789$; 200 less
2. $1,703,666 < 1,703,866$; 200 less
 $1,733,866 > 1,703,866$; 30,000 more
3. $20,557,897 > 20,457,897$; 100,000 more
 $20,457,797 < 20,457,897$; 100 less
4. $11,009,143 < 11,099,143$; 90,000 less
 $11,909,143 > 11,099,143$; 810,000 more
5. $58,764,910 > 58,764,110$; 800 more
 $58,264,110 < 58,764,110$; 500,000 less
6. $676,234,100 < 677,234,100$; 1,000,000 less
 $697,234,100 > 677,234,100$; 20,000,000 more

Main Idea 2

(LB page 10)

1. a. $87,345 < 87,435$ b. $360,345 = 306,345$
c. $12,121,098 > 12,112,098$ d. $150,760,100 < 150,760,110$
e. $102,897,232 = 102,897,232$ f. $76,598,198 > 76,489,198$
g. $1,349,755 > 928,795$ h. $58,096 < 58,123$
i. $657,801 = 657,801$ j. $7,651,483 < 7,653,001$

Ascending order:

2. a. $16,076 < 16,560 < 16,650 < 16,670$
Descending order: $16,670 > 16,650 > 16,560 > 16,076$
b. Ascending order: $450,660 < 450,667 < 450,676 < 450,766$
Descending order: $450,766 > 450,676 > 450,667 > 450,660$

- c. Ascending order: $120,476,110 < 120,647,110 < 120,764,110 < 120,976,110$
Descending order: $120,976,110 > 120,764,110 > 120,647,110 > 120,476,110$
- d. Ascending order: $191,110,130 < 919,100,103 < 991,100,103 < 999,100,100$
Descending order: $999,100,100 > 991,100,103 > 919,100,103 > 191,110,130$
- e. Ascending order: $890,672,033 < 890,762,033 < 890,917,033 < 899,008,002$
Descending order: $899,008,002 > 890,917,033 > 890,762,033 > 890,672,033$
- f. Ascending order: $178,178,020 < 178,178,200 < 187,178,200 < 187,188,200$
Descending order: $187,188,200 > 187,178,200 > 178,178,200 > 178,178,020$
- g. Ascending order: $3,456,740 < 3,539,704 < 3,546,074 < 3,546,704$
Descending order: $3,546,704 > 3,546,074 > 3,539,704 > 3,456,740$
- h. Ascending order: $907,995,324 < 970,025,513 < 970,524,513 < 975,864,513$
Descending order: $975,864,513 > 970,524,513 > 970,025,513 > 907,995,324$
- i. Ascending order: $85,005,468 < 85,014,248 < 85,100,643 < 85,329,002$
Descending order: $85,329,002 > 85,100,643 > 85,014,248 > 85,005,468$
- j. Ascending order: $29,434,950 < 87,059,458 < 100,523,458 < 123,987,458$
Descending order: $123,987,458 > 100,523,458 > 87,059,458 > 29,434,958$

Main Idea 3

(LB page 12)

1. 123,922,097
2. 81,687,877
3. 770,334,987 is more and 94,687,500 is less
4. $320,687,500 - 213,982,004 = 106,705,496$
5. Fifth row

Sub-strand 1: Number and numeration systems**Module 3****Round off whole numbers****Content standard**

B7.1.1.1 Demonstrate understanding and the use of place value for expressing quantities recorded as base ten numerals as well as rounding off these quantities to a given number of decimal places and significant figures.

Indicator

B7.1.1.1.3 Round (off, up, down) whole numbers more than 1,000,000,000 to the nearest hundred thousand, ten thousands, thousand, hundred and ten.

Learning expectations: In this module, learners will learn how to:

- Round up and round down whole numbers.
- Round off whole numbers.
- Round up whole numbers to a given number of significant figures.

Essential for learning: Learners can compare two numbers and determine which number is bigger or smaller.

Keywords: round up, round down, round off, whole numbers, significant figure.

Resources: Multi-base blocks

Competencies: Personal development and leadership, creativity and innovation.

Starter: Refer learners to page 13 of the Learner's Book. Ask learners to solve the questions by adding or subtracting quickly.

Main idea 1

Aproximations

LB page 13

Activity 1: Ask learners to read through the stepson page 14 in the Learner's Book to follow to round off numbers.

Steps in rounding off numbers

1. Draw a vertical line to the right of the place value digit that is required.
2. Look at the next digit.

3. If it is 5 or more, add 1 to the previous digit.
4. if it is 4 or less, maintain or keep the previous digit as it is.
5. Fill any space(s) to the right of the line with zeros.

So, to round off 3,258 to the nearest 10, 100 and 1,000:

1. To the nearest 10: the digit 8 is more than 5, so add 1 to 5 and replace 8 with 0.
∴ 3,258 to the nearest 10 is 3,260.
2. To the nearest 100: the digit 5 is equal to 5, so add 1 to 2 and replace 5 and 8 with 0s.
∴ 3,258 to the nearest 100 is 3,300.
3. To the nearest 1,000: the digit 2 is less than 5, so replace 2, 5 and 8 with 0s.
∴ 3,258 to the nearest 1,000 is 3,000.

Activity 2: Place learners into convenient groups. Write some numbers on the board; for example:

1. 2,629
2. 459,638

Demonstrate to learners how to round off the number in question 1 to the nearest 10, 100 and 1,000.

1. 2,629 to the nearest 10.
 - Draw a line after 2: 262/9
 - Look at the next digit; it is 9. As 9 is more than 5, we round off 9 to 1 and add 1 to the 2 to make 3.

So 2,629 to the nearest 10 is 2,630. Continue rounding off the number to the nearest 100 and 1,000 with learners.

Guidelines for rounding off the number in question 2.

Activity 3: Refer learners to the Worked examples on page 15. Go through the first three exercises with them. Ask learners to work in pairs to solve the remaining two.

Review exercise

Differentiated lessons

Remedial activity

Learners work in pairs to approximate 6,805 to the nearest 100 and 1,000.

Challenging activities

Ask learners to work in groups of four. They write six-digit number and approximate it to the nearest:

1. 10
2. 100
3. 1,000.

Assessment tasks ----- LB page 15

Learners round off numbers.

Suggested homework

1. Approximate 2,689 to the nearest 10,100 and 1,000.
2. Approximate 86,480 to the nearest 100 and 1000.

Main idea 2

Rounding off (up and down) of whole numbers

LB page 16

Activity 1: Review the previous lesson with learners. Work through the activity on page 16 in the Learner's Book with them. For example, rounding off 68 to the nearest 10: 8 is more than 5 so we round up and add 2 to 68 to get 70.

Rounding off 642 to the nearest hundred, you will get 600 because 42 is less than 50.

Activity 2: Ask learners to work in pairs to round off these numbers to the nearest 10, 100 and 1,000. You may give your own examples.

1. 6,528
2. 37,589
3. 9872

Activity 3: Work through the Worked examples on page 17 with learners.

Review exercise

Remedial activity

Learners work in pairs to round off these numbers to the nearest tens and hundreds.

1. 78
2. 1,244

Challenging activities

Work in pairs. Round off these numbers to the nearest tens, hundreds and thousands.

1. 653
2. 2,688

Assessment tasks

Learners round off numbers.

Suggested homework

Round off the numbers to the nearest 10,100 and 1,000.

1. 26,890
2. 66,445
3. 100,252

Main idea 3

Significant figures

LB page 18

Activity 1: Explain to learners the meaning of significant figures. Work through the statements and the rules for significant figures on page 19 in the Learner's Book with them.

Rules for significant figures

1. All non-zero numbers are significant. Example, the number 34.5 has three significant figures

2. A zero (0) between two non-zero is significant. 2053 and 20.53 have four significant figures each. Thus, the zeros between 2 and 5 are counted as significant numbers.
3. Leading zeros are not significant. They serve as place holders. 0.054 has only two significant figures. 0.00000042 also has two significant figures.

Activity 2: Write a number such as 637,649 on the board. Ask learners to round off to the number to three significant figures.

Find the last significant figure you have been given; it is 7

Now check the next figure to the right. In the example, it is 6 as 6 is more than 5, we round up the digit and add 1 to 7 to get 8. Therefore, 637,649 written to three significant figure is 638,000.

Activity 3: Write another number such as 837,549 on the board. Place learners in convenient groups and ask them to round off the number to 3, 2 and 1 significant figures.

Activity 4: Refer learners to pages 19 and 20 in the Learner's Book. Write the two questions on the board. Let learners work in their previous groups.

Review exercise

Remedial activity

Ask learners to work in pairs to round off 168,910 to: three significant figures and to two significant figures.

Challenging activities

Ask learners to work in pairs to round off 986751 to: four significant figures, three significant figures and two significant figures.

Assessment tasks ----- LB page 20

Learners write numbers to different significant figures.

Suggested homework

Round off the following numbers to: four significant figures, three significant figures and two significant figures.

1. 18,905

2. 16,200,005

3. 436,780

Answers to Assessment tasks

Main Idea 1

(LB page 15)

1.

Numbers	To the nearest 10	To the nearest 100	To the nearest 1,000
a. 3,486	3,490	3,500	3,000
b. 7,925	7,930	7,900	8,000
c. 67,052	67,050	67,100	67,000

2.

Numbers	To the nearest 100	To the nearest 1,000	To the nearest 10,000
a. 482,156	482,200	482,000	480,000
b. 739,462	739,500	739,000	740,000
c. 3,574,148	3,574,100	3,574,000	3,570,000

3. 5,847,163

	To the nearest	
a.	10	5,847,160
b.	100	5,847,200
c.	1,000	5,847,000
d.	10,000	5,850,000
e.	100,000	5,800,000

Main Idea 2

(LB page 18)

1.

38,673,917	Round up	Round down	Round off
To the nearest ten	38,673,920	38,673,910	38,673,920
To the nearest hundred	38,674,000	38,673,900	38,673,900
To the nearest thousand	38,674,000	38,673,000	38,674,000
To the nearest ten thousand	38,680,000	38,670,000	38,670,000
To the nearest hundred thousand	38,700,000	38,600,000	38,700,000

2.	5,107,513,613	Round up	Round down	Round off
	To the nearest ten	5,107,513,620	5,107,513,610	5,107,513,610
	To the nearest hundred	5,107,513,700	5,107,513,600	5,107,513,600
	To the nearest thousand	5,107,514,000	5,107,513,000	5,107,514,000
	To the nearest ten thousand	5,107,520,000	5,107,510,000	5,107,510,000
	To the nearest hundred thousand	5,107,600,000	5,107,500,000	5,107,500,000

3.	23,181,925,185	Round up	Round down	Round off
	To the nearest ten	23,181,925,190	23,181,925,180	23,181,925,190
	To the nearest hundred	23,181,925,200	23,181,925,100	23,181,925,200
	To the nearest thousand	23,181,926,000	23,181,925,000	23,181,925,000
	To the nearest ten thousand	23,181,930,000	23,181,920,000	23,181,930,000
	To the nearest hundred thousand	23,182,000,000	23,181,900,000	23,181,900,000

Main Idea 3

(LB page 20)

Numbers	a. 4 sig. fig.	b. 3 sig. fig.	c. 2 sig. fig.	d. 1 sig. fig.
1. 913,238	913,200	913,000	910,000	900,000
2. 707,556	707,600	708,000	710,000	700,000
3. 665,122	665,100	665,000	670,000	700,000
4. 123,262	123,300	123,000	120,000	100,000
5. 566,108	566,100	566,000	570,000	600,000
6. 1,855,556	1,856,000	1,860,000	1,900,000	2,000,000
7. 5,387,743	5,388,000	5,390,000	5,400,000	5,000,000
8. 209,233,876	209,200,000	209,000,000	210,000,000	200,000,000
9. 350,937,343	350,900,000	351,000,000	350,000,000	400,000,000
10. 5,845,246,774	5,845,000,000	5,850,000,000	5,800,000,000	6,000,000,000

Sub-strand 1: Number and numeration systems**Module 4****Round off decimal numbers****Content standard**

B7.1.1.1 Demonstrate understanding and the use of place value for expressing quantities recorded as base ten numerals as well as rounding off these quantities to given number of decimal places and significant figures.

Indicator

B7.1.1.1.3 Round off decimals to the nearest tenth, hundredth, thousandths, etc.

Learning expectations: In this module, learners will learn how to:

- Round up and round down decimal numbers.
- Round off decimal numbers.
- Round up decimal numbers to given significant figures.

Essential for learning: Learners can round off numbers to the nearest 10s 100s and 1,000s.

Keywords: round up, down and off, decimal number, significant figures

Resources: Place value chart

Competencies: Critical thinking and problem-solving

Starter: Refer learners to page 21 of the Learner's Book. Go through the starter activities with learners. They should work in pairs.

Main idea 1

Round off decimal numbers (up and down) to the nearest tenths, hundredths, thousandths etc **LB page 21**

Activity 1: Place learners in convenient groups. Revise with them the place values of whole numbers. Example : In 245: 2 hundreds, 4 tens + 5 ones. Write two numbers on the board 1.245 and 23.640. Ask learners to expand the numbers.

Activity 2: Write a number; for example, 67.048082 on the board. Ask learners to round off the number to the nearest tenth and hundredth. **67.048082** .

Demonstrate how to round off decimal numbers. Learners need to look at the next place value to the right (the hundredths). In the example, the number is 4; it is less than 5.

So, we do not change the number and the answer is 67.0. In their groups, ask learners to round off the number 62.048082 to the nearest hundredth. Let them look at the thousandths column. The number is 8 is more than 5 so ask learners what they must do. We must add 1 to 4 to give 5. So, 62.048082 to the nearest hundredth is 62.05. To the nearest thousandth, the number is 62.048.

Activity 3: Refer learners to pages 22 and 23 in the Learner's Book. Work through the Worked examples 1 and 2 with them. They should still work in their previous mixed ability groups.

Review exercise

Remedial activity

Ask learners to work in pairs and round off the number 13.0685 to the nearest tenth and to the nearest hundredth.

Challenging activities

Working in pairs, learners round off the number 6.3865 to the nearest tenths, hundredths and thousandth.

Assessment tasks ----- LB page 24

Learners round off decimal numbers.

Suggested homework

1. Round off 20.624 to the nearest tenth and hundredth.
2. Round off 62.6645 to the nearest hundredth and thousandth.

Main idea 2

Express decimal numerals to a given number of significant figures **LB page 24**

Activity 1: Revise the previous lesson with learners. Refer learners to pages 24 and 25 of the Learner's Book. Ask learners to read through the notes on the topic. Discuss with learners:

1. The leading zeros are not significant. For example, in 0.0567 the first significant digit is 5.
2. Zeros between digits are significant. For example, in 22.005, the two zeros are significant.
3. The last zero in a decimal number is significant.

Activity 2: Ask learners to work in pairs. Write decimal numbers on work cards and distribute them to the various groups. Examples include 2.6851 and 22.0056. In pairs, learners round off the numbers to one, two, three and four significant figures.

Activity 3: Refer learners to page 25 in the Learner's Book. Have learners work in pairs. Work through the Worked examples with them. Ask learners to exchange their work with the group next to them, check answers and make corrections where necessary.

Review exercise

Differentiated lessons

Remedial activity

Work in pairs. Write 552.028 to the following numbers of significant figures:

1. three
2. two

Challenging activities

Write 2.6805003 to the following numbers of significant figures:

1. two
2. one
3. four

Assessment tasks

Learners write decimal numbers to different numbers of significant figures.

Suggested homework

Write 67.08250 to correct to the following numbers of significant figures:

1. one
2. two
3. three
4. four

Main idea 3

Express decimal numbers to a given number of decimal places. **LB page 26**

Activity 1: Refer learners to pages 26 and 27 in the Learner's Book. Go through, the four rules with learners:

For the number of decimal places required, count that number of digits to the right of the decimal point and underline the digit.

- The next number to its right is called the “rounder decider”.
- If the rounder decider is 5 or more, round up the previous digit by 1.
- If the rounder decider is 4 or less, then keep the previous digit the same.

Activity 2: Place learners in groups of three. Write a number such as 9.74389 on the board. Ask the learners to round off the number to one, two, three and four decimal place. Refer them to pages 27 in the Learner's Book. Work through Worked examples with them.

Review exercise

Differentiated lessons

Remedial activity

Working in pairs, ask learners to round off 32.60503 to three and to two decimal places.

Challenging activities

Ask learners to write a number with four decimal places and round it off to two and to three decimal places.

Assessment tasks ----- **LB page 28**

Learners round off decimal numbers to one, two, three and four decimal places.

Suggested homework

1. Round off 24.6081 to the following number of decimal places:
a. two b. three
2. Round off 6.98201 to the following numbers of decimal places:
a. four b. three c. two
3. Round off 002561 to two and to three decimal places.

Revision 1

Number and numeration systems ----- LB page 29

Refer learners to page 29 of the Learner's Book. Have them do the revision exercise as class test.

Answers to Assessment tasks

Mani Idea 1

(LB page 24)

1.	23.509887	Round up	Round down	Round off
	To the nearest tenth	23.5	23.5	23.5
	To the nearest hundredth	23.51	23.50	23.51
	To the nearest thousandth	23.510	23.509	23.510

2.	786.19605	Round up	Round down	Round off
	To the nearest tenth	786.2	786.1	786.2
	To the nearest hundredth	786.20	786.19	786.20
	To the nearest thousandth	786.196	786.196	786.196

3.	105.32266772	Round up	Round down	Round off
	To the nearest tenth	105.4	105.3	105.3
	To the nearest hundredth	105.33	105.32	105.32
	To the nearest thousandth	105.323	105.322	105.323

Main Idea 2

(LB page 26)

- | | | |
|-------------|------------|--------------|
| 1. a. 30 | b. 25 | c. 25.06 |
| 2. a. 0.008 | b. 0.00778 | c. 0.0077824 |
| 3. a. 0.3 | b. 0.290 | c. 0.2895619 |
| 4. a. 200 | b. 166 | c. 166.16 |

Main Idea 3

(LB page 28)

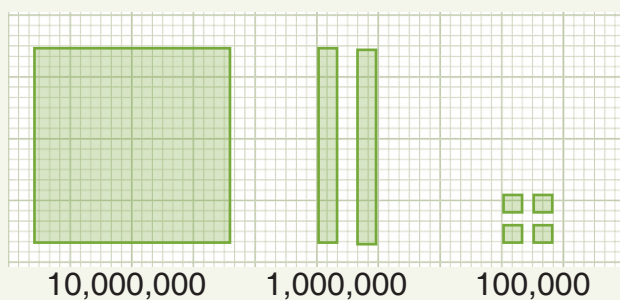
- | | | | |
|-------------|-----------|------------|-------------|
| 1. a. 55.5 | b. 55.54 | c. 55.537 | d. 55.5368 |
| 2. a. 0.1 | b. 0.05 | c. 0.055 | d. 0.0548 |
| 3. a. 4.9 | b. 4.91 | c. 4.912 | d. 4.9122 |
| 4. a. 786.2 | b. 786.18 | c. 786.184 | d. 786.1836 |

Answers to Revision

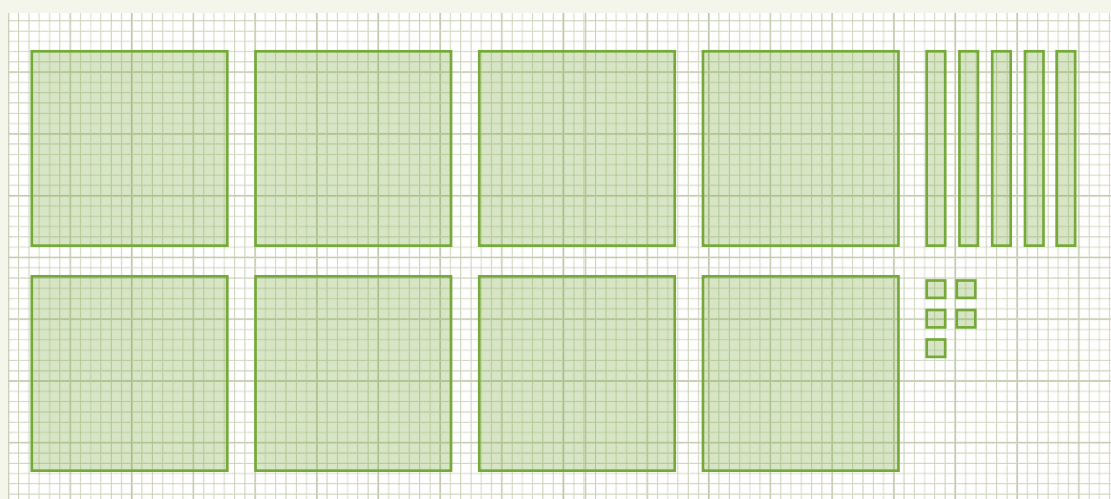
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(LB page 29)

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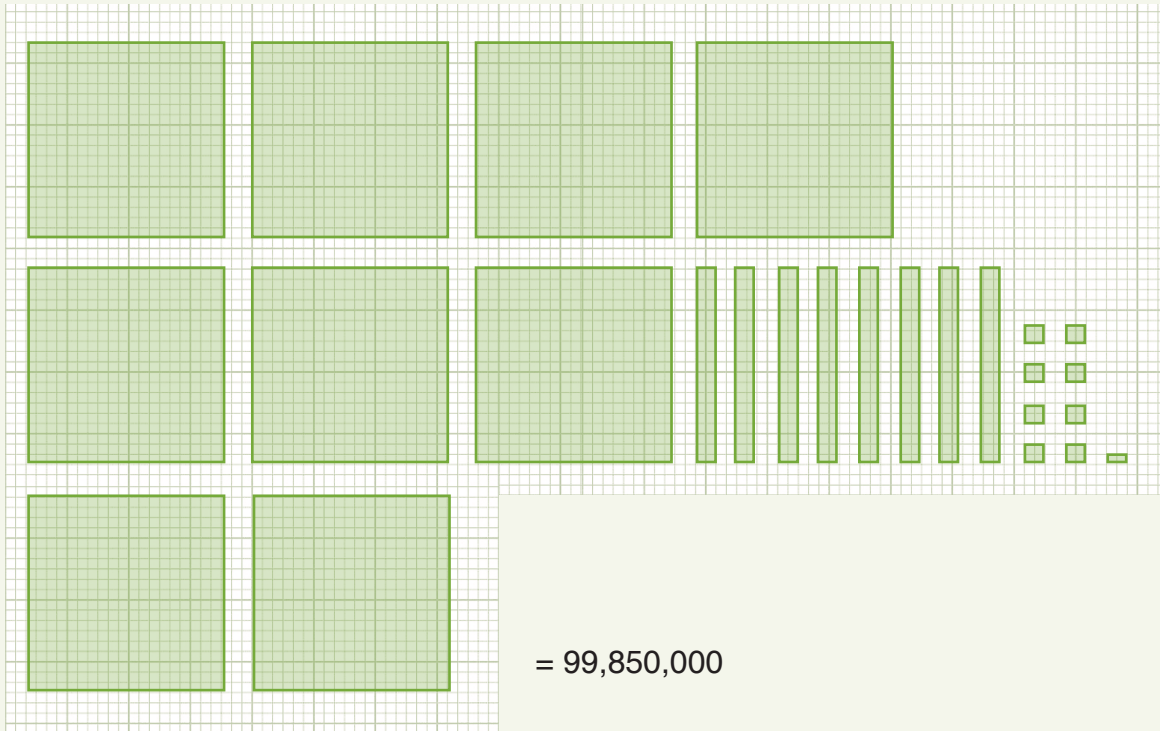


a.

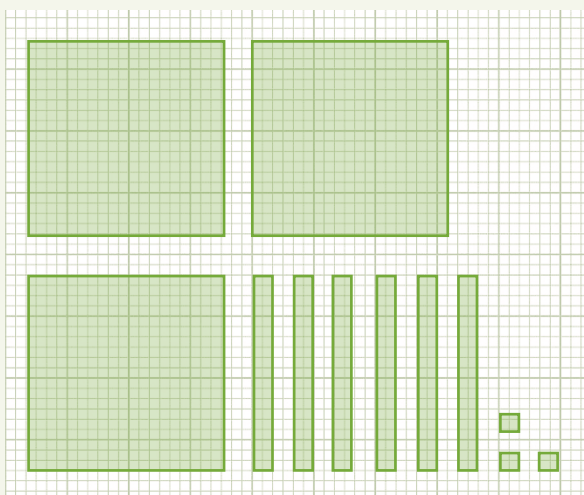


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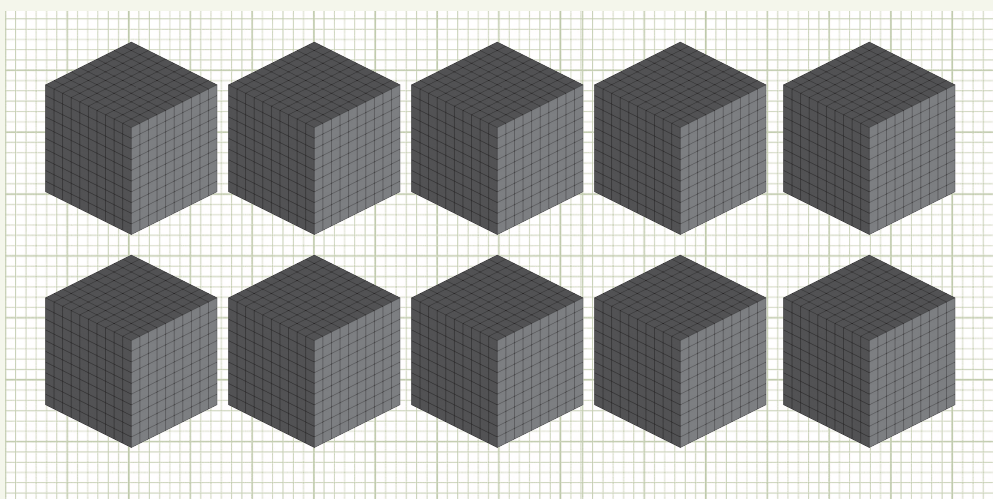
b.



c.

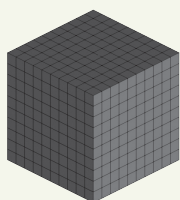


d.

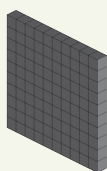


= 1,000,000,000

2. Key:



100,000,000



10,000,000

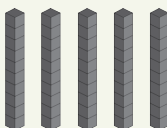
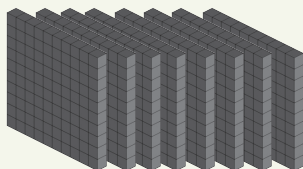


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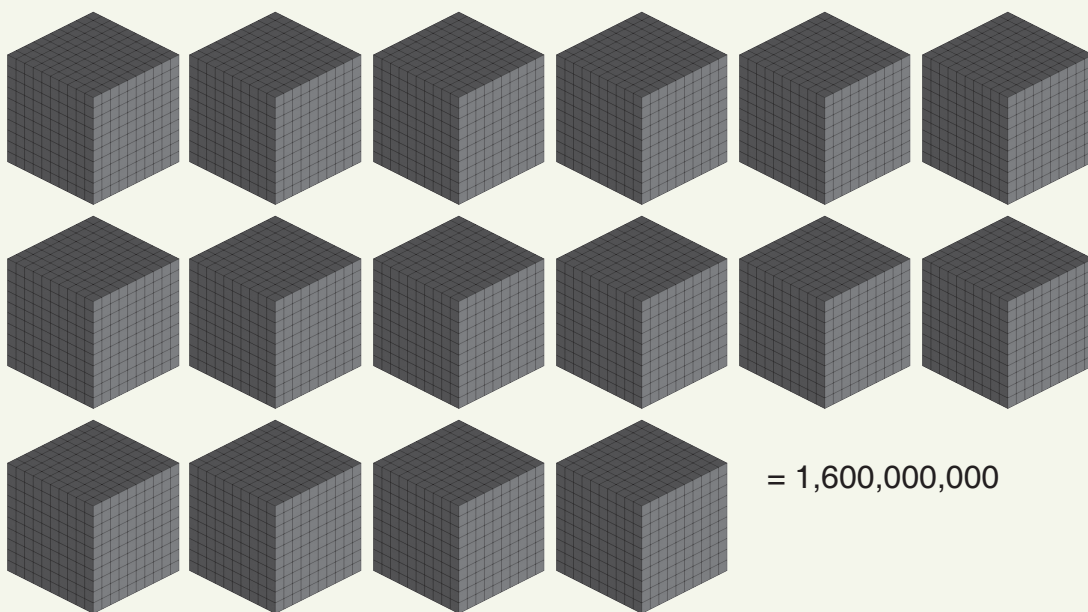
100,000

a.



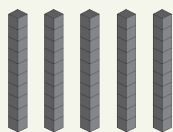
= 85,200,000

b.



= 1,600,000,000

c.



= 5,550,000

3.

Number	To the nearest 10	To the nearest 100	To the nearest 1,000	To the nearest 10,000	To the nearest 100,000
a. 3,628	3,630	3,600	4,000	0	0
b. 6,855	6,860	6,900	7,000	10,000	0
c. 12,654	12,650	12,700	13,000	10,000	0
d. 46,057,382	46,057,380	46,057,400	46,057,000	46,060,000	46,100,000

Sub-strand 2: Number operations**Module 1****Number computations****Content standard**

B7.1.2.1 Apply mental mathematics strategies and number properties used to solve problems.

Indicator

B7.1.1.2.1.1 Multiply and divide given numbers by powers of 10 including decimals and benchmark fractions.

Learning Expectation: In this module, learners will learn how to:

- Consolidate the rapid recall of multiplication and division facts.
- Consolidate the rapid recall of benchmark fractions converted to decimals and percentages.

Essential for learning: Learners can write multiplication fact up to 144.

Keywords: multiplication facts, division facts, fraction, percentage

Resources: Multiplication table

Competencies: Communication and collaboration, creativity and innovation

Starter: Ask learners to recite some multiplication tables such as the 8 time tables and 11 times. Ask learners to complete the multiplication table on page 30 in the Learner's Book.

Main idea 1

Multiplication and division facts

LB page 30

Activity 1: Explain to learners that multiplication and division are inverse operations. Both have to do with groups of equal sizes. Write $8 \times 6 = 48$ on the board. Ask learners to write multiplication and division facts as follows: $8 \times 6 = 48$, $48 \div 6 = 8$ and $48 \div 8 = 6$.

Activity 2: Place learners in convenient groups. Ask them to find the multiplication and division facts for numbers. e.g.

1. 60, 12, 5 2. 11, 88, 8 3. 72, 12, 6

Activity 3: Refer learners to page 31 in the Learner's Book. Go through the Worked examples with them. Learners solve the questions in their groups. Ask each group to do a group presentations.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs. They should fill in the spaces to complete the family facts.

1. $10 \times \underline{\quad} = 50$, $50 \div 5 = \underline{\quad}$

2. $144 \div \underline{\quad} = 12$, $12 \times 12 = \underline{\quad}$

Challenging activities

Ask learners to work in pairs to answer the questions.

1. $110 \div 10 = \underline{\quad}$

2. $13 \times 10 = \underline{\quad}$

Assessment tasks ----- LB pages 31 and 32

Suggested homework

Find the multiplication and division facts for the following numbers.

1. 110, 11 and 10

2. 12, 144, 12

3. 60, 0025

Main idea 2

Convert fractions to decimals or percentages

LB page 32

Activity 1: Write fractions on the board and ask learners to convert them to decimals and percentages. Examples 1. $\frac{3}{10}$ and $\frac{7}{10}$

Demonstrate the first fraction $\frac{3}{10}$ on the board for learners to observe.

$$\frac{3}{10} = 3 \times \frac{1}{10}, \frac{1}{10} = 0.1 = 10\%$$

$$3 \times 0.1 = 0.3$$

$$3 \times 10\% = 30\%$$

$$\therefore \frac{3}{10} = 0.3 = 30\%$$

Place learners in convenient groups. Ask them to convert $\frac{7}{10}$ to decimal and to a percentage.

Activity 2: Write the Worked examples on pages 32 and 33 in the Learner's Book on the board for learners to solve in their groups. Groups solve questions 1 and 2.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to write 0.5 as a fraction and a percentage and to write 30% as a fraction and as a decimal.

Challenging activities

Ask learners to work in pairs to solve three problems.

Write each fraction as as a decimal and as a percentage:

1. $\frac{9}{10}$

2. $\frac{37}{100}$

3. $\frac{82}{100}$

Assessment tasks ----- LB page 33

Learners convert percentages, fractions and decimal numbers.

Suggested homework

Convert the following fractions to decimals and percentages:

1. $\frac{9}{10}$

2. $\frac{33}{100}$

3. $\frac{19}{20}$

4. $\frac{5}{6}$

Main idea 3

Product of decimal numbers and powers of 10 LB page 34

Activity 1: Revise the previous lesson with learners. Write the number 1.6852 on the board. Demonstrate how to multiply it by the powers of 10, 100 etc. for learners to observe.

1. 1.6852×10 , we have one zero so we move one decimal place to the right. So, the answer is 16.852.
2. To multiply the same number by 100 we move two decimal places to the right:
 $1.6852 \times 100 = 168.52$.

Activity 2: Write two decimal numbers on the board; for example:

1. 16.2008 and
2. 32.01268. In pairs ask learners to multiply each number by 10, 100 and 1,000.

Activity 3: Work through the Worked examples 1 and 2 on pages 34 and 35 in the Learner's Book with learners. Let them copy the summarised results in the table in their jotters.

Activity 4: Write $5.64 \times \frac{1}{10}$ on the board. Tell learners that to divide a decimal number by negative powers, we move the decimal point to the left the same number of zeros as in the number; for example:

$$5.64 \times \frac{1}{10} = 5.64 \times 10^{-1} = 0.564$$

In pairs ask learners to solve these multiplication problems:

1. $28.625 \times \frac{1}{100}$ and

2. $3.685 \times \frac{1}{1,000}$.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs. Multiply these numbers by 10 and 100: 1. 6.285 2. 25.9006

Challenging activities

Multiply these numbers by 100 and 1,000.

1. 21.06052

2. 1.00169

3. 20.6885

Assessment tasks ----- LB page 36

Learners multiply decimal numbers, find missing factors and solve other questions.

Suggested homework

Multiply each number by 10, 100 and 1,000.

1. 60.285

2. 2.685

2. Multiply 2.82 by $\frac{1}{10}$, $\frac{1}{100}$ and $\frac{1}{1000}$.

Answers to Assessment tasks

Main Idea 1

(LB page 31)

- | | | | |
|-------------------------|-----------------------|-------------------------|-----------------------|
| 1. a. $7 \times 6 = 42$ | b. $4 \times 9 = 36$ | c. $12 \times 11 = 132$ | d. $11 \times 8 = 88$ |
| $6 \times 7 = 42$ | $4 \times 9 = 36$ | $11 \times 12 = 132$ | $8 \times 11 = 88$ |
| $42 \div 7 = 6$ | $36 \div 9 = 4$ | $132 \div 11 = 12$ | $88 \div 11 = 8$ |
| $42 \div 6 = 7$ | $36 \div 4 = 9$ | $132 \div 12 = 11$ | $88 \div 8 = 11$ |
| 2. a. $8 \times 7 = 56$ | b. $12 \times 6 = 72$ | c. $8 \times 5 = 40$ | d. $9 \times 7 = 63$ |
| $7 \times 8 = 56$ | $6 \times 12 = 72$ | $5 \times 8 = 40$ | $7 \times 9 = 63$ |
| $56 \div 8 = 7$ | $72 \div 12 = 6$ | $40 \div 8 = 5$ | $63 \div 9 = 7$ |
| $56 \div 7 = 8$ | $72 \div 6 = 12$ | $40 \div 5 = 8$ | $63 \div 7 = 9$ |
| 3. a. $96 \div 8 = 12$ | $8 \times 12 = 96$ | b. $72 \div 8 = 9$ | $8 \times 9 = 72$ |
| $96 \div 12 = 8$ | $12 \times 8 = 96$ | $72 \div 9 = 8$ | $9 \times 8 = 72$ |
| c. $42 \div 7 = 6$ | $7 \times 6 = 42$ | | |
| $42 \div 6 = 7$ | $6 \times 7 = 42$ | | |
| 4. a. $5 \times 8 = 40$ | $40 \div 5 = 8$ | b. $7 \times 9 = 63$ | $63 \div 7 = 9$ |
| $8 \times 5 = 40$ | $40 \div 8 = 5$ | $9 \times 7 = 63$ | $63 \div 9 = 7$ |
| c. $11 \times 9 = 99$ | $99 \div 11 = 9$ | d. $12 \times 11 = 132$ | $132 \div 12 = 11$ |
| $9 \times 11 = 99$ | $99 \div 9 = 11$ | $11 \times 12 = 132$ | $132 \div 11 = 12$ |

Main Idea 2

(LB page 33)

1. **a.** 0.2 **b.** 0.57 **c.** 0.36 **d.** 0.09
2. a. $\frac{62}{100} = \frac{31}{50}$ **b.** $\frac{28}{100} = \frac{7}{25}$ **c.** $\frac{12}{100} = \frac{3}{25}$ **d.** $\frac{82}{100} = \frac{41}{50}$
3. a. 0.7; 70% **b.** 0.8; 80% **c.** 0.35; 35% **d.** 0.06; 6%
4. a. $\frac{5}{10} = \frac{1}{2}$; 50% **b.** $\frac{15}{100} = \frac{3}{20}$; 15% **c.** $\frac{3}{100}$; 3% **d.** $\frac{87}{100}$; 87%

5.

Fraction	Decimal	Percentage
$\frac{1}{4}$	0.25	25%
$\frac{17}{20}$	0.85	85%
$\frac{9}{10}$	0.9	90%

Main Idea 3

(LB page 36)

1. **a.** 485 **b.** 272.34 **c.** 9,050 **d.** 75 **e.** 102.5 **f.** 5,724.6
2. a. 100 **b.** 4.5 **c.** 100 **d.** 100 **e.** 10.25 **f.** 1,000
3. 2,000 cm or 20 m
4. a. $8.07 \times 10 = 80.7$ **b.** $70.8 \times 100 = 7,080$ **c.** $0.807 \times 1,000 = 807$
5. a. 4.8351 **b.** 0.0673 **c.** 0.069743 **d.** 0.10862
e. 0.00023 **f.** 0.58504
6. a. 0.305 **b.** 0.000098 **c.** 8.902 **d.** 3.564
e. 7.68901 **f.** 0.7289

Sub-strand 2: Number operations**Module 2****Mental maths strategies****Content standard**

B7.1.2.1 Apply mental mathematics strategies and number properties used to solve problems.

Indicator

B7.1.2.1.2 Apply mental mathematics strategies and number properties used to perform calculations.

Learning expectations: In this module, learners will learn how to:

- Apply the halving and doubling strategies to find the product of two given numbers.
- Apply the distributive property strategy to find the product of two given numbers.
- Apply mental strategy to find the product of 9, 11 and a given number.

Essential for learning: Learners can double and half numbers.

Keywords: doubling, halving, distributive property

Competencies: Creativity and innovation, critical thinking and problem-solving

Starter: Refer to the table on page 37 and ask learners to complete the table. Let them work in pairs.

Main idea 1

Halving and doubling strategies for mental calculations

LB page 37

Activity 1: Place learners in convenient groups. Explain to learners that it is better to double the smaller number and halve the larger number. For example: $5 \times 14 = ?$ Learners double 5, that gives 10 and halve 14; that gives 7. So, the question now becomes $10 \times 7 = 70$.

Tell learners that it is better to double the odd factor and half the even number; for example: $5 \times 28 = ?$. Double 5 gives 10 and half of 28 is 14; so, $10 \times 14 = 140$.

Activity 2: Work through the tips for halving and doubling of numbers on page 38 in the Learner's Book.

Activity 3: Write the Worked examples on the board. Ask a few learners to work on the board while the rest work in their jotters and compare their answers. Refer learners to page 38 in the Learner's Book. Let them work through all the Worked examples.

Activity 4: Multiplying by 9 and 11

Multiplying by 9: Multiplying by 9 is one less than multiplying by 10; so, we can multiply 4 and 9. Since $4 \times 10 = 40$; it means that $4 \times 9 = 40 - 4 = 36$.

Multiplying by 11: Since multiplying by 11 is one more group than multiplying by 10. Multiply 7 by 11. Since $7 \times 10 = 70$ then $7 \times 11 = 70 + 7 = 77$.

To multiply two-digit numbers by 11, simply add the two digits and then write the sum between the original two digits. For instance, to multiply 11 and 45. Add 4 and 5 to get 9, then write 9 between the original two digits to get 495. Give more numbers for learners to multiply by 11.

Differentiated lessons

Remedial activity

Multiply.

1. 5×16

2. 3×30

3. 11×42

Challenging activities

Multiply.

1. 4×16

2. 56×5

3. 32×500

Assessment tasks ----- LB page 39

Learners use halving and doubling to multiply.

Suggested homework:

Multiply.

1. 25×20

2. 13×20

3. 50×22

4. 11×15

5. 9×650

Main idea 2

Find products of numbers using distributive property
LB page 39

Activity 1: Write $6 \times 13 = ?$ on the board. Demonstrate how to use the distributive property of multiplication to work out the answer. Discuss the two examples with the class.

1. $6 \times 24 = ?$

$$= 6 \times (20 + 4)$$

$$= 120 + 24$$

$$= 144$$

2. $18 \times 5 = ?$

$$= 5 (20 - 2)$$

$$= (5 \times 20) - (2 \times 5)$$

$$= 100 - 10$$

$$= 90$$

Activity 2: Place learners in convenient groups. Write some numbers on the board for learners to solve in their groups; for example:

1. 28×5

2. 54×5

3. 6×26

Ask a few groups to work on the board. They should explain their steps when solving the problem.

Activity 3: Ask learners to answer the Worked examples on the board before you refer them to page 40 in the Learner's Book.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to solve the problems using the distributive method.

1. 19×6

2. 17×8

Challenging activities

Using distributive strategy; multiply. 1. 78×5

2. 25×8

3. 18×20

Assessment tasks ----- LB page 40

Learners use the distributive property to multiply.

Suggested homework

Use distributive strategy to multiply.

1. 5×20

2. 4×35

3. 38×8

Answers to Assessment tasks

Main Idea 1

(LB page 39)

1. a. 4

b. 20

c. 62

d. 9

e. 3

f. 100

2. a. 2×48

b. 34×10

c. 3×32 or 12×8

d. 3×126

e. 50×4 or 100×2

f. 2×250

3. a. $2 \times 52 = 104$

b. $28 \times 10 = 280$

c. $8 \times 100 = 800$

d. $110 \times 2 = 220$

e. $50 \times 6 = 300$

f. $19 \times 1,000 = 19,000$

Main Idea 2

(LB page 40)

1. a. 5

b. 7

c. $(8 - 2)$ or 6

d. 3

e. 6

f. $(4 + 3)$ or 7

g. 4

h. 5

2. a. $3(20 - 3) = (3 \times \underline{20}) - (3 \times \underline{3}) = 60 - \underline{9} = \underline{51}$

b. $6(3 + 2) = (6 \times 3) + (\underline{6} \times \underline{2}) = 18 + \underline{12} = \underline{30}$

c. $8(15) = 8(\underline{10} + \underline{5}) = (8 \times \underline{10}) + (8 \times \underline{5}) = 80 + \underline{40} = \underline{120}$

d. $5 \times 29 = 5 \times (20 + \underline{9}) = (5 \times 20) + (\underline{5} \times \underline{9}) = \underline{100} + 45 = \underline{145}$

e. $29 \times 5 = (30 - \underline{1}) \times 5 = (30 \times 5) - (\underline{1} \times 5) = 150 - \underline{5} = 145$

3. **a.** $6 \times 24 = 6(20 + 4) = 6 \times 20 + 6 \times 4 = 120 + 24 = 144$
- b.** $3 \times 47 = 3(50 - 3) = 3 \times 50 - 3 \times 3 = 150 - 9 = 141$
- c.** $48 \times 5 = 5(50 - 2) = 50 \times 5 - 2 \times 5 = 250 - 10 = 240$
- d.** $29 \times 4 = 4(30 - 1) = 30 \times 4 - 1 \times 4 = 120 - 4 = 116$
- e.** $9 \times 25 = 25(10 - 1) = 10 \times 25 - 1 \times 25 = 250 - 25 = 225$
- f.** $7 \times 32 = 7(30 + 2) = 7 \times 30 + 7 \times 2 = 210 + 14 = 224$
- g.** $66 \times 5 = 5(60 + 6) = 60 \times 5 + 6 \times 5 = 300 + 30 = 330$
- h.** $53 \times 7 = 7(50 + 3) = 50 \times 7 + 3 \times 7 = 350 + 21 = 371$
- i.** $6 \times 28 = 6(30 - 2) = 6 \times 30 - 6 \times 2 = 180 - 12 = 168$

Sub-strand 2: Number operations**Module 3****Addition and subtraction facts****Content standard**

B7.1.2.2 Demonstrate an understanding of addition, subtraction, multiplication and division of (i) whole numbers, and (ii) decimal numbers, to solve problems.

Indicator

B7.1.2.2.1 Add and subtract up to four-digit numbers.

Learning expectations: In this module, learners will learn how to:

- Add up to four-digit whole numbers.
- Subtract up to four-digits whole numbers.
- Add and subtract decimal numbers.

Essential for learning: Learners can add and subtract three-digit numbers up to 10,000.

Keywords: partition, place value, addition, subtraction

Resources: Abacus, multi-base blocks

Competencies: Critical thinking and problem-solving

Starter: Ask learners to work in pairs and write the expanded form for the three numbers on page 42 in the Learner's Book..

Main idea 1

Addition and subtraction of whole numbers up to four digits
LB page 42

Activity 1: Revise the previous lesson with learners. Ask learners to work in pairs. Write numbers on the board and ask learners to write each number in expanded form.

1. 689

2. 2,430

3. 8,599

Solutions

1. $689 = 600 + 80 + 9$

2. $2,430 = 2,000 + 400 + 30$

3. $8,599 = 8,000 + 500 + 90 + 9$

Ask learners exchange their work with their partners, compare answers and correct answers that are not correct.

Activity 2: Refer learners to page 43 in the Learner's Book. Work through question 1 and 2 with them.

Activity 3: Write a few addition sentences on the board such as $282 + 531$. Ask learners to use partitioning method to add. Invite a girl and a boy to work on the board at the same time. In pairs, ask learners add the numbers:

1. $638 + 1,324$

2. $1,432 + 3,542$

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs.

1. $623 + 456$

2. $423 + 385$

Challenging activities

Work in pairs. Add:

1. $2,654 + 5,366$

2. $3,390 + 7,465$

Assessment task

Refer learners to page 44 in the Learner's Book.

Main idea 2

Add and subtract decimal numbers using partitioning and place value

LB page 42

Activity 1: Ask learners to work in pairs. Write some numbers on the board; for example, $37.46 + 12.24$. Ask learners how to work out the answers. How do you expand the numbers? Allow learners time to think about the question and ask a learner to explain. Get back to the class and ask learners to discuss about the answers. Demonstrate to learners how to solve the problem by expanding the numbers first.

$$37.46 = 30 + 7 + \frac{4}{10} + \frac{6}{100}$$

$$12.24 = 10 + 2 + \frac{2}{10} + \frac{4}{100}$$

$$\begin{aligned} 37.46 + 12.24 &= 40 + 9 + \frac{6}{10} + \frac{10}{100} \\ &= 40 + 9 + \frac{6}{10} + \frac{1}{10} + \frac{0}{100} \\ &= 40 + 9 + \frac{7}{10} + \frac{0}{100} \\ &= 49.70 \end{aligned}$$

Ask learners to explain why $\frac{10}{100}$ was changed to $\frac{1}{10}$.

Activity 3: In pairs, ask learners to add: $22.61 + 35.26$.

Work through Worked examples 1 and 2 with learners on pages 46 and 47 in the Learner's Book.

Activity 4: Solve one subtraction sentence on the board with learners: $364.82 - 212.64$.

$$364.82 - 212.64$$

$$364.82 = 300 - 60 - 4 - \frac{8}{10} - \frac{2}{100}$$

$$212.62 = 200 - 10 - 2 - \frac{6}{10} - \frac{2}{100}$$

$$364.82 - 212.62 = 300 - 60 - 4 - \frac{8}{10} - \frac{2}{100} - 200 - 10 - 2 - \frac{6}{10} - \frac{2}{100}$$

$$= 100 + 50 + 2 + \frac{2}{10} + \frac{0}{100}$$

$$= 152.20$$

Review exercise

Differentiated lesson

Remedial activity

Learners in pairs.

Add: $13.62 + 24.54$

Challenging activities

Learners work in pairs to work out the answers.

1. Subtract: $68.24 - 39.27$

2. Add: $72.32 + 39.45$

Assessment tasks ----- LB page 47

Learners use different methods to add and subtract.

Suggested homework:

1. Add: $23.681 + 17.282$

2. Add: $17.282 + 10.324$

3. Subtract 26.024 from 60.285.

4. Subtract 17.982 from 30.685.

Answers to Assessment tasks

Main Idea 1

(LB page 44)

- | | | | |
|---|--|--|--|
| 1. a. 4,170 | b. 8,821 | c. 6,460 | d. 8,222 |
| 2. a. 5,668 | b. 2,792 | c. 5,148 | d. 4,087 |
| 3. a. 5,328 | b. 9,103 | c. 2,199 | d. 4,881 |
| 4. a. 5,995 | | b. 5,340 | c. 7,221 |
| d. 8,000 | | e. 2,533 | f. 3,892 |
| 5. a. 2,042 | b. 318 | c. 2,518 | d. 1,711 |
| 6. a. 6,828 | b. 8,502 | c. 4,677 | |
| 7. a. $\begin{array}{r} 8,156 \\ + 1,723 \\ \hline 9,879 \end{array}$ | b. $\begin{array}{r} 4,375 \\ + 2,465 \\ \hline 6,840 \end{array}$ | c. $\begin{array}{r} 6,279 \\ - 2,856 \\ \hline 3,423 \end{array}$ | d. $\begin{array}{r} 4,635 \\ - 2,378 \\ \hline 2,257 \end{array}$ |

Main Idea 2

(LB page 47)

- | | | | |
|---|--|--|-----------|
| 1. a. 142.95 | b. 504.14 | c. 86.38 | d. 54.028 |
| 2. a. 132.04 | b. 33.345 | c. 49.005 | d. 579.09 |
| 3. a. 223.92 | b. 6.5 | c. 45.078 | d. 59.62 |
| 4. a. 9.25 | b. 47.88 | c. 8.902 | d. 17.58 |
| 5. a. $\begin{array}{r} 6.147 \\ + 1.585 \\ \hline 7.732 \end{array}$ | b. $\begin{array}{r} 1.980 \\ + 0.337 \\ \hline 2.317 \end{array}$ | c. $\begin{array}{r} 3.526 \\ - 0.834 \\ \hline 2.692 \end{array}$ | |

Sub-strand 2: Number operations**Module 4****Multiplication and division of whole numbers****Content standard**

B7.1.2.2 Demonstrate an understanding of addition, subtraction, multiplication and division of (i) whole numbers, and (ii) decimal numbers, to solve problems.

Indicator

B7.1.2.2.2 Multiply or divide multi-digit numbers by 1- and 2- digit numbers.

Learning expectations: In this module, learners will learn how to:

- Multiply multi-digit numbers by 1- and 2-digit numbers.
- Divide multi-digit numbers by 1- and 2-digit numbers.

Essential for learning: Learner's can multiply two-digit numbers by one-digit numbers.

Resources: Multiplication chart

Keywords: split, lattice, diagonal, multiplier, multiplicand

Competencies: Critical thinking and problem-solving, personal development and leadership

Starter: Refer learners to page 48 in the Learner's Book. Ask them to multiply the numbers mentally by 9 and 11.

Main idea 1

Multiplication and division of whole numbers using partitioning and place value **LB page 48**

Activity 1: Revise the Starter lesson with learners. Ask learners to work in pairs to solve questions using any strategy; for example:

1. 25×2

2. 71×9

Guide learners to multiply 256 by 6 using the partitioning strategy.

$$\begin{aligned} 256 \times 6 &= (200 + 300 + 36) \times 6 \\ &= 1,200 + 300 + 36 \\ &= 1,200 + 336 \\ &= 1,536 \end{aligned}$$

Activity 2: Ask learners to work in convenient groups to set their own questions and solve

them. They exchange their work with the group next to them and check answers.

Activity 3: Write a division sentence on the board. Work through the sentence with them. Let them work in pairs.

$$\begin{aligned} 442 \div 13 &= (390 + 52) \div 13 \\ &= 30 + 4 \\ &= 34 \end{aligned}$$

Refer learners to Worked examples on pages 48 and 49 in the Learner's Book. Work through the questions with them.

Review exercise

Differentiated lessons

Low ability workers

Use partitioning strategy to multiply: 214×4 .

Challenging activities

Multiply using the partitioning strategy.

1. 623×6

2. 372×5

Assessment tasks ----- LB page 50

Learners use different strategies to multiply and divide.

Suggested homework

Use partitioning strategy to work out the answers.

1. $168 \div 6$ 2. $664 \div 8$

3. 142×9 4. 720×9

Main idea 2

Multiplication using the lattice method

LB page 48

Activity 1: Work through how to multiply using the lattice method with learners.

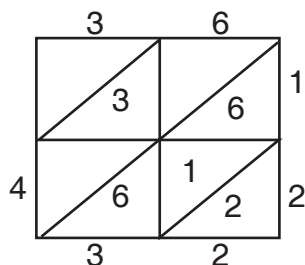
The lattice method is an alternative to long multiplication for numbers. Write the multiplicand along the top of the lattice and the multiplier along the right side of the lattice.

Draw an $n \times n$ lattice and draw diagonal lines from the upper right to the lower left to bisect each cell.

Calculate the product for each cell by multiplying the digit at the top of the column with the digit on the right of the row. Write the tens digit above the diagonal and write the ones digit below the diagonal. Then find the sum of the numbers between every pair diagonals and also between the first and last diagonals and the corresponding corners.

Write one exercise on the board and work through it with learners.

$$36 \times 12$$



$$\therefore 36 \times 12 = 432$$

Activity 2: Ask learners to write their own multiplication sentences and solve them. They exchange their work with a learner who sits close to them and discuss it.

Activity 3: Work through the Worked examples on page 51 with learners.

Review exercise

In mixed-ability groups, ask learners multiply using lattice method.

1. 39×16

2. 124×65

3. 105×14

Assessment tasks

Learners multiply using the lattice method.

Suggested homework:

Use lattice method to multiply.

1. 65×14

2. 262×24

3. 368×36

Main idea 3

Multiplication using the distributive property

LB page 48

Activity 1: Ask learners to read through the hints on page 51.

Demonstrate how to multiply 59×4 on the board 59×4 . You may use your own example.

Method 1: $59 \times 4 = (50 \times 4) + (9 \times 4)$

$$= 200 + 36$$

$$= 236$$

Method 2: $59 \times 4 = (60 - 1) \times 4$

$$= (60 \times 4) - (1 \times 4)$$

$$= 240 - 4$$

$$= 236$$

Activity 2: Work through the Worked examples on page 52 with learners. Ask learners to work in pairs or in convenient groups.

Review exercise

Differentiated lesson

Remedial activity

Ask learners to work in pairs to multiply using the distributive strategy.

1. 49×6

2. 37×12

Challenging activities

Learners work in pairs to multiply.

1. 162×7

2. 269×18

Assessment tasks

Learners use the distributive property to multiply.

Suggested homework

Use the distributive property to multiply.

1. 53×6

2. 32×4

3. 28×5

Main idea 4

Divisibility test

LB page 54

Activity 1: Work through the numbers in the divisibility tests for 2 and 3 with the learners. Ask learners to give their own examples and to justify whether numbers are divisible by 2 and 3.

Activity 2: Ask learners to use the same strategy to find numbers that are divisible by 7, 9, 10 and 11. Let learners write down numbers and check whether these numbers are divisible by 7, 9, 10 and 11.

Activity 3: Refer learners to page 55 in the Learner's Book. Work through the Worked examples with the class.

Review exercise

Place learners in pairs to determine which of the numbers 36, 295, 2,370 and 477 are divisible by 2, 3, 10 and 5. You may write your own question.

Assessment tasks ----- LB page 55

Learners use divisibility rules to work out which numbers are divisible by numbers between 2 and 10.

Suggested homework

Which of these numbers are divisible by 8, 9, 5 and 10?

60, 215, 54,000, 693

Answers to Assessment tasks

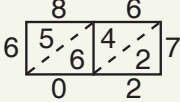
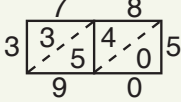
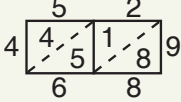
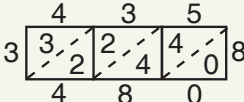
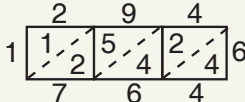
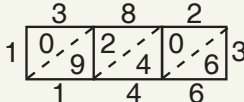
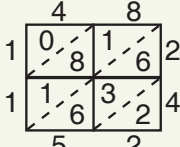
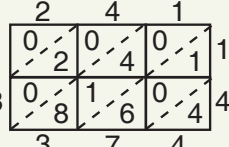
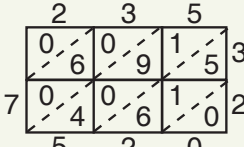
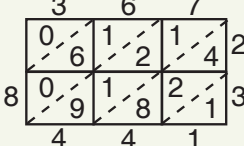
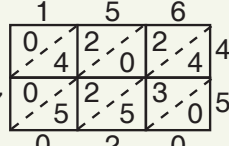
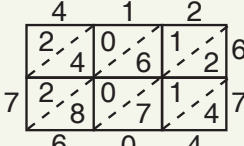
Main Idea 1

(LB page 50)

1. a. 270 b. 492 c. 1,482 d. 152 e. 1,062 f. 387
2. a. 720 b. 8,316 c. 8,544 d. 3,925 e. 21,012 f. 16,768
3. a. 14 b. 24 c. 35 d. 24 e. 7
4. a. 29 b. 18 c. 14 d. 468 e. 185 f. 756

Main Idea 2

(LB page 51)

1. a. 
 $86 \times 7 = 602$
- b. 
 $5 \times 78 = 390$
- c. 
 $52 \times 9 = 468$
- d. 
 $435 \times 8 = 3,480$
- e. 
 $6 \times 294 = 1,764$
- f. 
 $382 \times 3 = 1,146$
2. a. 
 $48 \times 24 = 1,152$
- b. 
 $241 \times 14 = 3,374$
- c. 
 $235 \times 32 = 7,520$
- d. 
 $367 \times 23 = 8,441$
- e. 
 $156 \times 45 = 7,020$
- f. 
 $412 \times 67 = 7,604$

Main Idea 3

(LB page 52)

1. a. $5 \times 88 = 5(80 + 8) + (5 \times 80 + 5 \times 8) = 400 + 40 = 440$
- b. $8(60 + 2) = (60 \times 8) + (2 \times 8) = 480 + 16 = 496$
- c. $6(50 + 4) = (6 \times 50) + (6 \times 4) = 300 + 24 = 324$
- d. $4(50 - 3) = (4 \times 50) - (4 \times 3) = 200 - 12 = 188$
- e. $9(30 - 1) = (9 \times 30) - (9 \times 1) = 270 - 9 = 261$

2. a. $6 \times 43 = 6(40 + 3) = (6 \times 40) + (6 \times 3) = 240 + 18 = 258$
- b. $9 \times 22 = 22(10 - 1) = (22 \times 10) - (22 \times 1) = 220 - 22 = 198$
- c. $48 \times 5 = 5(50 - 2) = (5 \times 50) - (5 \times 2) = 250 - 10 = 240$
- d. $246 \times 15 = 246(10 + 5) = (246 \times 10) + (246 \times 5) = 2,460 + 1,230 = 3,690$
- e. $324 \times 19 = 324(20 - 1) = (324 \times 20) - (324 \times 1) = 6,480 - 324 = 6,156$
- f. $28 \times 153 = (30 - 2) \times 153 = (153 \times 30) - (153 \times 2) = 4,590 - 306 = 4,284$

Main Idea 4

(LB page 55–56)

1. a. Numbers divisible by 3: 195, 576 and 8,700
- b. Numbers divisible by 4: 132, 576, 2,348 and 8,700
- c. Numbers divisible by 5: 195 and 8,700
- d. Numbers divisible by 6: 576 and 8,700
2. a. Numbers divisible by 7: 574, 2,275 and 1,694
- b. Numbers divisible by 11: 352, 913, 1,694 and 5,687
- c. Numbers divisible by 2: 352, 574 and 1,694
3. a. 192, 195 and 198
- b. 572 and 576
- c. 3,420 and 3,426
- d. 6,384
- e. 972
- f. 7,678
4. a. Numbers divisible by 8: 112 and 57,000
- b. Numbers divisible by 9: 693, 738 and 1,134
- c. Numbers divisible by 10: 4,130 and 57,000
5. a. A number is divisible by 8 if the number formed by last three digits is divisible by 8. 048 is divisible by 8; so, 2,048 is divisible by 8.
- b. 386 is not divisible by 6. For a number to be divisible by 6, it must be divisible by both 2 and 3. 386 is not divisible by 3 since the sum of its digits ($3 + 8 + 6 = 17$) is not divisible by 3.
- c. 684
- d. A number is divisible by 11, if the sum of alternates number subtracted from the sum of the other alternate numbers is 0 or 11.

Sub-strand 2: Number operations

Module 5

Multiplication and division of decimal numbers

Content standard

B7.1.2.2 Demonstrate an understanding of addition, subtraction, multiplication and division of (i) whole numbers, and (ii) decimal numbers, to solve problems.

Indicator

B7.1.2.2.2 Multiply or divide multi-digit numbers by 1- and 2- digit numbers.

Learning expectations: In this module, learners will learn how to:

- Multiply a decimal number by a whole number.
- Find the product of two decimal numbers.
- Divide a decimal number by a whole number.
- Find the quotient of two decimal numbers.

Essential for learning: Learners can multiply a whole number by 1-digit or 2-digit numbers.

Resources: Number chart

Keywords: product, quotient, dividend, divisor

Competencies: Critical thinking and problem-solving, personal development and leadership

Starter: Ask learners to answer the multiplication and division question in the starter on page 57 in the Learner's Book.

Main idea 1

Multiplication of decimal numbers

LB page 57

Activity 1: Explain to learners that multiplying decimals is the same as multiplying whole numbers, except for the placement of the decimal point in the answer. The number of decimal places in the product is the sum of the number of decimal places in the factors.

Write a question on the board and solve it with the learners. For example, multiply: 39×3.2 .

$$\begin{array}{r} 39 \\ \times 32 \\ \hline 78 \\ 117 \\ \hline 1248 \end{array}$$

Now to find out where to put the decimal point, ask learners to tell you the number of decimal places in the factors. In this case, there is only one. So, counting from right the answer is 124.8

Activity 2: Ask learners to work in convenient groups to multiply.

1. 22.5×1.6
2. 60.5×2.8

Invite the groups to work on the board while the rest of the learners compare their answers with what is on the board.

Multiplying decimals

Explain the rules to learners:

- Set up and multiply the numbers.
- Count the total number of decimal places in both factors.
- Place the decimal point in the product so that the number of decimal places in the product is the sum of the decimal places in the factors.
- Keep all zeros in the product when you place the decimal point.
- If the number of decimal places is greater than the number of digits in the product, write zeros in front of the product.
- You can drop the zeros to the right of the last digit after you have placed the decimal point in the product.

Activity 3: Ask learners to work in pairs to solve the questions in the Worked example on page 58 in the Learner's Book.

Explain the guidelines about how to multiply decimals to learners.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to in pairs to multiply.

1. 2.4×8
2. 35.6×0.5

Challenging activities

Ask learners to in pairs to multiply.

1. 28.6×2.3
2. 2.62×0.12

Assessment tasks ----- LB page 59

Learners multiply decimal numbers and whole numbers.

Suggested homework

Multiply.

1. 3.81×7
2. 0.08×1.2
3. 25.66×9

Activity 1: Explain to learners that we divide decimals in the same way as we divide whole numbers. The only difference is that we must place the decimal point in the quotient: Demonstrate to the class by working through one example on the board. Refer learners to tips the rules on division of decimals on page 59 in the Learner's Book:

- Divide as you would divide whole numbers, then place the decimal point in the quotient directly above the decimal point in the dividend.
- Multiply the divisor by the power of 10 to make the divisor a whole number, then multiply the dividend by the same power of 10.
- Move the decimal point in the dividend the same number of places to the right as decimal point in the divisor.
- Place the decimal point in the quotient directly above the decimal point in the dividend.

Activity 2: Divide 65.5 by 0.05.

Ask learners to multiply the (divisor) 0.05 by 100 to get a whole number of 5.

Multiply the (dividend) 65.5 by 100 to get a whole number of 6,550.

So $65.5 \div 0.05$ becomes $6,550 \div 5$.

$$\begin{array}{r} 1310 \\ 5 \overline{) 6,550} \\ \underline{5} \\ 15 \\ \underline{15} \\ 5 \end{array}$$

Count three decimal places from right and write the decimal point:

$$65.5 \div .05 = 1.310$$

Activity 3: Write two division questions on the board for learners to work in pairs.

Activity 4: Refer learners to the Worked examples question on page 60 in the Learner's Book and ask them to work through the solutions. through the exercise.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to divide.

1. $66.2 \div 5$

2. $48.8 \div 4$

Challenging activities

Ask learners to work in pairs to divide.

1. $28.5 \div 0.05$

2. $2.42 \div 3$

Learners work out the answers to division problems.

Suggested homework

Divide.

1. $35.7 \div 7$

2. $4.24 \div 0.8$

Answers to Assessment tasks

Main Idea 1

(LB page 59)

1. a. 3.5 b. 4.8 c. 3.6 d. 1.8 e. 7.2 f. 4.9
 2. a. 44.1 b. 16.38 c. 323.4 d. 26.16 e. 2.29 f. 170
 3. a. 2.24 b. 11.48 c. 1.81

4.

\times	3	<u>5</u>	8
<u>0.4</u>	<u>1.2</u>	<u>2.0</u>	3.2
0.7	<u>2.1</u>	<u>3.5</u>	5.6
0.9	2.7	4.5	<u>7.2</u>

5.

a.	2.23×6		13.08
b.	4.52×4		10.98
c.	3.27×4		13.38
d.	1.83×6		16.68
e.	4.17×4		18.08

Main Idea 2

(LB page 60)

1. a. 2.1 b. 5.1 c. 4.1 d. 6.2 e. 3.12 f. 15.3
 2. a. 3.7 b. 13.2 c. 0.77 d. 2.2
 e. 17.95 f. 13.5
 g. 28.55
 3. a. 3.34 b. 15 c. 2.2 d. 2.63
 e. 1.6 f. 44.75 g. 22.7 h. 3.85
 4. a. 7 \rightarrow in 1.37 b. 4 \rightarrow in 2.47 c. 4 \rightarrow in 9.94
 d. 7 \rightarrow in 7.06 e. 6 \rightarrow in 6.52) f. 9 \rightarrow in 10.98

Sub-strand 2: Number operations**Module 6****Word problems involving decimals****Content standard**

B7.1.2.2 Demonstrate understanding of addition, subtraction, multiplication and division of (i) whole numbers, and (ii) decimal numbers, to solve problems.

Indicator

B7.1.2.2.2 Create and solve story problems involving decimals on the four basic operations.

Learning expectations: In this module, learners will learn how to:

- Solve addition and subtraction word problems that involve decimals.
- Solve multiplication and division word problems that involve decimals.

Essential for learning: Learners can solve multiplication and division problems that involve decimals.

Resources: Word problem cards involving addition, subtraction, multiplication and division

Keywords: word problem, decimals, division

Competencies: Critical thinking and problem-solving (CP) personal development and leadership

Starter: Refer learners to page 62 in the Learner's Book for the warming up activity.

Main idea 1

Word problems that involve adding and subtracting decimal numbers **LB page 62**

Activity 1: Write a word problem on the board. Ask two learners, a boy and a girl, to read aloud the questions to the whole class.

Ask learners whether each problem involves addition or subtraction. Ask them to write mechanical sentences for each problem and to solve it. Below are a few examples.

1. Ohene Asienim weighs 108.6 kg. His son Kwesi weighs 48.5 kg. By how much is Ohene Asienim weight heavier than his son?
2. Fusenni bought a dress for Gh¢48.60. Fosuah also bought a wrist watch for GH¢52.70.
 - a. How much money did the two spend altogether?
 - b. How much did Fosuah spend more than Fusenni?

Activity 2: Place learners in convenient groups. Give each group a word problem card. Ask the leaders to read to the group. They brainstorm and decide whether the problem is addition or subtraction and they solve the problem.

Activity 3: Refer learners to Worked examples on pages 62 and 63. Ask learners to work in pairs and to work through the two examples.

Review exercise

Differentiated lessons

Remedial activity

Prepare word cards and let learners work in pairs to solve problems. A barrel full of watermelons weighs 106.30 kg. If the empty barrel weighs 23.20 kg, what is the weight of the watermelons?

Challenging activities

Write an addition sentence on the board for learners to solve. Amudu bought 24.8 kg of meat. Mrs Anderson also bought 12.6 kg of meat less than Amudu bought. How many kilograms of meat did they buy all together?

Assessment tasks

Learners solve word problems.

Suggested homework

The weight of Kufour's gallon full of water is 20 kg. What will the weight be of nine similar gallons?

Main idea 2

Word problems involving multiplication and division of decimal numbers

LB page 64

Activity 1: Revise how to solve word problems with learners. Write two word problems involving multiplication and division on the board. Ask a boy and a girl to read problems aloud to the class. Each problem is a multiplication or division situation. Learners work in pairs and solve the problems. Below are two examples.

1. A piece of rod is 14.4 m long. If it is divided into five equal parts what will be the length of each rod?
2. The weight of the class teacher's table is 6.5 kg. Find the total mass of 15 of the same books.

Activity 2: Place learners in convenient groups. Give each group a few multiplication or division sentence cards. They select a leader to read and write a sentence for the problem and work with group members to solve the problem.

Activity 3: Refer learners to Worked examples on page in the Learner's Book. Work through the examples with the class.

Review exercise

Differentiated lessons

Remedial activity

Write a problem on the board for learners to solve in pairs. Below is an example.
The total weight of six bags of cement is 300 kg. What will be the weight for one?

Challenging activities

Ask learners to work in pairs to work out the answers.

The total mass of six bags of rice is 40 kg. If each box has the same mass, what is the mass for

1. 1 box?
2. 8 boxes?

Assessment tasks ----- LB page 64 and 65

Learners solve word problems.

Suggested homework

1. A farmer has 42 acres of land. He wants to share it equally among his five children. How many acres of land will each child get?
2. The weight of a bag of cocoa is 64.2 kg. What will be the weight of six identical fridges?

Main idea 3

Word problems on data

LB page 66

Activity 1: Six leavers in J.S.S 3 have the following ages.

Name	Age
Adwoa	12
Suzzy	13
Fatima	16
Abu	15
Oppong	14
Koomson	15

Encourage learners to ask questions about the data collected. Below are examples.

1. How many years is Fatima older than Adwoa?
2. What is the total age of Koomson and Abu?
3. What will be the age of Suzzy in ten years time?

Activity 2: Refer learners to page 66 in the Learner's Book. Take them through the Worked examples.

Review exercise

Place learners in convenient groups of mixed ability. Let each group write two different questions on the data on page 66 in the Learner's Book and give answers.

Assessment tasks ----- LB page 66

Learners answer questions about data.

Suggested Homework

Ask learners to draw the table in their homework books and answer the question.

Days	Number of eggs sold in one week
Monday	70
Tuesday	45
Wednesday	28
Thursday	32
Friday	102
Saturday	90
Sunday	48

1. How many eggs were sold in the week?
2. What is the difference between the sales on Thursday and Friday?
3. On which day was sales very low?
4. How many eggs were sold in total on Friday, Wednesday and Sunday.

Answers to Assessment tasks

Main Idea 1

(LB page 63)

1. Total mass: 93.43 g
2. Oforiwah spent GH¢ 98.20.
3. Asiedu grew 5 cm
4. Original price: GH¢ 25.55
5. Volume of water left: 134.55 litres
6. Yayra paid GH¢ 90.45 for the wrist watch.
7. 4.992 kg
8. 0.35

Main Idea 2

(LB page 64)

1. Total mass: 3.6 kg
2. The length of each piece: 4.6 m
3. 0.36 kg or 360 g
4. Malam Seidu received GH¢ 470.00
5. 3.0125 kg
6. The number is 24.3.
7. Total distance covered: 8.3 km
8. a. 6.5 kg b. 45.5 kg

Main Idea 2

(LB page 65)

1. Amount left: GH¢ 31.87
2. Perimeter: 14.55 cm
3. Total weight: 5.406 kg
4. Area: 3.75 cm^2
5. The answer was 0.05.
6. Length of each piece: 9.99 m
7. 52.38
8. Total mass: 6.276 kg

Main Idea 3

(LB page 66)

1.
 - a. July
 - b. August
 - c. May, August and September
 - d. $2.2 + 7.4 + 16 = 25.6 \text{ mm}$
 - e. $87 - 4.6 = 82.4 \text{ mm}$
2.
 - a. 195 goals
 - b. Ayiem United and Sobre XI
 - c. Black Arrows
 - d. 277 goals
 - e. Ayiem United

Sub-strand 2: Number operations

Module 7

Powers of natural numbers

Content standard

B7.1.2.3 Demonstrate understanding and the use of powers of natural numbers in solving problems.

Indicator

B7.1.2.3.1 Illustrate with examples the meaning of repeated factors using counting objects such as bottle tops or bundle sticks.

Learning expectations: In this module, learners will learn how to:

- Explain what is meant by a power of a number.
- State the features of the powers of numbers.
- Express a number as a product of a given number.
- Explain why the value of any natural number with exponent zero is 1.
- Find the value of a number in index form.

Essential for learning: Learners can multiply 2-digit numbers by 1-digit numbers.

Resources: Bottle caps, work cards

Keywords: powers, factors, exponent, base, index, natural numbers, repeated factor

Competencies: Creativity and innovation, critical thinking and problem-solving.

Starter: Refer learners to page 68 in the Learner's Book for quick mental drill.

Main idea 1

Expressing numbers in the form of powers

LB page 66

Activity 1: Explain the concepts of factors, powers, exponent, index to learners. Refer learners to the Main idea on page 68 in the Learner's Book. Read the notes and explain the concepts to them as they read along.

Factors are numbers that we can divide into a particular number without leaving a remainder. Factors can be composite numbers or prime numbers. Repeated factors are factors that are repeated. The power or exponent of a number tells you how many times a given number is multiplied. Let us consider the number 81.

The factors of 81 are: $3 \times 3 \times 3 \times 3 = 81$

3 is the factor that repeated, so 3 is the repeated factor of 81 which is 3^4 .

The 3 in 81 is the base and the 4 is the index, exponent or the power.

The base of a power is the number that is multiplied.

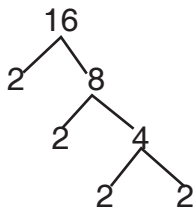
The exponent, index or power tells us how many times to multiply the base by itself.



Activity 2: Give bottle caps to learners in groups. Ask learners to model repeated factors using counters. Example: 00 00 00 00 shows $2 \times 2 \times 2 \times 2 = 16$

Activity 3: Ask learners to work in convenient groups. Guide them to find the factors for some numbers. Examples: 1. 16 2. 8 2. 49

Introduce the factor tree.



Factors for $16 = 2 \times 2 \times 2 \times 2 = 2^4$

Activity 4: Refer learners to page 69 in the Learner's Book. Go through the Worked examples with them.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to solve the problems:

- Express 32 in index form.
- Write the number for the factors: $3 \times 3 \times 3$.

Challenging activities

Learners work in pairs. Express these numbers in index form.

- 62
- $\frac{4}{64}$

Assessment tasks ----- LB page 70

Learners answer questions that involve powers.

Suggested Homework

- Express these numbers in index form.
 - 1,331
 - 343×32
- Write the following numbers in index form.
 - $\frac{27}{128}$
 - 338

Activity 1: Demonstrate by explaining to learners why any number raised to the power zero is 1.

Thus, if we have $\frac{25}{25}$, the result is 1. Using powers of numbers, $\frac{25}{25} = 5^{2-2} = 5^0 = 1$

Therefore, any natural number with an exponent of 0 equals 1.

Activity 2: Ask learners to explain why $\frac{4}{4} = 1$ in index form.

Refer learners to Learner's Book page 71. Work through the examples with the class.

Activity 3: Place learners in convenient groups. Work through the Worked examples with them.

Review exercise

Differentiated lessons

Low ability workers

Learners work in pairs to simplify the fractions.

1. $\frac{8}{8}$

2. $\frac{2}{60}$

Challenging activities

Learners work in pairs.

Simplify and write your answers in exponent form:

1. 64×80

2. $27 \times (809)^0$

Assessment tasks ----- LB page 71

Learners simplify fractions.

Suggested homework

Simplify.

1. $(9y)^0 \times \frac{9}{40}$

2. $12x^0 - 4y^0$

3. $(\frac{1}{4})^2 + (\frac{5}{6})^0$

Answers to Assessment tasks

Main Idea 1

(LB page 70)

1. a. 5^4 b. 7^5 c. $(\frac{1}{2})^3$ d. $(\frac{3}{5})^6$
 e. $2 \times 3^4 \times 7^2$ f. $3^3 \times 6^4 \times 9^3$ g. $(\frac{1}{4})^2 \times (\frac{2}{3})^4$
2. a. $4 \times 4 \times 4 \times 4 \times 4$ b. $7 \times 7 \times 7$ c. $5 \times 5 \times 5 \times 5 \times 5 \times 5$
 d. $\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3}$ e. $\frac{2}{7} \times \frac{2}{7} \times \frac{2}{7} \times \frac{2}{7} \times \frac{2}{7} \times \frac{2}{7} \times \frac{2}{7}$
 f. $3 \times 3 \times 3 \times 3 \times 8 \times 8 \times 8 \times 8 \times 8 \times 9 \times 9$
 g. $\frac{3}{8} \times \frac{3}{8} \times \frac{3}{8} \times \frac{3}{8} \times \frac{2}{11} \times \frac{2}{11} \times \frac{2}{11}$
3. a. $32 = 2^5$ b. $81 = 9^2 = 3^4$
 c. $256 = 2^8 = 4^4 = 16^2$ d. $625 = 5^4 = 25^2$
 e. $36 \times 125 = 2^2 \times 3^2 \times 5^2 = 6^2 \times 5^3$ f. $27 \times 121 \times 343 = 3^3 \times 11^2 \times 7^3$
 g. $64 \times 169 \times 243 = 2^6 \times 13^2 \times 3^5 = 4^3 \times 13^2 \times 3^5 = 8^2 \times 13^2 \times 3^5$
4. a. $16 = 2^4 = 4^2$ b. $128 = 2^7$ c. $243 = 3^5$
 d. $\frac{1}{64} = (\frac{1}{2})^6 = (\frac{1}{8})^2 = (\frac{1}{4})^3$ e. $\frac{8}{125} = (\frac{2}{5})^3$ f. $\frac{81}{256} = (\frac{3}{4})^4 = (\frac{9}{16})^2$
 g. $\frac{27}{64} = (\frac{3}{4})^3$

Main Idea 2

(LB page 71)

1. a. 1 b. 1 c. 1 d. 1 e. 1
 f. 1 g. 1 h. $\frac{3}{1} = 3$ i. 1
2. a. $1 + 1 = 2$ b. $3 \times 1 = 3$ c. 1 d. $6 - 1 = 5$
 e. $1 + 1 = 2$ f. $8 - 1 = 7$ g. $1 + 1 = 2$ h. $\frac{1}{9} + 1 = 1\frac{1}{9}$
3. a. $1 - 5 = -4$ b. $\frac{1}{6}$ c. x^2 d. $1 + 1 = 2$
 e. $8 \times 1 = 8$ f. $3 + 1 = 4$ g. $\frac{1}{6} \div \frac{1}{36} = 6$ h. $\frac{5}{1} \div \frac{10}{1} = \frac{1}{2}$

Main Idea 3

(LB page 72)

1. a. 32 b. 81 c. 125 d. $\frac{1}{27}$ e. $\frac{16}{625}$
2. a. 343 b. $\frac{1}{16}$ c. $\frac{8}{729}$ d. 225 e. $\frac{32}{243}$
 f. 2 g. $\frac{1}{3}$
3. a. 64 b. 625 c. $\frac{1}{16}$ d. $\frac{16}{81}$ e. $\frac{27}{64}$
 f. $9 \times 64 \times 5 = 2,880$ g. $1,024 - 243 = 781$ h. $216 \div 2 = 218$

Sub-strand 2: Number operations

Module 8

Finding HCF using powers of numbers

Content standard

B7.1.2.3 Demonstrate understanding and the use of powers of natural numbers in solving problems.

Indicator

B7.1.2.3.5 Apply the concept of powers of numbers (product of prime) to find HCF.

Learning expectations: In this module, learners will learn how to:

- Find HCF using prime factorisation.
- Solve problems involving real-life applications of HCF.
- Solve problems involving real-life applications of LCM.

Essential for learning: Learners can write factors for a given number and write the factors in index form.

Resources: Numeral cards

Keywords: factorisation, prime numbers

Competencies: Creativity and innovation, critical thinking and problem-solving.

Starter: Refer learners to page 73 in the Learner's Book for quick mental drill.

Main idea 1

Finding HCF using prime factorisation

LB page 73

Activity 1: Explain the concept prime factorisation and highest common factor (HCF) to learners.

Refer learners to page 73 in the Learner's Book. Ask learners to read the notes in Main idea 1.

Prime factorisation is a process of finding the prime numbers of a composite number and writing the factors as a product.

Example: $28 = 4 \times 7 = 2 \times 2 \times 7$; so, $2 \times 2 \times 7$ are the prime factors of 28.

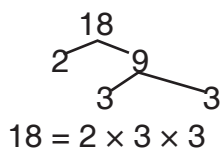
Highest common factor (HCF): The HCF of two or more numbers is the largest number that can divide into the numbers without leaving a remainder.

To find the HCF of numbers, find the prime numbers of all the numbers and select the common ones and find their product.

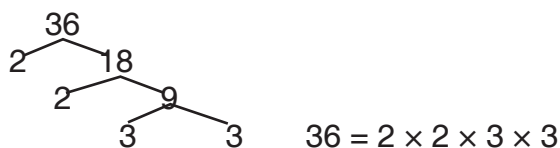
Activity 2: Write two numbers on the board. Demonstrate how to find the HCF of numbers; for example, 18 and 36.

Guide learners to use factor trees to find the prime factors of some numbers. Below are factor trees for 18 and 36.

Prime factors of 18



Prime factors of 36



Activity 3: Guide learners to find the HCF of 18 and 36. Circle the common factors in the HCF.

$$18 = (2) \times 3 \times (3)$$

$$36 = (2) \times 2 \times (3) \times 3$$

So, the HCF of 18 and 36 = $2 \times 3 = 6$.

Activity 4: Place learners in convenient groups. Ask learners to set their own questions and solve them. Groups exchange their work with other groups to check the answers.

Activity 5: Refer learners to Worked examples on page 74. Go through the exercise with them.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in groups of three. Ask learners to find the HCF of the following numbers.

1. 30 and 25

2. 8 and 12

Challenging activities

Ask learners to work in pairs. Find the HCF of the following numbers.

1. 12 and 42

2. 48 and 60

Assessment tasks ----- LB page 75

Learners use prime factorisation to find HCFs.

Suggested Home work

Find the HCF of the following numbers.

1. 36 and 64

2. 48 and 50

3. 12, 64 and 32

4. 8, 12 and 24

Main idea 2

Application of HCF in real life

LB page 75

Activity 1: Revise the previous lesson with learners. Place learners in mixed ability groups and let them give three reasons why and when we use HCF. Refer them to page 75 to check whether their answers are right or wrong.

Activity 2: Refer learners to page 76 in the Learner's Book. Ask them to read the Worked examples 1 and 2 thoroughly. Ask them to brainstorm and answer the questions working in their previous groups.

Activity 3: Ask learners to read through the two solutions to find out if their answers are correct.

Review exercise

In their mixed ability groups, ask learners to work out the answer to the following problem.

Two learners Adwoa and Mawusi each bought packets with the same number of pencils in each packet. Adwoa had 20 pencils and Kwesi had 30 pencils. What is the largest possible number of pencils in each packet?

Assessment tasks ----- LB page 76 and 77

Learners use prime factors to solve problems.

Suggested Home work

1. Find the HCF of the 48 and 60.
2. A labourer has 63 pepper seeds and 81 garden eggs to sow. He sows equal numbers of each type of vegetable in each row. What is the greatest possible number of seeds he can sow in each row?

Main idea 3

Application of L.C.M in real life

LB page 77

Activity 1: Revise the previous lesson with learners. Place learners in mixed ability groups. Ask them to explain the importance of least common multiples (LCMs) in real life situation. Refer them to page 77 in the Learner's Book. Ask learners to read through the notes and compare them with what they wrote down.

Activity 2: Refer learners to pages 77 and 78 in the Learner's Book. Ask them read through Worked examples 1 and 2 thoroughly. Ask them to brainstorm and solve the problems in their previous groups.

Activity 3: Ask learners to read through the two solutions to check their solutions. Discuss the Worked examples with the class.

Review exercise

Still in their previous groups, ask learners to solve the following problem.

Two bells toll in intervals of 30 and 40 minutes. If they toll together at a certain time, after how many hours will they toll next at the same time again?

Assessment tasks ----- LB page 78

Learners use prime factorisation to solve word problems.

Suggested homework

A piece of iron rod must be cut into equal pieces so that no piece of rod will be left over. If the lengths of the pieces can be 20 cm, 12 cm and 10 cm, what is the shortest possible length of the iron rod?

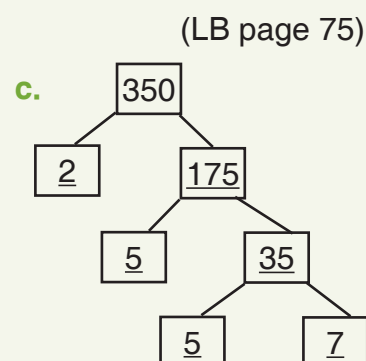
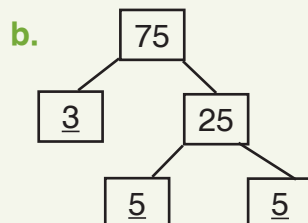
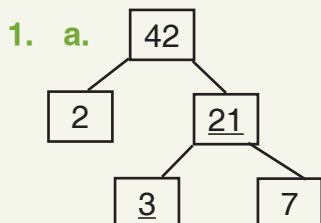
Revision 2

Number operations ----- LB page 79

Learners write revision exercise on page 79 as a class test.

Answers to Assessment tasks

Main Idea 1



2. a. $36 = 2 \times 2 \times 3 \times 3$

b. $100 = 2 \times 2 \times 5 \times 5$

c. $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$

d. $231 = 3 \times 7 \times 11$

e. $1,800 = 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$

f. $72 = 2 \times 2 \times 2 \times 3 \times 3$

g. $105 = 3 \times 7 \times 5$

3. a. $63 = 3 \times 3 \times 7$

b. $15 = 3 \times 5$

c. $36 = 2 \times 2 \times 3 \times 3$

$81 = 3 \times 3 \times 3 \times 3$

$21 = 3 \times 7$

$4 = 2 \times 2$

$\therefore \text{HCF} = 3 \times 3 = 9$

$\therefore \text{HCF} = 3$

$\therefore \text{HCF} = 2 \times 2 = 4$

d. $48 = 2 \times 2 \times 2 \times 2 \times 3$

e. $24 = 2 \times 2 \times 2 \times 3$

f. $48 = 2 \times 2 \times 2 \times 2 \times 3$

$60 = 2 \times 2 \times 3 \times 5$

$42 = 2 \times 3 \times 7$

$60 = 2 \times 2 \times 3 \times 5$

$\therefore \text{HCF} = 2 \times 2 \times 3 = 12$

$72 = 2 \times 2 \times 2 \times 3 \times 3$

$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

$\therefore \text{HCF} = 2 \times 3 = 6$

$\therefore \text{HCF} = 2 \times 2 \times 3 = 12$

g. $72 = 2 \times 2 \times 2 \times 3 \times 3$

$90 = 2 \times 3 \times 3 \times 5$

$126 = 2 \times 3 \times 3 \times 7$

$\therefore \text{HCF} = 2 \times 3 \times 3 = 18$

4. $36 = 2 \times 2 \times 3 \times 3$ and $60 = 2 \times 2 \times 3 \times 5$; so, the HCF = $2 \times 2 \times 3 = 12$
 \therefore the geatest possible number of seeds in each row is 12.

Main Idea 2

(LB page 76)

1. 12 markers 2. 12 cm 3. 20 kg 4. 18 m 5. 6 cm

Main Idea 3

(LB page 78)

1. After 6 hours
2. 12 metres
3. 450 cm
4. He should buy 30 candles and 30 candle stands or two packets of candles and three packets of candle stands.
5. 120 seconds or 2 minutes
6. 600 km
7. At 10:12 a.m.

Answers to Revision

2

(LB page 79)

1. a. $14 \times 4 = 56$ b. $15 \times 10 = 150$ c. $13 \times 7 = 91$ d. $6 \times 23 = 138$
 $4 \times 14 = 56$ $10 \times 15 = 150$ $7 \times 13 = 91$ $23 \times 6 = 138$
 $56 \div 14 = 4$ $150 \div 15 = 10$ $91 \div 13 = 7$ $138 \div 23 = 6$
 $56 \div 4 = 14$ $150 \div 10 = 15$ $91 \div 7 = 13$ $138 \div 6 = 23$
2. a. $\frac{3}{4} = 0.75 = 75\%$ b. $\frac{6}{10} = 0.6 = 60\%$
c. $\frac{3}{6} = 0.25 = 25\%$ d. $\frac{25}{100} = 0.5 = 50\%$
3. a. 2,350 b. 589 c. 99.35 d. 5.7351 e. 0.0563 f. 0.058743
4. a. $5 \times 68 = 10 \times 34 = 340$ b. $14 \times 40 = 28 \times 20 = 560$
c. $55 \times 4 = 110 \times 2 = 220$ d. $58 \times 500 = 29 \times 1,000 = 29,000$
5. a. 9,202 b. 6,176 c. 9,828 d. 6,694
6. a. 8,019 b. 3,793 c. 6,168 d. 4,232

7. a. 468×5
 $= (400 + 60 + 8) \times 5$
 $= 2,000 + 300 + 40$
 $\therefore 468 \times 5 = 2,340$

b. $256 \div 2 = (200 + 50 + 6) \div 2$
 $= 100 + 25 + 3$
 $\therefore 256 \div 2 = 128$

8. a. 543×25
 $500 + 40 + 3$
 $\times (20 + 5)$

 $10,000 + 800 + 60$
 $2,500 + 200 + 15$

 $10,860 + 2,715$
 $= 13,575$

b. $216 \div 8$
 $= (200 + 16) \div 8$
 $= (200 \div 8) + (16 \div 8)$
 $= 25 + 2$
 $= 27$

9. a.
 $\therefore 498 \times 61 = 30,378$

b.
 $\therefore 923 \times 37 = 34,151$

c.
 $\therefore 451 \times 28 = 12,628$

d.
 $\therefore 825 \times 45 = 37,125$

10. a. 0.0036

b. 26.16

c. 13.12

11. a. $60.4 \text{ m}^2 - 42.58 \text{ m}^2 = 17.82 \text{ m}^2$

b. $\text{GH}¢[50 - (18.90 + 24.50)] = \text{GH}¢6.60$

Sub-strand 3: Fractions, decimals and percentages**Module 8****Fractions, percentages and decimals****Content standard**

B7.1.3.1 Simplify, compare and order a mixture of positive fractions (i.e. common, percent and decimal) by changing all to equivalent (i) fractions, (ii) decimals, or (iii) percentages.

Indicator

B7.1.2.3.1 Determine and recall the percentages and decimals of given benchmark fractions (i.e. tenths, fifths, fourths, thirds and halves) and use these to compare quantities.

Learning expectations: In this module, learners will learn how to:

- Recognise the equivalence of simple fractions, decimals and percentages.
- Simplify fractions and identify equivalent fractions.
- Convert improper fractions to mixed numbers and mixed numbers to improper fractions.

Essential for learning: Learners can find factors of a given number and write the factors in index form.

Resources: Work cards, cut-out shapes of 2D shapes

Keywords: equivalent, mixed number, improper fraction, denominator, numerator, proper fraction

Competencies: Critical thinking and problem-solving, creativity and innovation.

Starter: Refer learners to page 80 in the Learner's Book for a quick warming up activity.

Main idea 1

Equivalent fractions

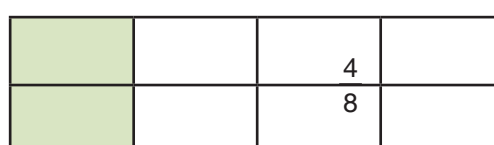
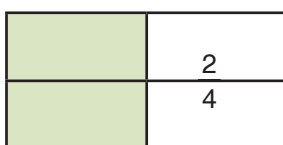
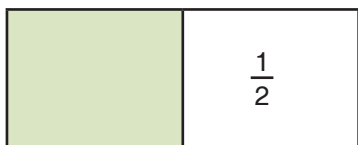
LB page 80

Activity 1: Explain the concepts of numerator, denominator, equivalent fractions to learners. Let them give example for each one. Example in $\frac{3}{8}$, 3 is the numerator and 8 is the denominator.

Equivalent fractions are fractions that have the same value but with different figures.

Example: $\frac{1}{3} = \frac{2}{6} = \frac{3}{9}$

Activity 2: Place learners in convenient groups. Give groups cut-out shapes of rectangles. Ask learners to fold each rectangle into two equal parts and to shade one half. Ask learners to fold the rectangle again in a different way. They should tell you what the shaded parts are called.



So, equivalent fraction are: $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$

Activity 3: Repeat this practical activity with different fractions.

Activity 4: Write some fractions on the board and ask learners to find three fractions that will be equivalent to each fraction.

1. $\frac{1}{4}$

2. $\frac{2}{5}$

3. $\frac{2}{3}$

Activity 5: Refer learners to page 81 of the Learner's Book. Work through the examples with learners.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs.

Write two equivalent fractions for each fraction.

1. $\frac{2}{3}$

2. $\frac{3}{5}$

Challenging activities

Write three equivalent fractions for each fraction.

1. $\frac{2}{3}$

2. $\frac{5}{7}$

3. $\frac{11}{12}$

Assessment tasks ----- LB page 82

Learners simplify a fraction and find equivalent fractions.

Suggested Homework

Reduce each fraction to its lowest terms.

1. $\frac{6}{12}$

2. $\frac{12}{72}$

3. $\frac{11}{121}$

4. $\frac{8}{64}$

Activity 1: Revise the previous lesson with learners. Explain mixed numbers and proper fractions to learners. Ask learners to give examples of mixed numbers and proper fractions.

In a **proper fraction**, the numerator is smaller than the denominator.

Examples: $\frac{2}{5}$, $\frac{3}{10}$ and $\frac{75}{100}$

An **Improper fraction** is a fraction whose numerator is greater than the denominator.

Examples: $\frac{7}{5}$, $\frac{18}{4}$ and $\frac{89}{10}$

A **mixed number** has a whole number part and a proper fraction part. Its value is greater than 1.

Examples: $2\frac{3}{5}$, $25\frac{3}{4}$ and $6\frac{3}{20}$

In general:

1. To convert **improper fractions** in to **mixed numbers**, divide the numerator by the denominator. The quotient is the **whole** and the ratio of the remainder and denominator is the **fractional part**.

Example: $\frac{25}{4}$ is $25 \div 4 = 6$ remainder 1. This gives 6 as a quotient and 1 as the remainder.

So, 6 is the whole, 1 the numerator and 4 (the denominator) becomes the fractional part.

So, $\frac{25}{4} = 6\frac{1}{4}$

2. Explain to learners that, to convert **mixed numbers** to **improper fractions**, multiply the whole number and the denominator and add the result to the numerator, which will be the numerator of the improper fraction.

Example: $5\frac{3}{4} = \frac{(5 \times 4) + 3}{4} = \frac{20 + 3}{4} = \frac{23}{4}$

Activity 2: Place learners in convenient groups. Write the calculation that follows on the board. Guide learners to make groups that form wholes:

$$\frac{14}{3} = \frac{3}{3} + \frac{3}{3} + \frac{3}{3} + \frac{3}{3} + \frac{2}{3} = 1 + 1 + 1 + 1 + \frac{2}{3} = 4\frac{2}{3}$$

Guide learners to use division: $\frac{14}{3} = \frac{14}{3} = 4\frac{2}{3}$

Activity 3: Write a mixed number on the board. Explain to learners how to change it into an improper

fraction. Example: $6\frac{1}{5} = \frac{(5 \times 6) + 1}{5} = \frac{31}{5}$

Give more examples to learners. Ask them to set their own questions and answer the questions.

Activity 4: Refer learners to the Worked examples on pages 84 and 85 in the Learner's Book. Work through the activities with the class.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs.

Write each improper fraction as a mixed number. 1. $\frac{25}{6}$ 2. $\frac{17}{2}$ 3. $\frac{29}{7}$

Challenging activities

Ask learners to work in pairs.

Write each improper fraction as a mixed number.

1. $\frac{207}{18}$ 2. $\frac{125}{11}$

Write each mixed number as an improper fractions.

1. $13\frac{1}{3}$ 2. $17\frac{1}{5}$

Assessment task ----- LB page 85

Learners simplify fractions, convert mixed numbers to improper fractions and improper fractions to mixed numbers.

Suggested homework

Express these improper fractions as mixed numbers.

1. $\frac{302}{7}$ 2. $\frac{136}{5}$ 3. $\frac{221}{21}$

Convert these mixed fractions into improper fractions.

1. $12\frac{1}{8}$ 2. $36\frac{1}{3}$ 3. $19\frac{11}{12}$

Main idea 3

Equivalent fractions, decimals and percentages LB page 86

Activity 1: Write a fraction $\frac{1}{2}$ on the board and ask learners to covert it to a decimal and a percentage.

1. $\frac{1}{2}$ 2. $\frac{3}{5}$

1. $\frac{1}{2} = 0.5 = 50\%$ 2. $\frac{1}{5} = 0.2 = 20\%$
 $3 \times 20\% = 60\%$
 $\frac{3}{5} = 0.6 = 60\%$

Activity 2: Refer learners to Worked examples 1 and 2 on pages 86 and 87 in the Learner's Book. Work through the activities with them.

Activity 3: Place learners in convenient groups. Ask them to write a fraction and convert it into a percentage and a decimal. Ask learners to write one percentage and convert it into a decimal and a fraction.

Review exercise

Remedial activity

Convert the following fractions into decimals and percentages.

1. $\frac{1}{10}$

2. $\frac{4}{4}$

Challenging activities

1. Convert $\frac{1}{3}$ into a decimal and into a percentage.

2. Convert 45% into a fraction and into a decimal.

Assessment tasks ----- LB page 87

Learners convert fractions into decimals and percentages, and decimals into percentages and fractions.

Suggested Homework

Complete a copy of the table.

Fraction	Decimal	Percentage
		70
	0.4	
$\frac{4}{6}$		

Main idea 4

Simplifying, comparing and ordering fractions

LB page 88

1. Reducing a fraction to its simplest form

Activity 1: Write a fraction such as $\frac{12}{18}$ on the board. Ask learners to work in pairs. Let them discuss whether there are numbers we can divide into the numerator and the denominator without any remainder. Ask learners to continue until there is no number we can divide into the numbers.

$\frac{12}{18}$, $\frac{6}{9}$, $\frac{2}{3}$ so $\frac{12}{18}$ reduced to its simplest form is $\frac{2}{3}$.

Activity 2: Place learners in Mixed-ability groups to simplify the fractions.

1. $\frac{12}{24}$

2. $\frac{17}{34}$

3. $\frac{36}{124}$

Activity 3: Work through the Worked examples on page 88 in the Learner's Book with learners.

2. Comparing common fractions

Activity 4: Explain that when we compare two or more fractions, the fractions should have the same denominator. For example, fraction is greater: $\frac{1}{3}$ or $\frac{2}{5}$?

Learners need to convert $\frac{1}{3}$ and $\frac{2}{5}$ into equivalent fractions that have the same denominator.

Multiples of 3 = 3, 6, 9, 12, 15, ...

Multiples of 5 = 5, 10, 15, 20, ...

The lowest common multiple is 15.

$$\frac{1}{3} = \frac{1 \times 5}{3 \times 5} = \frac{5}{15}$$

$$\frac{2}{5} = \frac{2 \times 3}{5 \times 3} = \frac{6}{15}$$

Now the two fractions have the same denominator and so we can compare the fractions.

Comparing $\frac{5}{15}$ and $\frac{6}{15}$: $\frac{6}{15}$ is bigger and the smaller fraction is $\frac{5}{15}$.

Activity 5: We can compare the fractions using the greater than (>) and the less than (<).

1. $\frac{3}{4}$ and $\frac{2}{3}$

2. $\frac{7}{3}$ and $\frac{2}{3}$

Activity 6: Refer learners to Learner's Book page 89. Work through the Worked examples with the class.

3. Ordering common fractions

Activity 7

Steps to follow to order fractions

Discuss the following steps with the class:

1. Write all the fractions with a common denominators.
2. Find the largest or smallest fraction by comparing the numerators.
3. Rewrite the fractions as they appear in order of size.

Activity 8: Write these on the board and ask learners to order them in ascending and descending orders.

1. $\frac{1}{8}, \frac{1}{5}, \frac{1}{4}$

2. $\frac{3}{4}, \frac{1}{2}, \frac{5}{8}$

Activity 9: Work through the Worked examples on page 90 and 91 with learners.

Review exercise

Place learners in mixed ability groups to work out the answers.

Order the following fractions in ascending and in descending order.

1. $\frac{1}{8}, \frac{1}{7}, \frac{1}{4}, \frac{1}{3}$

2. $\frac{3}{5}, \frac{1}{3}, \frac{3}{10}, \frac{1}{3}$

Assessment tasks ----- LB page 91

Learners simplify, convert and compare fractions.

Suggested homework

1. Simplify $\frac{35}{80}$.
2. Use the symbols $<$ and $>$ to compare these fractions $\frac{7}{8}$ and $\frac{16}{64}$.
3. Order these fractions in ascending and descending orders.
 - a. $\frac{1}{3}, \frac{2}{5}, \frac{1}{4}$
 - b. $\frac{1}{5}, \frac{3}{10}, \frac{4}{5}, \frac{1}{2}$

Answers to Assessment tasks

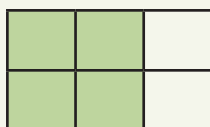
(LB page 82)

1. a. $\frac{2}{5}$ b. $\frac{3}{4}$ c. $\frac{7}{10}$

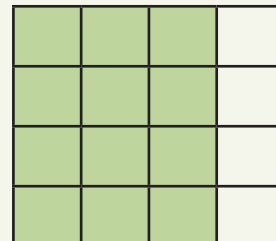
2. a. $\frac{5}{8}$



- b. $\frac{2}{3}$



- c. $\frac{3}{4}$



3. a. $\frac{1}{4}$ b. $\frac{3}{4}$ c. $\frac{2}{5}$ d. $\frac{3}{5}$

4. a. $\frac{3}{8}$ b. $\frac{5}{6}$ c. $\frac{2}{3}$ d. $\frac{1}{2}$ e. $\frac{3}{4}$

5. Examples of equivalent fractions:

a. $\frac{2}{5} = \frac{4}{10} = \frac{6}{15} = \frac{8}{20} = \frac{10}{25}$

b. $\frac{3}{10} = \frac{6}{20} = \frac{9}{30} = \frac{12}{40} = \frac{15}{50}$

c. $\frac{3}{4} = \frac{6}{8} = \frac{9}{12} = \frac{12}{16} = \frac{15}{20}$

d. $\frac{1}{100} = \frac{2}{200} = \frac{3}{300} = \frac{4}{400} = \frac{5}{500}$

- 6.

$\frac{2}{3}$	$\frac{16}{24}$	$\frac{36}{54}$
$\frac{3}{4}$	$\frac{45}{60}$	$\frac{9}{12}$
$\frac{2}{5}$	$\frac{16}{40}$	$\frac{36}{90}$
$\frac{4}{5}$	$\frac{48}{60}$	$\frac{28}{35}$
$\frac{1}{10}$	$\frac{9}{90}$	$\frac{5}{50}$

Main Idea 2

(LB page 85)

1. $\frac{157}{10}$

2. $22\frac{1}{2}$

3. $15\frac{3}{4}$

4. a. $\frac{29}{8}$

b. $\frac{29}{5}$

c. $\frac{169}{10}$

d. $\frac{423}{4}$

e. $\frac{714}{100}$

5. a. $6\frac{2}{5}$

b. $5\frac{2}{3}$

c. $8\frac{3}{5}$

d. $66\frac{2}{3}$

e. $22\frac{1}{2}$

Main Idea 3

(LB page 87)

1. a. $\frac{3}{5} = 0.6 = 60\%$

b. $\frac{7}{10} = 0.7 = 70\%$

c. $\frac{4}{5} = 0.8 = 80\%$

d. $\frac{1}{100} = 0.01 = 1\%$

2. a. $0.4 = 40\% = \frac{2}{5}$

b. $0.33 = 33\% = \frac{33}{100}$

c. $0.5 = 50\% = \frac{1}{2}$

d. $0.7 = 70\% = \frac{7}{10}$

3.	Fraction	Percentage	Decimal
a.	$\frac{1}{2}$	50%	0.5
b.	$\frac{1}{3}$	$33\frac{1}{3}\%$	0.33
c.	$\frac{1}{4}$	25%	0.25
d.	$\frac{1}{10}$	10%	0.1
e.	$\frac{3}{5}$	60%	0.6

Main Idea 4

(LB page 91)

1. a. $\frac{9}{15} = \frac{3}{5}$ b. $\frac{16}{24} = \frac{2}{3}$ c. $\frac{18}{45} = \frac{2}{5}$ d. $\frac{64}{128} = \frac{1}{2}$ e. $\frac{40}{72} = \frac{5}{9}$
2. a. $\frac{3}{7} > \frac{2}{9}$ b. $\frac{3}{5} < \frac{3}{4}$ c. $\frac{5}{8} = \frac{35}{56}$ d. $2\frac{5}{6} > 2\frac{3}{7}$ e. $1\frac{2}{5} < 1\frac{1}{2}$
3. Ascending order
- a. $\frac{1}{3}, \frac{1}{2}, \frac{4}{7}, \frac{3}{5}, \frac{3}{4}$ b. $\frac{1}{8}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}$
- c. $\frac{1}{5}, \frac{3}{10}, \frac{5}{8}, \frac{2}{3}, \frac{4}{5}$ d. $\frac{3}{10}, \frac{4}{9}, \frac{1}{2}, \frac{3}{4}, \frac{5}{6}$
4. Descending order
- a. $\frac{3}{4}, \frac{4}{6}, \frac{5}{8}, \frac{1}{3}, \frac{1}{3}$ b. $\frac{9}{10}, \frac{5}{6}, \frac{4}{5}, \frac{3}{4}, \frac{1}{2}$ c. $\frac{4}{5}, \frac{2}{3}, \frac{5}{8}, \frac{3}{10}, \frac{1}{5}$
5. Aboagye did better in Mathematics since $\frac{26}{40} > \frac{50}{80}$.

Sub-strand 3: Fractions, decimals and percentages**Module 2****Comparing and ordering decimal fractions****Content standard**

B7.1.3.1 Simplify, compare and order a mixture of positive fractions (i.e. common, percent and decimal) by changing all to equivalent (i) fractions (ii) decimals, or (iii) percentages.

B7.1.3.2 Demonstrate an understanding of the process of addition and/or subtraction of fractions and apply this when solving problems.

Indicator

B7.1.3.1.2 Compare and order fractions (i.e common, percent and decimal fractions up to thousandths) limit to the benchmark fractions.

B7.1.3.2.1 Explain the process of addition and subtraction of two or three unlike and mixed fractions.

Learning expectations:

In this module, learners will learn how to:

- Compare two decimal fractions and order the fractions.
- Compare and order common and decimal fractions and percentages.

Essentials for Learning: Learners can simplify common fractions.

Resources: Fraction chart

Keywords: order, compare, percent, decimal fraction

Competencies: Communication and collaboration, critical thinking and problem-solving

Starter: Refer learners to Learner's Book page 92 for a quick mental exercise.

Main idea 1

Compare and order decimal fractions

LB page 92

Activity 1: Place learners in mixed ability groups. Explain to the class that in order to order decimal fractions, we have to convert them to common fractions, or if decimal numbers have the same number of digits after the decimal points, we can compare the numbers easily.

Write two questions on the board. Below are two examples.

1. 0.365

2. 0.142

Comparing the digits in the tenth place: of a is bigger than

1. So, 3 tenths is greater than 1 tenth, so: $0.365 > 0.142$ or $0.142 < 0.365$

Activity 2: Ask learners to work in pairs to solve questions.

For example, compare these numbers using the symbols $>$ or $<$.

- 1.** 0.651 and 0.682 **2.** 0.024 and 0.126

Activity 3: Ask learners to compare and order the following decimal fractions in ascending order.

0.248, 0.2240, 0.345

Activity 4: Work through the Worked examples 1 and 2 on page 93 in the Learner's Book with learners.

Review exercise

Place learners into mixed-ability groups.

Ask learners to work in pairs to solve problems.

Compare and order the decimal numbers in descending order.

1. 0.064, 0.0012, 0.084

2. 0.123, 0.0339, 0.142

Assessment tasks ----- LB page 94

Learners compare decimal numbers.

Suggested homework

Compare and order the following decimals in ascending and descending orders.

1. 0.685, 0.682, 0.689

2. 0.35, 0.689, 0.542

3. 0.006, 0.001, 0.0069

Main idea 2

Compare and order common decimal, fractions and percentages

LB page 95

Activity 1: Revise the previous lesson with learners. Write a question on the board; for example, ask learners to compare $\frac{1}{4}$, 0.15 and 30%. Explain to learners that to compare and order fractions, it is better to convert the fractions into percentages or hundredths.

$$\text{So, } \frac{1}{4} = \frac{1}{4} \times \frac{100}{100} = 25\% \text{ and } 0.15 = \frac{15}{100}.$$

Compare: 25%, 15% and 30%.

Since $30\% > 25\% > 15\%$ then:

ascending order: 0.15, $\frac{1}{4}$, 30%

descending order: 30%, $\frac{1}{4}$, 0.15

Activity 2: Place learners in mixed ability groups to compare and order fractions, decimals and percentages in ascending and descending orders.

1. $\frac{1}{5}$, 0.36, 28%

2. 13%, 0.05, $\frac{1}{10}$

Activity 3: Refer learners to Learner's Book page 95. Work through the Worked examples with the class.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to compare and order 70%, $\frac{1}{4}$, 0.1 in ascending and descending orders.

Challenging activities

Ask learners to work in pairs, compare and order the following values in ascending and descending orders.

1. $\frac{1}{2}$, 0.52, 10%

2. $12\frac{1}{2}$, $\frac{3}{5}$, 0.75

Assessment tasks ----- LB page 96

Learners arrange fractions, decimal numbers and percentages in ascending and descending order.

Suggested homework

1. Arrange the values in descending orders.

a. $\frac{1}{3}$, 9%, 0.65

b. $\frac{1}{4}$, $\frac{1}{5}$, 0.40, 36%

2. Mama Adwoa shared pens to the three best students in her class. The first person received $\frac{1}{2}$, the second received 40% and the third received 0.10 of the pens. Who received the most pens?

Answers to Assessment tasks

Main Idea 1

(LB page 94)

1. a. $0.499 > 0.456$

b. $0.276 > 0.03$

c. $0.999 > 0.1000$

2. a. $0.0003 < 0.002$

b. $0.098 < 0.9999$

c. $0.1729 < 0.178$

3. Descending order

a. $0.875 > 0.864 > 0.7867 > 0.754$

b. $0.6 > 0.2980 > 0.1342 > 0.015$

c. $0.009 > 0.0087 > 0.007 > 0.0039$

d. $0.0628 > 0.0627 > 0.0625 > 0.0624$

e. $0.46 > 0.321 > 0.17 > 0.0987$

4. Ascending order

- a. $0.45 < 0.5 < 0.501 < 0.51011 < 0.55$
- b. $0.7 < 0.8 < 0.801 < 0.81 < 0.811$
- c. $0.0888 < 0.208 < 0.399 < 0.4 < 0.41$
- d. $0.431 < 0.433 < 0.435 < 0.436 < 0.56$
- e. $0.0008 < 0.001 < 0.002 < 0.009 < 0.0134$

5. Descending order

- a. $0.92 > 0.8 > 0.75 > 0.574 > 0.02$
- b. $0.77 > 0.67 > 0.66 > 0.48 > 0.45$
- c. $0.725 > 0.703 > 0.225 > 0.065 > 0.004$
- d. $0.891 > 0.725 > 0.72 > 0.54 > 0.26$
- e. $0.7 > 0.42 > 0.09 > 0.06 > 0.01$

Main Idea 2

(LB page 96)

1. Descending order

- a. $0.893 > 72\% > \frac{3}{5} > 56\%$
- b. $89\% > 0.736 > \frac{2}{3} > \frac{4}{7}$
- c. $100\% > \frac{9}{10} > 62\frac{1}{2}\% > \frac{1}{4}$

2. Ascending order

- a. $0.2 > 25\% > 0.354 > 0.75$
- b. $0.003 > 9\% > \frac{1}{6} > \frac{1}{5}$
- c. $0.523 > \frac{13}{20} > \frac{11}{15} > 74\%$

- 3.** $\frac{1}{4} = 25\%$; $\frac{1}{5} = 20\%$; $\frac{3}{8} = 37.5\%$; $\frac{1}{3} = 33.33\%$; $\frac{2}{3} = 66.67\%$; $\frac{17}{25} = 68\%$

Ascending order: $\frac{1}{5} < \frac{1}{4} < \frac{1}{3} < \frac{3}{8} < \frac{2}{3} < \frac{17}{25}$

- 4.** Electricity = 12% Water bill = $\frac{7}{40} = 17.5\%$ Fuel = $0.31 = 31\%$

Fuel is the most expensive and electricity is the least expensive.

- 5.** Esi received $0.37 = 37\%$, Ajo received $\frac{2}{5} = 40\%$ and Efi received $(100\% - 37\% - 40\%) = 23\%$.

So, Ajo received the biggest share and Efi received the smallest share.

Sub-strand 3: Fractions, decimals and percentages**Module 3****Addition and subtraction of fractions****Content standard**

B7.1.3.2 Demonstrate an understanding of the process of addition and/or subtraction of fractions and apply this in solving problems.

Indicator

B7.1.3.2.1 Explain the process of addition and subtraction of two or three unlike and mixed fractions.

Learning expectations: In this module, learners will learn how to:

- Add and subtract like fractions and unlike fractions.
- Add and subtract mixed numbers.
- Add and subtract fractions in word problems.

Essential for learning: Learners can convert fractions to decimals and percentages.

Resources: Fractional chart, sentence cards

Keywords: denominator, numerator, like fractions, unlike fractions

Competencies: Communication and collaboration, critical thinking and problem-solving

Starter: Refer learners to Learner's Book page 97 for the Starter exercise.

Main idea 1

Adding and subtracting fractions

LB page 97

Add and subtract like fractions

Activity 1: Write examples of like fractions on the board and explain to learners how to add the fractions.

Add: $\frac{1}{5} + \frac{3}{5}$

Since all the denominators are the same, we add only the numerators:

$$\frac{1}{5} + \frac{3}{5} = \frac{1+3}{5} = \frac{4}{5}$$

Explain to the class that we subtract in the same way:

$$\frac{7}{10} - \frac{3}{10} = \frac{7-3}{10} = \frac{4}{10}$$

Activity 2: Refer learners to Worked examples on page 98 in the Learner's Book. Go through the Worked examples with the class.

Add and subtract of unlike fractions

Activity 3: Give learners an example of addition and subtraction sentences that include unlike fractions to solve. See the two examples. If they forget, remind learners that they must make the denominators the same.

$$\begin{aligned} 1. \quad & \frac{1}{3} \times \frac{4}{4} + \frac{1}{4} \times \frac{3}{3} \\ &= \frac{4}{12} + \frac{3}{12} \\ &= \frac{4+3}{12} \\ &= \frac{7}{12} \end{aligned}$$

$$\begin{aligned} 2. \quad & \frac{5}{6} - \frac{3}{4} = \frac{5}{6} \times \frac{4}{4} - \frac{3}{4} \times \frac{6}{6} \\ &= \frac{20}{24} - \frac{18}{24} \\ &= \frac{20-18}{24} \\ &= \frac{2}{24} \\ &= \frac{1}{12} \end{aligned}$$

Activity 4: Refer learners to Worked examples on page 98 in the Learner's Book. Work through the exercise with them.

Review exercise

Differentiated lessons

Remedial activity

Learners in pairs to work out the answers

$$1. \quad \frac{5}{12} + \frac{4}{12}$$

$$2. \quad \frac{5}{10} - \frac{3}{10}$$

$$3. \quad \frac{7}{10} + \frac{1}{5}$$

Challenging activities

Work in pairs.

$$1. \quad \frac{6}{8} + \frac{1}{8}$$

$$2. \quad \frac{9}{14} - \frac{3}{14}$$

$$3. \quad \frac{5}{8} + \frac{1}{3}$$

$$4. \quad \frac{9}{12} - \frac{1}{3}$$

Assessment tasks ----- LB page 98

Learners add and subtract fractions.

Suggestion homework

Work out the answers.

$$1. \quad \frac{7}{10} - \frac{4}{9}$$

$$2. \quad \frac{3}{4} - \frac{1}{3}$$

$$3. \quad \frac{5}{6} - \frac{4}{5}$$

$$4. \quad \frac{3}{5} + \frac{2}{3} + \frac{1}{2}$$

$$5. \quad \frac{2}{4} + \frac{1}{3}$$

$$6. \quad \frac{5}{16} - \frac{4}{12} + \frac{3}{48}$$

Activity 1: Refer learners to page 99 in the Learner's Book. Go through the steps with them. Write an example on the board. Demonstrate the two methods we can use to add and subtract mixed numbers.

Method 1

Steps

- Convert all mixed numbers into improper fractions.
- Check if the mixed numbers have common denominators, if not, find a common denominator.
- Create equivalent fractions where necessary.
- Add or subtract the numerators and keep the denominators the same.
- If the answer is an improper fraction, write it as a mixed number.

$$\begin{aligned}
 &2\frac{1}{3} + 3\frac{4}{5} \\
 &= \frac{7}{3} + \frac{19}{5} \\
 &= \frac{35 + 57}{15} \\
 &= \frac{92}{15} \\
 &= 6\frac{2}{15}
 \end{aligned}$$

Give more exercises for learners to work through in their previous groups.

Activity 2: Refer learners to page 101 in the Learner's Book. Go through the steps with learners and let them work through some examples on the board.

Method 2

Steps

- Write the mixed numbers as wholes and fractional parts.
- Add or subtract the whole number parts.
- Check if the fraction part has common denominator; if not, find the common denominator.
- Find equivalent fractions, if necessary.
- Add or subtract the numerators of the same fraction part and keep the denominator.
- If the answer is an improper fraction, convert it into a mixed number.

Below are two examples – one with addition and one with subtraction.

$$\begin{aligned}
 &3\frac{1}{3} + 4\frac{1}{4} \\
 &= (3 + 4) + \frac{1}{3} + \frac{1}{4} \\
 &= 7 + \frac{1}{3} + \frac{1}{4} \\
 &= 7 + \frac{4 + 3}{12} \\
 &= 7\frac{7}{12}
 \end{aligned}$$

$$\begin{aligned}
 &5\frac{1}{5} - 2\frac{1}{5} \\
 &= (5 - 2) + \frac{1}{5} - \frac{1}{5} \\
 &= 3 + 0 \\
 &= 3
 \end{aligned}$$

Activity 3: Refer learners to Worked examples 1 and 2 on pages 100 to 102. Go through the examples with them.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to work out the answers.

1. $2\frac{1}{3} + 3\frac{1}{5}$

2. $6\frac{1}{2} - 4\frac{1}{4}$

Challenging activities

Ask learners to work in pairs.

1. $7\frac{8}{15} + 2\frac{1}{5}$

2. $15\frac{2}{15} - 9\frac{1}{3}$

Assessment tasks ----- LB page 102

Learners add and subtract mixed numbers.

Suggested Homework

Work out the answers.

1. $1\frac{1}{8} + 3\frac{1}{8}$

2. $3\frac{4}{5} + 5\frac{1}{6} = ?$

3. $13\frac{7}{8} - 7\frac{1}{2}$

4. $19\frac{6}{7} - 11\frac{2}{3}$

Main idea 3

Word problems involving addition and subtraction of fractions
LB page 103

Activity 1: Place learners into convenient groups. Take them through the following steps.

Steps:

- Write a mathematical statement for the question.
- Check if fractions have the same denominator. If not, find a common denominator.
- Add or subtract the numerators and keep the denominator the same.
- If the answer is an improper fraction, write it as a mixed number.

Write a word problem on the board. Ask learners to brainstorm to identifying the type of operation needed to solve the problem.

For example, the weight of three fruits, a watermelon, a pineapple and a pawpaw are $\frac{1}{2}$ kg, $\frac{1}{3}$ kg and $\frac{1}{5}$ kg respectively. Find the total weight of the three fruits.

Let learners write a mathematical statement: $\frac{1}{2} + \frac{1}{3} + \frac{1}{5}$

The fractions have different denominators, so ask the learners to find a common denominator

and add: $\frac{1}{2} + \frac{1}{3} + \frac{1}{5}$

$$= \frac{15 + 10 + 6}{30}$$
$$= \frac{31}{30}$$

Convert $\frac{31}{30}$ to proper fraction: $1\frac{1}{30}$ kg

Activity 2: Give each group different word problem cards to solve. Let them exchange their work with another group and check whether the answer is correct or not. If it is wrong, they need to discuss the problem and do corrections.

Activity 3: Write a word problem that involves subtraction on the board. Ask learners to write mechanical sentences for the problem and solve it. Below is an example.

Adwoa Fosuaa spent $\frac{2}{5}$ of her money on chocolate and $\frac{1}{3}$ on fruits. If she still has GH¢60.00 in her pocket, what fraction of her money did she not spend?

Activity 4: Ask each group to set one question that involves addition or subtraction and solve it.

Activity 5: Refer learners to Worked examples 1 and 2 on pages 103 and 104 in the Learner's Book. Go through the Worked examples with the class.

Review exercise

Differentiated Learners

Remedial activity

Ask learners to work in pairs and to add the fractions:

Add $\frac{1}{3}$ to the difference of $\frac{5}{7}$ and $\frac{2}{7}$

Challenging activities

Ask learners to work in pairs to solve the problem:

Enusah spent $\frac{1}{5}$ of his pocket money on books and $\frac{1}{4}$ on food.

1. What fraction did he spend on both books and food?
2. What fraction of his pocket money did he not spend?

Assessment tasks ----- LB page 104

Refer learners to Learner's Book page 104 for exercise.

Suggested homework

1. Work out the answer if $\frac{1}{3}$ is added to the difference of $\frac{7}{10}$ and $\frac{3}{5}$.
2. Opanyin Koramoah Worked in his cocoa farm for $6\frac{1}{4}$ hours on Monday. He Worked for $4\frac{1}{3}$ hours on Tuesday. How many more hours did he work on Monday than on Tuesday?

Answers to Assessment tasks

Main Idea 1

(LB page 98)

1. a. $\frac{3}{5}$ b. $\frac{2}{3}$ c. $1\frac{1}{8}$ d. $1\frac{5}{12}$ e. $1\frac{1}{6}$

2. a. $\frac{17}{20}$ b. $\frac{47}{60}$ c. $1\frac{23}{30}$ d. $\frac{1}{5}$ e. $\frac{7}{12}$

f. $\frac{1}{8}$ g. $\frac{13}{90}$

3. a. $\frac{13}{60}$ b. $\frac{11}{15}$ c. $\frac{1}{4}$ d. $\frac{9}{10}$ e. 1 f. $\frac{1}{12}$

4.

$\frac{2}{5}$	$\frac{1}{15}$	$\frac{8}{15}$
$\frac{7}{15}$	$\frac{5}{15}$	$\frac{3}{15}$
$\frac{2}{15}$	$\frac{3}{5}$	$\frac{4}{15}$

Main Idea 2

(LB page 102)

1. a. $8\frac{1}{12}$ b. $6\frac{17}{20}$ c. $5\frac{3}{20}$ d. $8\frac{1}{2}$

2. a. $3\frac{1}{8}$ b. $7\frac{3}{16}$ c. $1\frac{23}{24}$ d. $\frac{35}{36}$

3. a. $10\frac{11}{12}$ b. $8\frac{5}{8}$ c. $9\frac{17}{48}$ d. $1\frac{5}{12}$ e. $1\frac{13}{60}$ f. $2\frac{1}{12}$

4. $1\frac{1}{12}$

5. $4\frac{1}{2}$

6. $2\frac{1}{24}$

7. $7\frac{7}{20}$

Main Idea 3

(LB page 104)

1. $4\frac{1}{12}$ hours or 4 hours and 5 minutes 2. $2\frac{1}{6}$ hours or 2 hours and 10 minutes

3. $4\frac{1}{8}$ 4. $\frac{3}{4}$ 5. a. $\frac{19}{20}$ b. $\frac{1}{20}$

Sub-strand 3: Fractions, decimals and percentages

Module 4

Multiplication of fractions

Content standard

B7.1.3.3 Demonstrate an understanding of the process of multiplying and dividing positive fractions and apply this in solving problems.

Indicator

B7.1.3.3.1 Explain the process of multiplying a fraction (i.e. common, percent and decimal fractions up to thousandths) by a whole number and by a fraction.

Learning expectations: In this module, learners will learn how to:

- Multiply fractions by whole numbers, percentages and decimals.
- Multiply a fraction by a fraction.
- Multiply a fraction by a given quantity.

Essential for learning: Learners can solve addition and subtraction with decimal fractions.

Resources: Work cards

Keywords: decimal, fraction, multiply, common fraction, percentage

Competencies: Critical thinking and problem-solving.

Starter: Refer learners to Learner's Book page 105 for the Starter quick mental activity.

Main idea 1

Multiplying fractions by whole numbers

LB page 105

Activity 1: Explain to learners know that multiplication is repeated addition. Multiplying a fraction by a whole number is the same as adding the fraction for the number of times of the whole

number; for example, $3 \times \frac{1}{2}$ means adding $\frac{1}{2}$ three times.

$$\text{So, } 3 \times \frac{1}{2} = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{1+1+1}{2} = \frac{3}{2} = 1\frac{1}{2}$$

Activity 2: Place learners in convenient groups. Write some examples for learners to solve on the board. Below are two examples.

1. $3 \times \frac{1}{4}$

2. $4 \times \frac{1}{5}$

Alternative method: Ask learners what they know about the different ways of to multiply a whole number by a fraction.

Demonstrate an example on the board; for example, to multiply $3 \times \frac{2}{5}$, write the whole number 3 as a fraction $\frac{3}{1}$, so it is easier to multiply: $\frac{3}{1} \times \frac{2}{5} = \frac{3 \times 2}{1 \times 5} = \frac{6}{5} = 1\frac{1}{5}$

Activity 3: Refer learners to Worked examples 1 and 2 in on pages 106 and 107 in the Learner's Book. Discuss with the class how to multiply a whole number by mixed fraction. Ask learners to set a few questions and solve them.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to work out the answers.

1. $4 \times 3\frac{1}{2}$

2. $3 \times 7\frac{1}{2}$

Challenging activities

Ask learners to work in pairs.

1. $6 \times \frac{2}{9}$

2. $10 \times 8\frac{7}{9}$

3. $8 \times 13\frac{1}{3}$

Assessment tasks ----- LB page 108

Learners multiply whole numbers by fractions and mixed numbers and simplify answers.

Suggested homework

Multiply

1. $4 \times \frac{1}{9}$

2. $11 \times \frac{7}{8}$

3. $12 \times 4\frac{4}{6}$

4. $9 \times 23\frac{1}{3}$

5. $7 \times 2\frac{1}{5}$

6. $10 \times \frac{1}{8}$

Main idea 2

Multiplying decimals, percentages by whole numbers
LB page 108

Activity 1: Write an example of multiplying a percentage by a whole number on the board and solve it with the class. Example: Multiply 40% by 20.

Place learners in groups and guide them to work out the answer:

$$\frac{40}{100} \times \frac{20}{1} = \frac{800}{100} = 8$$

$$40\% \text{ of } 20 = 8$$

Ask learners to write their own questions and solve them. Let them exchange their work with the group next to them and check their answers. Learners correct their own answers if the answers are wrong.

Activity 2: Write a question about multiplying a percentage by a whole number on the board. Ask learners solve it. Example: $25\% \times 40$

$$25\% \text{ of } 40$$

$$= \frac{25}{100} \times \frac{40}{1}$$

$$= 10$$

Refer learners to Worked examples on page 109 in the Learner's Book. Work through the all examples with them.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in groups of threes to work out the answers.

1. 40% of 20
2. 10% of 60

Challenging activities

Learners work in pairs to work out the percentages.

1. 50% of 25
2. 325% of 5

Assessment tasks ----- LB page 109

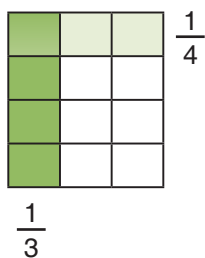
Learners work out the percentages.

Suggested homework

1. Find 9% of 90.
2. Multiply 0.5% by 20.
3. Find $\frac{1}{4}$ of 25% of GH¢ 200.00.
4. Find $12\frac{1}{2}\%$ of 300.

Activity: Write a fraction on the board and ask learners to solve.

Solve it by modelling it on the board. Multiply: $\frac{1}{3} \times \frac{1}{4}$



Shade $\frac{1}{3}$ of the diagram.

Divide the diagram into fourths and shade $\frac{1}{4}$ with a different colour. Count the number of blocks where the two colours overlap.

Count the total number of blocks. This number gives the denominator. So, $\frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$

Write more questions on the board for learners to model them.

Multiply. **a.** $\frac{1}{3} \times \frac{2}{5}$

b. $\frac{1}{6} \times \frac{1}{2}$

Guide learners to deduce that, to multiply a fraction by a fraction, we multiply the numerators to get the new numerator then we multiply the denominators to get the new denominator.

See the example below.

$$\frac{2}{3} \times \frac{1}{5} = \frac{2 \times 1}{3 \times 5} = \frac{2}{15}$$

Activity 2: Refer learners to the Worked examples on page 111 in the Learner's Book. Work through the examples with them.

Review exercise

Differentiated lessons

Remedial activity

Learners work in pairs to work out the answers.

1. $\frac{1}{2} \times \frac{7}{10}$

2. $\frac{4}{5} \times \frac{1}{3}$

Challenging activities

Solve these

1. $\frac{2}{9} \times \frac{5}{6}$

2. $\frac{7}{12} \times \frac{6}{11}$

3. $\frac{7}{15} \times \frac{3}{4}$

Assessment tasks ----- LB page 111

Learners multiply, simplify and also use models to find products.

Suggested homework

Model each problem to find the product of the fractions.

1. $\frac{2}{3} \times \frac{1}{4}$

2. $\frac{1}{5} \times \frac{2}{3}$

Solve these.

3. Find the area of a rectangle with a side length of $5\frac{1}{4}$ cm and a breadth of $2\frac{1}{5}$ cm.

Main idea 4

Multiplying a fraction by a given quantity

LB page 112

Activity 1: Explain to learners that multiplying a fraction by a given quantity is the same as multiplying a fraction by a whole number.

Place learners in convenient groups. Give each group different questions to solve.

Invite the group leaders to write the group's solution on the board for the rest of the class to observe.

1. Find $\frac{1}{3}$ of GH¢300.00.
2. Calculate $\frac{1}{5}$ of 400 bags.
3. Find $\frac{3}{10}$ of GH¢1,000.00.

Activity 2: Ask the groups to set their own questions and solve them.

Activity 3: Refer learners to the Worked examples on page 112 in the Learner's Book. Work through the exercises with them.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs and work out the answers.

1. Find $\frac{1}{4}$ of Gh¢100.00.
2. Find $\frac{2}{5}$ of 200m of wine.

Challenging activities

Ask learners to work on their own to find the answers.

1. The population of a village is 1,500. If $\frac{2}{5}$ are males, how many are females?
2. Find $\frac{2}{15}$ of GH¢3,000.00.

Assessment tasks ----- LB page 113

Learners calculate fractions of quantities.

Suggested homework

- Answer the questions if 2,500 candidates sat for BECE and $\frac{3}{5}$ candidates passed.
 - How many candidates passed?
 - How many candidates failed?
- Find $\frac{9}{10}$ of 260 kg of rice.

Answers to Assessment tasks

Main Idea 1

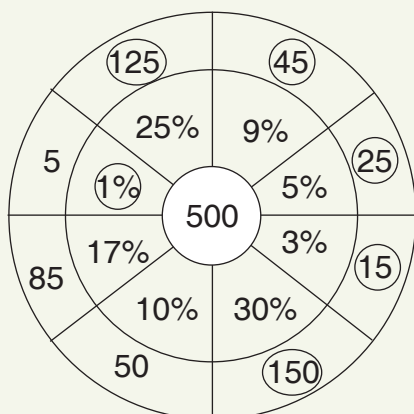
(LB page 108)

- $4\frac{4}{5}$
 - 34
 - $4\frac{2}{3}$
 - $16\frac{2}{3}$
 - 36
 - 255
 - $274\frac{1}{2}$
 - 836
- 21
 - $33\frac{1}{3}$
 - 57
 - 46
 - 520
 - 420
 - 3,600
 - 2,300
- 6 learners
- 78 teachers
- GH¢25.00

Main Idea 2

(LB page 109)

- 21.6
 - 3,100
 - 625
 - 124
 - 81
 - 9
- 72.25
 - 16.2
 - 0.63
 - 3.06
 - 3.25
 - 20.18
- 9
 - 72
 - 62.5
 - 270
- 100
 - 2
 - 5
 - 105
 - 5
 - 4
- 300
 - 275
 - 180
 - 110
 - 255



Main Idea 3

(LB page 111)

1. a. $\frac{1}{12}$ b. $\frac{1}{3}$ c. $\frac{3}{16}$ d. $\frac{5}{9}$ e. $\frac{3}{10}$
2. a. $\frac{5}{21}$ b. $\frac{4}{33}$ c. $\frac{3}{10}$ d. $\frac{5}{18}$
3. a. $\frac{2}{21}$ b. $\frac{3}{8}$ c. $\frac{11}{8} = 1\frac{3}{8}$
d. $\frac{95}{2} = 47\frac{1}{2}$ e. $\frac{8}{15}$ f. 14
4. a. $\frac{1}{16}$ b. $\frac{5}{3} = 1\frac{2}{3}$ c. 40
5. Area = 60 cm²
6. Volume = 35 cm³

Main Idea 4

(LB page 113)

1. a. 8 kg b. 160 m c. GH¢40.00 d. 27 km e. 625 kg f. 7,500 ml
2. a. 18 kg b. 36 cm c. GH¢9.30 d. 450 ml
3. a. GH¢12.50 b. 22.5 g c. 150 km d. 187.5 ml
4. a. 72 ml b. $13\frac{1}{2}$ hours or 13 hours 30 minutes
c. 180 m d. 4.5 minutes or 4 minutes 30 seconds
5. GH¢135.00
6. 412 failed
7. GH¢600.00
8. a. $\frac{1}{8}$ b. 150 learners c. $\frac{1}{4}$ d. 600 learners
9. 320 learners study science

Sub-strand 3: Fractions, decimals and percentages

Module 5

Division of fractions

Content standard

B7.1.3.3 Demonstrate an understanding of the process of multiplying and dividing positive fractions and apply this in solving problems.

Indicator

B7.1.3.3.3 Explain the process of dividing a fraction (i.e. common, percent and decimal fractions up to thousandths) by a 1-digit whole number and by a fraction.

Learning expectations: In this module, learners will learn how to:

- Divide a fraction by a fraction.
- Divide a whole number by a fraction and a fraction by a whole number.
- Divide a quantity by fraction.

Essential for learning: Learners can multiply a whole number by a fraction.

Resources: Cut-out shapes of rectangles and squares

Keywords: reciprocal, division, quotient

Competencies: Critical thinking and problem-solving.

Starter: Refer learners to the Starter on page 114 in the Learner's Book for warm up activity.

Main idea 1

Dividing a fraction by a fraction

LB page 114

Activity 1: Place learners in convenient groups. Write a division sentence on the board.

Example: $\frac{3}{4} \div \frac{1}{2}$

Previously, learners learnt that dividing a number by 1 gives the same number. So, we can change the divisor to 1 by, multiplying it by its reciprocal. In order not to change the question, we have to multiply the dividend by the reciprocated fraction.

Teachers can refer to the above example again.

Change $\frac{1}{2}$ to 1 by reciprocating it as $\frac{2}{1}$.

The sentences then changes to: $(\frac{3}{4} \times \frac{2}{1}) \times (\frac{1}{2} \times \frac{2}{1}) = \frac{3}{4} \times \frac{2}{1} = \frac{6}{4} = 1\frac{1}{2}$.

Write some questions on the board for learners to solve.

1. $\frac{2}{3} \div \frac{1}{5}$

2. $\frac{5}{6} \div \frac{1}{3}$

Activity 2: Refer learners to page 114 in the Learner's Book. Explain the steps for dividing a fraction by a fraction with learners.

Discuss the examples in the Worked examples on page 115 in the Learner's Book with the class.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to work out the answers.

1. $\frac{1}{3} \div \frac{1}{4}$

2. $\frac{5}{6} \div \frac{1}{5}$

3. $\frac{2}{3} \div \frac{1}{4}$

Challenging activities

Learners work in pairs to work out the answers.

1. $1\frac{1}{2} \div \frac{1}{3}$

2. $\frac{7}{4} \div \frac{7}{9}$

3. $3\frac{2}{3} \div \frac{5}{6}$

Assessment tasks ----- LB page 116

Learners work out the answers to division problems.

Suggested homework

Work out the answers.

1. $\frac{2}{3} \div \frac{1}{8}$

2. $\frac{5}{6} \div \frac{7}{4}$

3. $3\frac{1}{2} \div 1\frac{1}{5}$

4. $7 \div 8$
 $\frac{1}{5} \quad \frac{1}{3}$

5. $13 \div$
 $\frac{1}{5} \quad \frac{5}{6}$

Main idea 2

Dividing whole numbers by fractions and vice versa
LB page 116

Activity 1: Revise how to divide a fraction by a fraction with learners. Explain to learners that just like what we did for multiplication, we make the divisor 1 by multiplying it by its reciprocal. In order not to change the question, we

multiply the reciprocated number by the whole number. Example: $4 \div \frac{1}{3}$

Multiply $\frac{1}{3} \times \frac{3}{1}$ to get 1 whole, then multiply the reciprocated fractions $\frac{3}{1}$ by the whole number

(4): $(4 \times \frac{3}{1}) \times (\frac{1}{3} \times \frac{3}{1})$

$= 12 \times 1$

$= 12.$

Activity 2: Refer learners to page 116 in the Learner's Book. Ask learners to read through

the hints on dividing a whole number by a fraction. Write some examples on the board for learners to solve when working in their previous groups.

Examples

1. $4 \div \frac{1}{2}$

2. $6 \div \frac{1}{5}$

3. $17 \div \frac{1}{3}$

Activity 3: Refer learners to the Worked examples on pages 117 and 118 in the Learner's Book. Work through the questions with them.

We can divide a fraction by a whole number $\frac{3}{4} \div 5$. When we write the whole number 5 as the fraction $\frac{5}{1}$, the statement becomes $\frac{3}{4} \div \frac{5}{1} = (\frac{3}{4} \times \frac{1}{5}) \times (\frac{5}{1} \times \frac{1}{5}) = \frac{3 \times 1}{4 \times 5} \times 1 = \frac{3}{20}$

In their previous groups, ask learners to set their own questions and solve them.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs to work out the answers.

1. $5 \div \frac{1}{3}$

2. $8 \div \frac{2}{3}$

Challenging activities

Solve these in threes.

1. $\frac{4}{5} \div 6$

2. $8 \div \frac{2}{3}$

3. $2\frac{1}{2} \div \frac{1}{3}$

4. $15 \div 1\frac{3}{4}$

Assessment tasks ----- LB page 118

Learners solve word problems that involve division.

Main idea 3

Dividing a quantity by a fraction

LB page 118

Activity 1: Place learners in convenient groups and revise the previous lesson with them. Explain that dividing a quantity by a fraction is the same as dividing a whole number by a fraction. Write a question on the board, and solve it with learners. Below is an example.

$$\begin{aligned} 80 \div \frac{5}{8} \\ &= (80 \times \frac{8}{5}) \times (\frac{5}{8} \times \frac{8}{5}) \\ &= \frac{80 \times 8}{5} \times 1 \\ &= \frac{640}{5} \\ &= 128 \end{aligned}$$

Ask learners to work in their previous groups to solve the problems.

1. $30 \div \frac{1}{5}$

2. $45 \div \frac{5}{9}$

Activity 2: Work through the Worked examples on pages 118 and 119 with learners.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs and to solve the two division problems.

1. $21 \div \frac{1}{7}$

2. $40 \div \frac{5}{6}$

Challenging activities

Ask learners to work in pairs to solve the division problems.

1. $36 \div 1\frac{1}{3}$

2. A rod of length 60 m is to be divided equally of lengths $\frac{3}{5}$ m. Into how many of these lengths can the rod be cut?

Assessment tasks ----- LB page 119

Learners work out the answers to division problems.

Suggested homework

Work out the answers.

1. $16 \div \frac{2}{3}$

2. $\frac{2}{5} \div 20$

3. A cable of length 64 m is to be cut equally of lengths of $\frac{1}{8}$ m. Into how many lengths can the cable be cut?

Revision 3

Fractions, decimals and percentages ----- LB page 120

Learners answer the revision questions as a class test.

Answers to Assessment tasks

Main Idea 1

(LB page 116)

- | | | | |
|----------------------------------|---------------------------------|------------------|---------------------------------|
| 1. a. 2 | b. $\frac{3}{2} = 1\frac{1}{2}$ | c. $\frac{2}{3}$ | d. $\frac{9}{8} = 1\frac{1}{8}$ |
| e. $\frac{10}{7} = 1\frac{3}{7}$ | f. $\frac{1}{2}$ | g. $\frac{6}{7}$ | h. $\frac{3}{2} = 1\frac{1}{2}$ |
-
- | | | | |
|----------------------------------|------------------|---------------------------------|---------------------------------|
| 2. a. $\frac{1}{4}$ | b. $\frac{2}{9}$ | c. $\frac{4}{3} = 1\frac{1}{3}$ | d. $\frac{4}{3} = 1\frac{1}{3}$ |
| e. $\frac{24}{7} = 3\frac{3}{7}$ | f. $\frac{1}{5}$ | g. $\frac{5}{2} = 2\frac{1}{2}$ | |
-
3. $\frac{3}{10}$
4. 12 packets
5. 84 cans
6. 630 l
7. $1\frac{5}{7}$

Main Idea 2

(LB page 118)

- | | | |
|----------------------|-------------------|-------------------|
| 1. a. $\frac{1}{12}$ | b. $\frac{1}{18}$ | c. 10 |
| d. $1\frac{7}{13}$ | e. $1\frac{1}{4}$ | f. $5\frac{5}{9}$ |
-
2. $\frac{5}{32}$ m
3. 13.24 m or $13\frac{6}{25}$ m
4. 24 of the $\frac{1}{4}$ cups
5. $6\frac{3}{10}$ kg
6. 15 scoops
7. $\frac{3}{4}$

Main Idea 3

(LB page 119)

- | | | |
|------------------------|---------------------|-------|
| 1. a. $58\frac{2}{31}$ | b. $112\frac{1}{2}$ | c. 16 |
| d. $6\frac{3}{4}$ | e. $7\frac{1}{7}$ | |

2. a. 21

b. $2\frac{1}{2}$

c. $9\frac{1}{3}$

d. 35

e. $4\frac{2}{3}$

3. 150 packets

4. 48 sheets

5. 45 pieces

6. 39 pieces

7. 6 dresses

8. 80 bottles

Answers to Revision

3

(LB page 120)

1. a. $\frac{1}{5} = \frac{4}{20}$

b. $\frac{3}{4} = \frac{21}{28}$

c. $\frac{5}{6} = \frac{20}{25}$

d. $\frac{5}{6} = \frac{45}{54}$

e. $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{12}{24}$

f. $\frac{3}{8} = \frac{6}{16} = \frac{9}{24} = \frac{21}{56} = \frac{18}{48}$

2. a. $\frac{82}{9}$

b. $\frac{35}{9}$

c. $\frac{103}{12}$

d. $\frac{70}{9}$

e. $\frac{56}{15}$

3. a. $\frac{3}{4} = 0.75 = 75\%$

b. $\frac{1}{2} = 0.5 = 50\%$

4. a. $0.25 = 25\% = \frac{1}{4}$

b. $0.75 = 75\% = \frac{3}{4}$

5. a. $\frac{3}{18}, \frac{2}{9}, \frac{3}{8}, \frac{3}{5}$

b. $\frac{7}{30}, \frac{5}{12}, \frac{3}{5}, \frac{3}{4}$

c. $\frac{3}{8}, \frac{7}{10}, \frac{4}{5}, \frac{7}{8}, \frac{9}{10}$

6. a. $0.793 > 0.75$

b. $0.993 > 0.99$

c. $0.432 > 0.38$

7. a. $\frac{37}{45}$

b. $-\frac{1}{28}$

c. $\frac{11}{40}$

8. a. $1\frac{1}{12}$

b. $\frac{1}{7}$

c. $1\frac{23}{30}$

d. $\frac{6}{7}$

9. a. $6\frac{1}{2}$

b. $4\frac{3}{10}$

c. $7\frac{11}{18}$

d. $3\frac{1}{2}$

10. a. 33

b. 51

c. 136

d. $49\frac{1}{2}$

11. a. 21.4

b. 21.8

c. 2.5

d. 31.5

12. a. 1,224 mm

b. GH¢500.00

c. 625 g

Sub-strand 4: Number: ratios and proportion**Module 1****Ratio****Content standard**

B7.1.4.1 Demonstrate an understanding of the concept of ratios and its relationship to fractions and use it to solve problems that involve rates, ratios, and proportional reasoning.

Indicator

B7.1.4.1.1 Find ratio and use ratio language to describe the relationship between two quantities.

Learning expectations: In this module, learners will learn how to:

- Use ratio notation, simplify ratios and divide a quantity into two parts in a given ratio.
- Express two quantities as a ratio.
- Describe quantities using ratio language.
- Use rate to solve problems.
- Use tables or diagrams to explain the concept of rate.

Essential for learning: Learners can reduce fractions to their lowest terms.

Resources: Fruits, bottle cups, work cards

Keywords: ratio, proportion, homogenous, unit rate, rate

Competencies: Critical thinking and problem-solving, communication and collaboration

Starter: Refer learners to the Starter questions on page 121 in the Learner's Book and ask them to solve the question.

Main idea 1

Ratio

LB page 121

Activity 1: Ask the class to count the number of boys and girls and write the totals on the board.

Example: 20 boys and 25 girls. Write the information on the board as a ratio: boys to girls is 20 : 25. Ask learners to reduce the ratio to its simplest form (4 : 5). This means for every 4 boys there are 5 girls in the class.

Activity 2: Ask learners to write a ratio for each question in their jotters.

1. There are 30 ripe mangoes and 20 unripened mangoes in a basket.
2. A farmer has 30 eggs and has 50 guinea fowls eggs. Encourage them to give their own examples.

Activity 3: Place learners in convenient groups and ask them to reduce each ratio to its lowest form.

1. 40 : 30
2. 15 : 65
3. 75 : 100

Activity 4: Explain examples of dividing quantities in a given ratio on the board.

Example: Kwesi and Fuseini shared 39 coconuts in the ratio 5 : 8.

Find the share of each person.

Ask learners to discuss the question in their groups and identify the ratio for each person and work out the answer.

Ratio: Kwesi is 5 and Fuseini 8

Total ratio: 13

Kwesi's share: $\frac{5}{13} \times 39 = 15$

Fuseini's share: $\frac{8}{13} \times 39 = 24$

Kwesi's share is 15 and Fuseini's share is 24.

Activity 5: Refer learners to the Worked examples on pages 122 to 125 in the Learner's Book. Work through the examples with the class.

Reviewed exercise

Differentiated lessons

Remedial activity

Reduce the following ratios to their simplest form.

1. 60 : 12
2. 48 : 20
3. 12 : 132

Challenging activities

Learners work in groups and work out the solution.

Share 60 books between Adom and Nhyira in the ratio 4 : 5.

Assessment tasks ----- LB page 125

Learners solve ratio problems.

Suggested homework

Learners solve the problems.

In a certain village, there are 200 men and 250 women.

1. What is the ratio of women to men? Reduce it to its lowest term.
2. How many people are in the village?

Activity 1: Ask learners to read the information in Main idea 2 on page 126 in the Learner's Book. Stress the fact that the order of terms in a ratio is very important because the range will change when the order in which a ratio is written changes. So $5 : 4$ is not the same as $4 : 5$.

Activity 2: Write an example on the board and ask learners to discuss how they will solve it. There are 12 saloon cars and 20 articulator cars in a garage.

1. What is the ratio of articulator cars to saloon cars? Simplify the ratio.
2. What is the ratio of saloon cars to articulator cars?
3. Find the total number of cars in the garage.

Place learners in mixed-ability groups and ask groups to solve the problem and make a presentation.

Activity 3: In their mixed ability groups, ask learners to write their own questions and solve them. They exchange their answers with a group next to them and check their answers.

Activity 4: Work through the Worked examples on page 127 in the Learner's Book.

Review exercise

Place learners in mixed-ability groups.

Ask learners to solve a problem and do presentation to the whole class. Below is an example.

In a J. H. S. class at Akwasiho, the ratio of girls to boys is $3 : 5$. If there are 20 boys, answer the questions.

1. Find the number of girls in the class.
2. Find the total number of learners in the class.

Assessment tasks ----- LB page 128

Learners answer ratio questions.

Suggested homework

1. Two numbers are in the ratio $3 : 4$. Find the numbers if the lowest common multiple (LCM) is 60.
2. The ratio of the ages of Vida and Aku is $6 : 7$. If their total age is 42 answer the questions.
 - a. Find Vida's age.
 - b. Find Aku's age.

Main idea 3

Describe quantities using ratio language

LB page 129

Activity 1: Revise the previous lesson with learners. Draw three circles and two rectangles on the board.



Guide learners to compare the number of circles with the number of rectangles and also the number of rectangles with the number of circles. Using the ratio, the number of circles to rectangles is 3 : 2, and the ratio of rectangles to circles is 2 : 3.

There are two rectangles to every three circles.

Activity 2: The teacher places four bananas and five oranges on the table. Place learners in mixed-ability groups and ask them to describe the answers using ratio language. One learner in each group shares the group's answers with the whole class.

Activity 3: In their various groups, ask learners to take two different items and describe them using ratio language.

Activity 4: Refer learners to the Worked examples on pages 129 and 130 in the Learner's Book. Work through all the examples with the class.

Review exercise

Place learners into mixed-ability groups to solve the ratio problem.

1. The ratio of Math books to Science books in a cupboard is 2 : 3. If there are 30 Math books and 20 Science books are 20, describe the quantities in two different ways.

Assessment tasks ----- LB page 130

Learners answer ratio questions.

Suggested homework

The ratio of red pens to blue pens in a box is 3 : 6. Write two statements that describe the ratio of red pens to blue pens.

Main idea 4

Unit rate

LB page 131

Activity 1: Explain to learners that rate is a ratio of two quantities with different units. It is written as a fraction with the first quantity as the numerator and the second quantity as the denominator. Example: with GH¢100.00 you can buy 20 exercise books. The rate is

GH¢ $\frac{100}{20}$ books or GH¢100 : 20 books. Ask learners to give their own examples.

In a unit rate, one of the quantities is 1.

Examples: there are 30 eggs in 1 crate, there are 30 sticks in one match box and you can drive 60 km in one hour.

Activity 2: Write a question on the board and ask learners working in their mixed-ability groups to discuss the problem that follows and solve it.

In three hours, a man drives 120 km. How many kilometres will the man drive in one hour?

3 hrs: 120 km

$$\therefore 1 \text{ hr: } \frac{120}{3} = 40 \text{ km}$$

\therefore In every 1 hour he drives 40 km.

Activity 3: Distribute work cards to learners in their groups. Ask learners to discuss, the problem and solve it. Groups can then swap answers, check answers, make corrections and do presentations.

Activity 4: Refer learners to Worked examples on page 132 in the Learner's Book. Work through the examples with the class.

Review exercise

Place learners in mixed-ability groups to solve the two problems.

1. If a train travels 900 km in three hours find its speed when it travels one hour.
2. Aunt Nkrumah paid GH¢1,500.00 for 30 crates of eggs. Find the unit rate for one crate of eggs.

Assessment tasks ----- LB page 133

Learners answer questions that involve ratios and rates.

Suggested homework

1. A gardener waters 120 acres of land in 6 days, write the ratio as a unit rate.
2. Express the following as unit rates.
 - a. 80 banana for 5 tress
 - b. 120 books for 10 learners

Main idea 5

Ratios tables

LB page 134

Activity 1: Ask learners what they think ratio tables are. Explain to learners that we use ratio tables to explain the concept of rate. Ratio tables are created by multiplying or dividing both the numerator and the denominator by the same number.

Activity 2: Write a question on the board for learners to discuss and build ratio tables in their groups.

A seamstress in a company is paid GH¢20.00 for every hour she works. Create ratio table that shows how much she is paid from 1 to 7 hours.

Ask learners by how much we multiply the numerator and the denominator.

Amount paid (GH¢)	20	40	60	80	100	120	140
Time (hours)	1	2	3	4	5	6	7

Activity 3: Refer learners to Worked examples on pages 134 and 135 in the Learner's Book. Discuss the examples with the class.

Review exercise

Place learners into mixed-ability groups. Write a question on the board and ask learners to create ratio table for it. Below is an example question.

In a J.H.S. 1 class, the ratio of boys to girls is 5 : 6. Create a ratio table.

Assessment tasks ----- LB page 135

Learners answer questions that involve ratio and rate.

Suggested homework

A tailor earns GH¢30.00 for every hour she works in a factory. Complete the table below for the number of hours and amount the tailor earns.

Amount paid (GH¢)	30					180	
Time (hours)	1	2	3	4	5	6	7

Answers to Assessment tasks

Main Idea 1

(LB page 125)

1. a. $20 : 35 = 4 : 7$ b. $15 : 20 = 3 : 4$
2. a. $3 : 4$ b. $12 : 21 = 4 : 7$
3. $25 : 55 = 5 : 11$
4. a. $32 : 16 = 2 : 1$ b. $16 : 48 = 1 : 3$
5. a. $25 : 20 = 5 : 4$ b. $15 : 20 = 3 : 4$ c. $20 : 60 = 1 : 3$ d. $15 : 45 = 1 : 3$
6. a. $8 : 6 = 4 : 3$ b. $5 : 1$ c. $5 : 20 = 1 : 4$ d. $6 : 6 = 1 : 1$
7. 16 boys
8. Bashiru's share is GH¢91.00.
9. 84 green apples

Main Idea 2

(LB page 128)

- 63 nurses
- 30 guinea fowls
 - Total number of turkeys and guinea fowls = 80
- $21 : 28 = 3 : 4$
 - $28 : 49 = 4 : 7$
- 48 ice-cream cones
- Amount of sugar = 3.6 litres
 - Amount of salt = 2.4 litres

6. The son is 40 years old.
7. **a.** Number of boys is 22. **b.** Total number of boys and girls is 55.
8. 30 and 40
9. Attah is 40 years old.
10. GH¢13,500.00

Main Idea 3

(LB page 130)

1–8. Check on learners' answers

Main Idea 4

(LB page 132)

1. GH¢6.67 per hour
2. 12 km per hour
3. **a.** 20 learners per a teacher **b.** 20 kg per cubic metre
- c.** GH¢2.50 per a cake of soap
4. 1.6 km per litre
5. 80 km per hour
6. 250 eggs per day
7. $1\frac{1}{2}$ cups of flour per a cup of sugar
8. 3 flower pots per minute
9. 6 gallons per minute
10. GH¢0.83 per minute
11. GH¢14.40
12. **a.** GH¢41.00 **b.** GH¢65.60 **c.** GH¢16.40
13. 600 km
14. 8 minutes
15. 2,000 loaves ; 250 loaves per hour

Main Idea 4

(LB page 135)

1.

Rice (kg)	3	5	6	10
Price (GH¢)	24	40	48	80

2.

Containers	1	2	3	4	5
Number of barrels	12	24	36	48	60

3.

Number of oranges	3	6	9	12	15	18
Cost (GH¢)	2	4	6	8	10	12

4. 18 oranges cost GH¢12.00.
5. 30 female teachers

Sub-strand 4: Number: ratios and proportion

Module 2

Equivalent ratios

Content standard

B7.1.4.1 Demonstrate an understanding of the concept of ratios and its relationship to fractions and use it to solve problems that involve rates, ratios, and proportional reasoning.

Indicator

B7.1.4.1.4 Make tables of equivalent ratios (written as common fractions) relating quantities that are proportional.

Learning expectations: In this module, learners will learn how to:

- Find equivalent ratios.
- Make tables of equivalent ratios.
- Use the table to answer questions.
- Use proportional reasoning to find missing values.
- Plot pair of values on the coordinate plane.
- Find the percentage of a given quantity.

Essential for learning: Learners can reduce ratios to their lowest terms.

Resources: Graph sheets

Keywords: unit rate, rate, ratio, equivalent, proportion, value, percentage, quantity

Competencies: Critical thinking and problem-solving

Starter: Refer learners to the Starter exercise on page 136 in the Learner's Book for learners to answer.

Main idea 1

Tables of equivalent ratios

LB page 136

Activity 1: Write an example of two equivalent fractions on the board. Ask learners to tell the class what they know about the two two equivalent fractions such as $\frac{1}{3}$ and $\frac{2}{6}$.

Expected answers: The two fractions look different, but they have the same value. Ask learners in their groups to give four equivalent fractions for $\frac{2}{3}$.

Activity 2: Draw an equivalent ratio table on the board and ask learners find the missing values for $\frac{1}{5}$.

$$\frac{1}{5}, \frac{2}{10}, \frac{3}{15}, \frac{4}{20}, \frac{5}{25}, \frac{6}{30}$$

Activity 3: Go through the Worked examples on pages 137 and 138 in the Learner's Book with learners.

Review exercise

Place learners in mixed ability groups to work out the answer to the following question.

In a J.S.S. 1 class, the number of boys to girls is in the ratio 4 : 5. Use the ratio and create a table to find equivalent ratios.

Assessment tasks ----- LB page 138

Learners use equivalent ratios to answer questions.

Suggested homework

Find the missing values in the table of equivalent ratios.

1.

4	8		12		20
5	10		15		

2. Find the missing numbers to give or complete equivalent ratios.

a. 5 : 10

b. 6 : ___ = $\frac{36}{42}$

Main idea 2

Finding missing values using proportional reasoning
LB page 140

Activity 1: Revise the previous lesson with learners. Tell learners that two equivalent fractions are said to be in proportion.

Example: $\frac{3}{4} = \frac{6}{8}$

A proportion is an equation that states that two ratios are equal. So, 3 : 4 = 6 : 8.

Activity 2: Place learners in groups. Write a ratio on the board and ask learners to find three equivalent ratios for each ratio. Examples:

1. $\frac{1}{4}$

2. $\frac{3}{8}$

3. $\frac{4}{5}$

Ask groups to exchange their answers and mark the other group's answers.

Activity 3: Work learners through the Worked examples on pages 141 and 142 in the Learner's Book.

Review exercise

Differentiated lessons

Remedial activity

Find the missing numbers in the each ratio.

a. $3 : 5 = 15 : ?$

b. $6 : y = 18 : 7$

Challenging activities

The ratio of girls to boys in J. H. S. 1 is 5 : 3, if the total number of learners in the class is 48, find the number of boys in the class.

Assessment tasks ----- LB page 142

Learners answer questions that involve ratios and proportions.

Suggested homework

Ask learners to work out the answers to the questions.

Find three equivalent ratios for each ratio.

1. a. $6 : 8$

b. $12 : 8$

c. $5 : 7$.

2. In a hen coop, the ratio of broilers to cockles is 3 : 5. If the total number of birds is 800, find:

a. the number of cockles

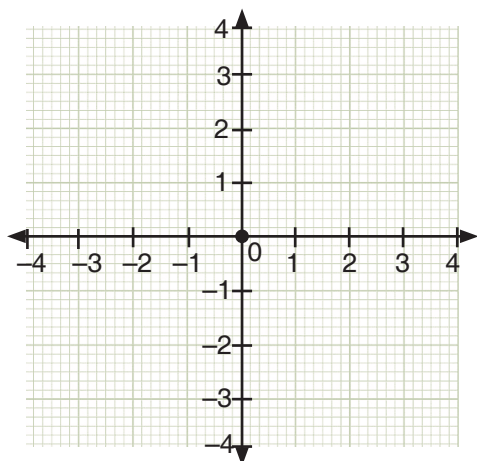
b. the number of broilers.

Main idea 3

Plotting pairs of values on the coordinate's plane **LB page 143**

Activity 1: Refer learners to pages 143 and 144 in the Learner's Book. Ask one learner to read the information about a coordinate plane is and the steps to follow when plotting coordinates.

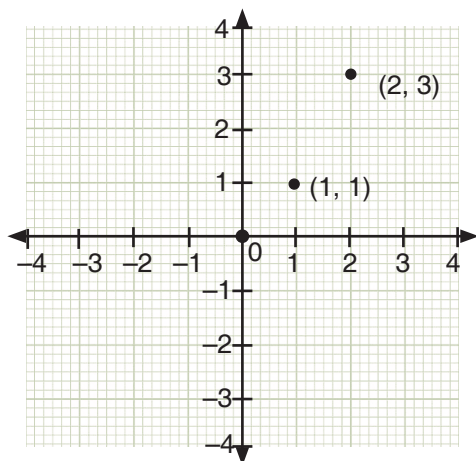
Explain to learners that the coordinate plane is a two-dimensional surface where we can plot points, lines, geometric shapes and curves. It is also called the Cartesian plane. The plane has two lines that are perpendicular to each other.



The horizontal line is called the x -axis. The values on the x -axis increase and are positive as we move to the right of zero, but they are negative and decrease as we move to the left of zero.

The vertical line is the y -axis and the values are positive and increase as we move up from zero of the plane and are negative and decrease when we move down the plane from zero.

Activity 2: Draw a simple coordinate plane on the board and demonstrate how it works by plotting points such as (2, 3) and (1, 1).



Activity 3: Place learners in mixed ability groups and give them graph sheets on which they can plot some points such as the three examples that follow.

1. (3, -3)

2. (5, 4)

3. (0, -3)

Activity 4: Work through the Worked examples on page 145 in the Learner's Book with learners.

Review exercise

Place learners in mixed-ability groups. Give them graph sheets so that they can plot the following points: (1, 1), (0, 3), (4, 4), (-1, 2).

Assessment tasks ----- LB page 145

Learners plot points on the coordinate plane.

Suggested homework

Ask learners to plot the points on the Cartesian plane.

1. (6, 10)

2. (3, -2)

3. (-2, 3)

4. (-2, -3)

Main idea 4

Finding percentages of quantities

LB page 146

Activity 1: Remind learners what percentages are (per 100). So, 10% means 10 out of 100, 60% means 60 out of 100 and 90% means 90 out of 100. Ask learners to give more examples.

Activity 2: Ask learners to read the steps on page 146 in the Learner's Book. Ask learners to work out the answer to the following problem.

Find 10% of 60.

$$\frac{10}{100} \times 60 = 6$$

Activity 3: Ask learners to work in their groups, and to work out answers to problems such as the two that follow.

1. Find 20% of Gh¢460.00.
2. 20% of a certain number is 80. Find the number.

Activity 4: Guide learners to read through the Worked examples on pages 146 and 147 in the Learner's Book.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs and work out the answers.

1. Find 5% of 60 mangoes.
2. Calculate 60% of Gh¢600.00.

Challenging activities

Ask learners to work in pairs.

1. Find 50% of 250 pens.
2. If 30% of a number is 200. Find the number.

Assessment tasks ----- LB page 147

Refer learners to Learner's Book page 147- 148 for exercise.

Suggested homework If 20% of a number is 65, what is the number?

3. 129 is 43% of what number?

Revision 4

Number: ratio and proportion ----- LB page 149

Learners answer the questions in Revision 4 on page 149 in the Learner's Book as a class test.

Answers to Assessment tasks

Main Idea 1

(LB page 138)

1. a.

20	14	<u>12</u>	10
90	<u>63</u>	54	<u>45</u>

 b.

<u>72</u>	36	18	<u>9</u>
80	<u>40</u>	20	10

 c.

5	<u>15</u>	30	60
<u>6</u>	18	<u>36</u>	<u>72</u>
- d.

<u>0.5</u>	5	5.5	<u>9</u>
1	<u>10</u>	11	18

 e.

10	5	4	<u>3</u>
<u>60</u>	30	<u>24</u>	18

 f.

21	<u>35</u>	42	<u>70</u>
27	45	<u>54</u>	90

2. a. $A = 9$ b. $B = 6$ c. $x = 96$ d. $D = 22$ e. $E = 9$

3. a. 2 b. $36\frac{2}{3}$ c. 15 d. 3 e. 9

4. a. $3 : 7 = 6 : 14 = 9 : 21 = 12 : 28 = 15 : 35 = 18 : 42$ etc.

b. $6 : 5 = 12 : 10 = 18 : 15 = 24 : 20 = 30 : 25 = 36 : 30$ etc.

c. $2 : 9 = 4 : 18 = 6 : 27 = 8 : 36 = 10 : 45 = 12 : 54$ etc.

d. $11 : 4 = 22 : 8 = 33 : 12 = 44 : 16 = 55 : 20 = 66 : 24$ etc.

e. $5 : 3 = 10 : 6 = 15 : 9 = 20 : 12 = 25 : 15 = 30 : 18$ etc.

5. a. $2 : 3 = 6 : \underline{9} = \underline{8} : 12 = 14 : \underline{21} = \underline{18} : 27 = 1 : 1\frac{1}{2}$

b. $3 : 5 = 1.5 : \underline{2.5} = \underline{12} : 20 = 15 : \underline{25} = \underline{21} : 35 = 36 : \underline{60}$

c. $1 : 2 = \underline{2} : 4 = \underline{3} : 6 = 5 : \underline{10} = 7 : \underline{14} = \underline{11} : 22$

d. $4 : 7 = \underline{12} : 21 = 20 : \underline{35} = \underline{24} : 42 = 36 : \underline{63} = \underline{2} : 3.5$

5.

Kwablavi	20	2	10	30	40
Tei	30	3	15	45	60
Atinga	40	4	20	60	80

The three shared $30 + 45 + 60 = 135$ mangoes.

Main Idea 2

(LB page 142)

1. a. $x = 8$ b. $x = 64$ c. $y = 1$ d. $y = 12\frac{1}{2}$
2. a. 26 doctors b. 45 nurses
3. a. Larger angle is 54° b. The smaller angle is 21° .
4. 45 teachers
5. a. 68 goats b. $68 : 248 = 17 : 62$

Main Idea 3

(LB page 143)

1. a. $a = 24$; $b = 60$

b. $k = 2$; $t = 30$

2.

4	6	8	10	12	14	18
<u>6</u>	<u>9</u>	12	<u>15</u>	<u>18</u>	21	<u>27</u>

The ratio table is in proportion since the ratios are equal. We can simplify all the ratios to 2 : 3.

3. a.

x	9	<u>4</u>	5	<u>2</u>
y	36	16	<u>20</u>	8

Constant of proportionality: $(k) = 4$

b.

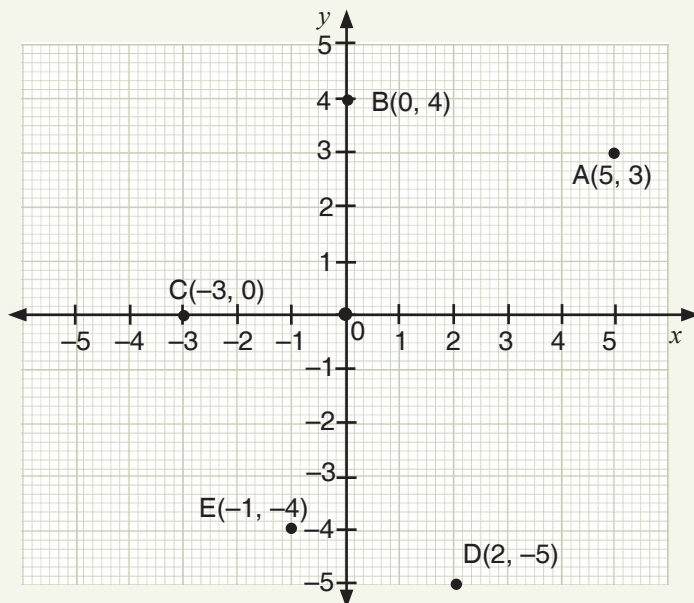
x	<u>12</u>	6	15	9
y	4	2	<u>5</u>	<u>3</u>

Constant of proportionality: $(k) = \frac{1}{3}$

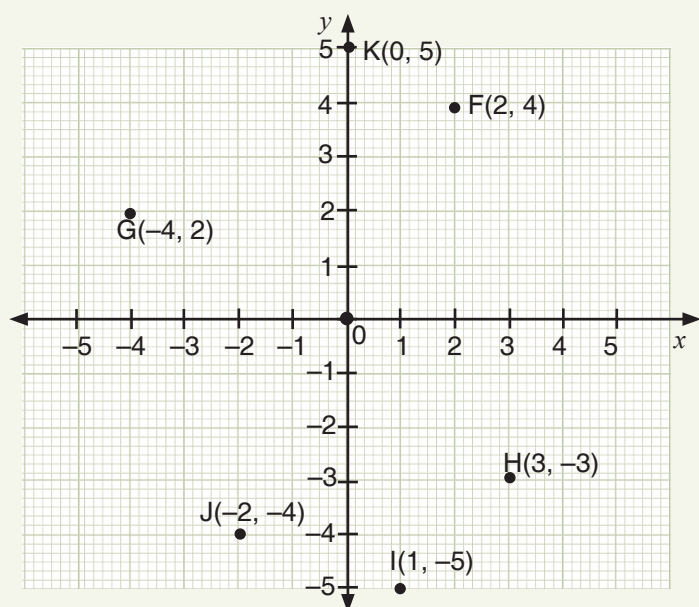
Main Idea 4

(LB page 145)

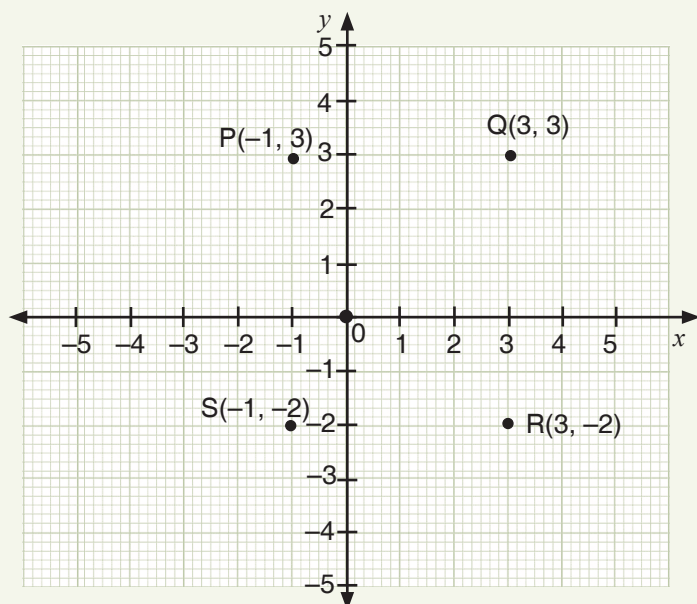
1.



2.



3.



Main Idea 5

(LB page 147)

1. GH¢150.00
2. GH¢960.00
3. a. 350 b. 140 c. 675 d. 300 e. GH¢306.50
4. GH¢22,500.00

Main Idea 6

(LB page 147)

1. a. 40% b. 60%
2. 70%

- 3.** 520 candidates passed.
- 4.** **a.** GH¢180.00 **b.** GH¢67.50
- 5.** GH¢212.80

Answers to Revision

(LB page 149)

1. a. 9 : 7 b. 5 : 7 c. 7 : 9 d. $9 : 21 = 3 : 7\frac{5}{7}$
2. a. a and c = $2 : 4 = 1 : 2$ b. 1 : 2
c. The larger number is 35. d. Razak gets GH¢100.00 which is $\frac{5}{7}$.
3. 47 calls per sale
4. 12 apples per girl
5. GH¢131.50 per shirt; unit rate: 1 : 65.75
6. 44 learners per class; unit rate: 1 : 44

Green balls	12	3	<u>36</u>
Blue balls	16	<u>4</u>	48

$$12 : 16 = 3 : 4 = 36 : 48$$

- 8.

Sub-strand 1: Patterns and relations

Module 1

Relations

Content standard

B7.2.1.1 Derive the rule for a set of points of a relation, draw a table of values to graph the relation in a number plane and make predictions about subsequent elements of the relation.

Indicator

B7.2.1.1.1 Extend a given relation presented with and without symbolic materials and explain how each element differs from the preceding one.

Learning expectations: In this module, learners will learn how to:

- Use patterns to describe relations and solve problems.
- Describe the relation between two sets.
- Identify the rule of a relation.

Essential for learning: Learners can continue patterns with numbers and shapes.

Resources: Cut-out shapes of rectangles

Keywords: patterns, domain, co-domain, relation, range

Competencies: Creativity and innovation, critical thinking and problem-solving

Starter: Refer learners to the Starter activity on page 151 in the Learner's Book.

Main idea 1

Using patterns to describe a relation

LB page 151

Activity 1: Refer learners to the Main idea 1 notes. Revise the meaning of domain and co-domain with learners (see pages 151 and 152 in the Learner's Book).

Discuss the following concepts with learners.

A relation in Mathematics

A relation is a relationship between two set of values: it is a pairing of input values with output values.

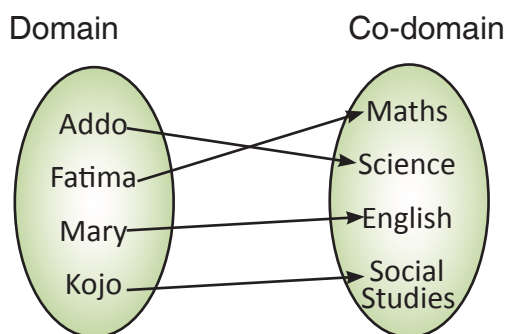
In maths, a relation is between, x -values and the y -values of ordered pairs. A set of all the x -values is called the domain and the set of all the y -values is the range or co-domain.

Domain, co-domain and range of a relation

Arrows are used to show a relation between the elements of two sets. An arrow always starts from one element in one set and points to the related element in the other set.

The set from which the arrow starts is called the domain of the relation. The set to which the arrow points is the co-domain. The elements in the co-domain that are linked by the arrows make up the range of the relation. Therefore, the range is a subset of the co-domain.

For example: The relation between the learners and their favourite subjects is represented on the arrow diagram below.



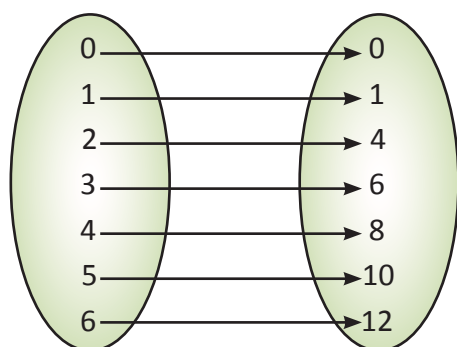
Activity 2: Ask learners to work in pairs to study the pattern below and fill in the missing numbers.

Domain	1	2	3	4	5	6	7	8
Co-domain	4	7		13			22	

Activity 3: Refer learners to Worked examples 1 and 2 on pages 153 and 154 in the Learner's Book. Go through the Worked examples with learners. Ask them to study the pattern and work out what determines the numbers in the co-domain.

Activity 4: Place learners in mixed ability groups to list the domain and co-domain for each ordered pair.

Use the diagram: (0, 0), (1, 1), (2, 4), (3, 6), (4, 8), (5, 10), (6, 12)



Review exercise

Place learners in mixed-ability groups and ask them complete the table below.

Domain	1	2	3	4	5	6
Co-domain	1	4	8			20

Learners answer questions about patterns and relations.

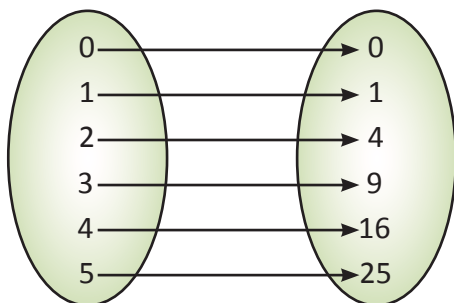
Suggested homework

Ask learners to copy the table in their homework exercise book and fill in the missing numbers.

1.

Domain	1	2	3	4	5	6	7	8
Co-domain	1	5	10		26			65

2. Identify the domain, co-domain and relation, and draw the mapping diagram.



Main idea 2

Describing the relation between two sets

LB page 156

Activity 1: Revise relation to learners giving practical examples. For example, ask some learners to write their names on the board and relate each name to the day on which the learner was born.

Set A {Esi, Dan, Kwakwe, Ama}

Set B {Monday, Tuesday, Wednesday and Thursday}

The relation here is: was born on.

Activity 2: Refer learners to Worked examples on pages 157 and 158 in the Learner's Book. Ask learners to study the pattern of the triangle carefully and look for the relation. Ask them copy and complete the table. The pattern shows that to find the number of matches, multiply the number of triangles by 2 and then add 1.

Activity 3: Place learners in convenient groups. Ask them to find the number of matches for each triangle.

1. 12 triangles

2. 35 triangles

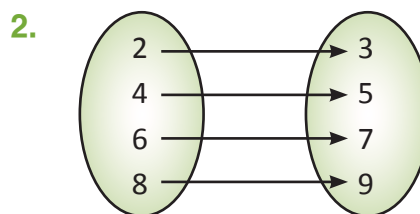
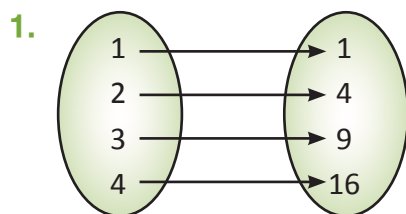
Activity 4: Work through the Worked examples on pages 157 and 158 in the Learner's Book with the learners.

Review exercise

Differentiated lessons

Remedial activity

Describe the relation shown in each arrow diagram.



Challenging activities

Find the number of matches in 130 triangles and in 242 triangles.

Assessment tasks ----- LB page 159

Learners answer questions about arrow diagrams.

Suggested homework

Describe the following relations in words.

1.

Input (x)	0	3	6	9	12
Output (y)	-1	5	11	17	23
Output (y)	2	8	14	20	26

2.

x	0	2	4	6	8
y	4	8	12	16	20
y	-2	4	10	16	22

Main idea 3

Identifying rules for mapping

LB page 161

Activity 1: Finding a rule for, is the same as describing the relationship both in words and in a mathematical sentence.

In the previous lessons, learners learnt how to describe the relation between two sets. Revise the concepts by asking the class questions.

Activity 2: Write an example on the board. Below is an example.

Domain:	1	2	3	4
	↓	↓	↓	↓
Range:	1	4	9	16

Ask learners to find the relationship between the domain and the range. Each element in the range is the square of the element in the domain. So, the rule is: a square of.

Activity 3: Write some questions on the board and ask learners to find the rule.

Activity 4: Explain to learners that, when there is a constant difference between the conservative elements in both the domain and the co-domain, we can use the equation, $y = ax + b$.

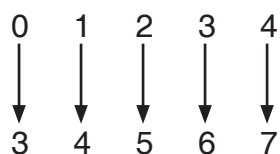
Activity 5: Work through the Worked examples on pages 161 to 163 with the class. Ask learners to work in convenient groups.

Review exercise

Differentiated lessons

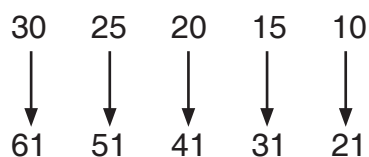
Remedial activity

Ask learners to work in pairs to find the rule for the diagram.



Challenging activities

Learners can work on their own and identify the rule for the following diagram.



Assessment tasks ----- LB page 164

Learners give the rules for different mappings.

Suggested homework

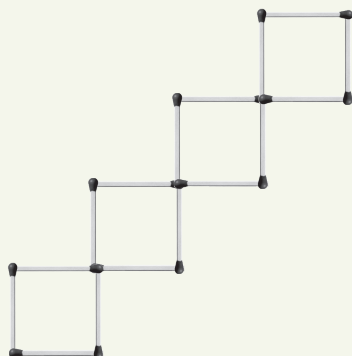
P is defined as $p = \{5, 7, 8, 9, 10\}$. The rule is multiply by 2 and subtract 3. Find the range.

Answers to Assessment tasks

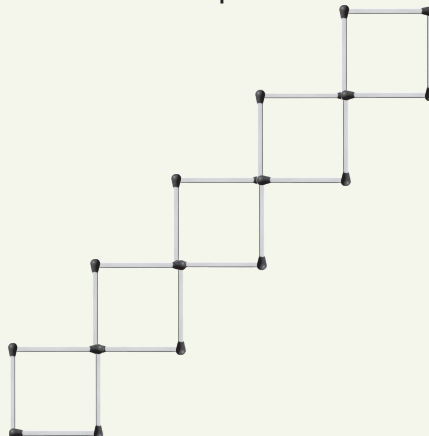
Main Idea 1

(LB page 155)

1. a. Fourth pattern



Fifth pattern



b. Number of patterns

Number of matchsticks

1	2	23	4	5	6	7	8
4	8	12	16	20	24	28	32

c. Seventh pattern: 28 matchsticks

Eighth pattern: 32 matchsticks.

2. a. Fifth pattern



Sixth pattern



b. There are five triangles in the fifth pattern and six triangles in the sixth pattern.

c.

Number of patterns	1	2	23	4	5	6	7	8
Number of matchsticks	3	5	7	9	11	13	15	17

3. a. Domain = {1, 2, 3, 4}

Co-domain = {1, 4, 9, 16}

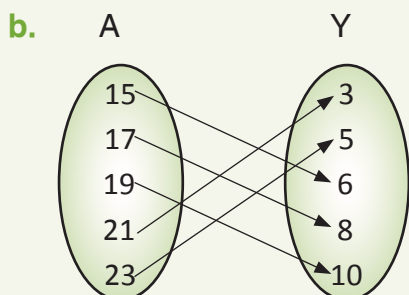
Range = {1, 4, 9, 16}

b. Domain = {0, 1, 2, 3}

Co-domain = {0, 1, 2, 3, 4, 5, 6}

Range = {0, 3, 4, 6}

4. a. Co-domain: $y = \{3, 5, 6, 8, 10\}$



5. a. (0, 1), (1, 2), (2, 3), (6, 7), (7, 8)

The relation is: add one.

b. (Paul, Maths), (Mansah, Social Studies), (Antwi, Twi), (Tetteh, ICT), (Ekow, Science), (Fatima, English)

The relation is: favorite subject.

Main Idea 2

(LB page 159)

1. a. is a factor of

b. was born on

c. is divisible by

d. 2 more than

e. multiply by 2

f. 2 less than

2. a. Relation: multiply by 3

Domain = {0, 1, 2, 3, 4}

Co-domain = {0, 3, 6, 9, 12}

b. Relation: 3 more than

Domain = {3, 4, 5, 7}

Co-domain = {6, 7, 8, 10}

c. Relation: unit of quantity

Domain = {area, volume, force, temperature, angles}

Co-domain = {Celsius, cubic unit, degree, newton, square unit}

d. Relation: square of

Domain = {5, 6, 8, 9}

Co-domain = {25, 36, 64, 81}

f. Relation: multiply by 2

Domain = {15, 12, 13, 14}

Co-domain = {24, 26, 28, 30}

3. a. Rule: Multiply by 4

x	0	3	6	9	12	15
y	0	12	24	<u>36</u>	<u>48</u>	60

c. Rule : 4 more than twice x

x	1	2	3	4	5
y	6	8	<u>10</u>	12	<u>14</u>

e. Relation: 1 less than

Domain = {1, 2, 3, 4}

Co-domain = {0, 1, 2, 3}

b. Rule: 5 less than 5 times x

x	1	2	3	4	5	6
y	0	5	10	<u>15</u>	<u>20</u>	25

d. Rule: 4 less than twice x

x	1	2	3	5	7
y	<u>-2</u>	0	2	6	<u>10</u>

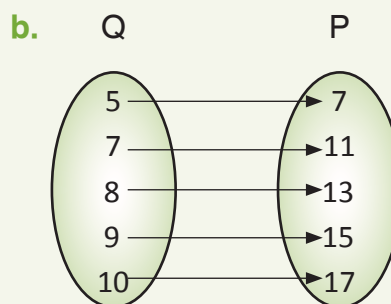
Main Idea 3

(LB page 163)

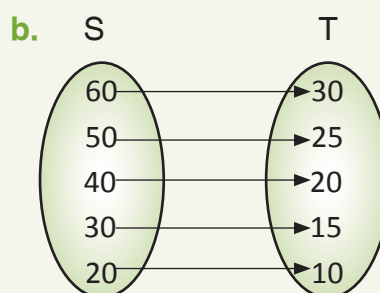
1. a. $y = x - 2$

2. $y = 2x - 1$

3. a. Co-domain $P = \{7, 11, 13, 15, 17\}$



4. a. $y = \frac{1}{2}x$



5. a. $y = 3x - 2$

x	1	2	3	4	5
	↓	↓	↓	↓	↓
y	1	4	7	10	13

b. $y = 5x + 1$

x	1	2	3	4	5
	↓	↓	↓	↓	↓
y	6	11	16	21	26

c. $y = 4x + 3$

x	1	2	3	4	5
	↓	↓	↓	↓	↓
y	7	11	15	19	23

6. a. $x = 16$

b. $y = 3x - 4$

x	-1	0	1	2	3	4
y	-7	-4	-1	2	5	8

Sub-strand 1: Patterns and relations

Module 2

Graphs of relation

Content Standard

B7.2.1.1 Derive the rule for a set of points of a relation, draw a table of values to graph the relation in a number plane and make predictions about subsequent elements of the relation.

Indicator

B7.2.1.1.4 Locate points on the number plane, draw a table of values of a given relation, draw graphs for given relations and use them to solve problems.

Learning expectations: In this module, learners will learn how to:

- Draw a table of values for a given rule.
- Locate points on the number plane.
- Draw a graph of a given relation.

Essential for learning: Learners can identify rules for mapping.

Resources: Graph sheets.

Keywords: graphs, number plane, coordinate points

Competencies: Creativity and innovation, critical thinking and problem-solving

Starter: Refer learners to the Starter activity on page 164 in the Learner's Book for the rule for the mapping.

Main idea 1

Drawing tables from given rules

LB page 164

Activity 1: In the previous lesson, learners learnt that a relation is a connection between two sets that can be represented by an ordered pair. Ask learners to give examples of ordered pairs and write them on the board. Below are three examples.

(0, 1), (2, 3) and (1, 4)

Activity 2: To identify which the x - and y -coordinates in the ordered pairs.

The x -coordinates are 0, 2 and 1 and the y -coordinates are 1, 3 and 4.

Activity 3: Place learners in mixed-ability groups.

Write a rule on the board and guide learners to make a table for the mapping. See the example.

$x \rightarrow 2x + 1$ on the domain $\{1, 2, 3, 4\}$.

When $x = 1$, $y = (2 \times 1) + 1 = 3$.

When $x = 2$, $y = (2 \times 2) + 1 = 5$.

When $x = 3$, $y = (2 \times 3) + 1 = 7$.

Discuss with learners how to draw up the table.

x	1	2	3	4
y	3	5	7	9

Learners should exchange their work and check their answers.

Activity 4: Work learners through the Worked examples on page 165 in the Learner's Book..

Review exercise

Ask learners to work in mixed-ability groups and illustrate.

The relation in a table: $y = 2x + 2$ for $\{x : x = 0, 1, 2, 3, 4\}$.

Assessment tasks ----- LB page 165

Learners draw up tables to map relations.

Suggested homework

Make a table for the mapping by the rule $x \rightarrow 4x - 3$ on the domain $\{-2, -1, 0, 1, 2\}$

Main idea 2

Locating points on the number plane

LB page 166

Activity 1: Refer learners to Main idea 2. Discuss the explanations with learners.

Discuss how to locate points on the number line with learners.

Activity 2: Draw a number plane on the board.

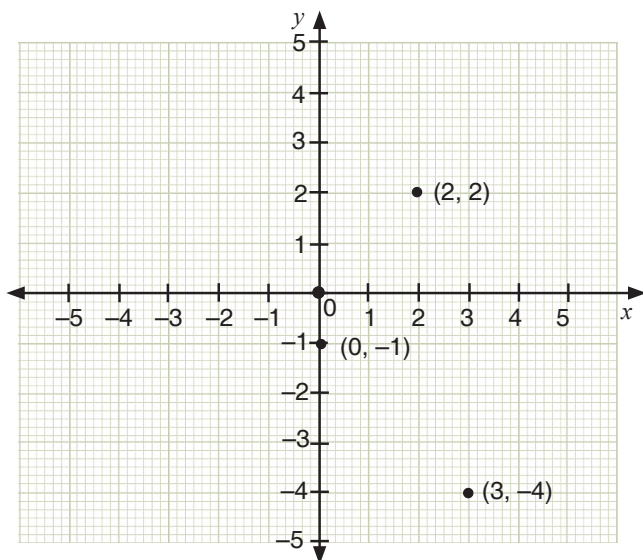
Demonstrate how to locate some points such as $(2, 3)$ and $(0, -4)$ for learners to observe.

Ask about three learners to locate some points on the number plane.

Activity 3: Place learners in convenient groups.

Give a few learners number plane cards and ask them to plot these points. Ask learners to add more points on a coordinate plane.

$(0, -1)$, $(2, 2)$, $(3, -4)$



Ask exchange their work and mark each other's work.

Activity 4: Go through the Worked examples with learners on page 167 in the Learner's Book.

Review exercise

Place learners in mixed-ability groups.

Give them graph sheets and ask them to plot these ordered pairs: $(0, -3)$, $(0, 0)$, $(4, 3)$ $(2, 2)$.

Assessment tasks ----- LB page 167

Learners draw up tables for mapping, locate points and give the coordinates for points.

Suggested homework

Plot these coordinates on the number plane: $(2, 4)$, $(3, 3)$, $(0, 4)$, $(1, 2)$, $(4, 0)$.

Main idea 3

Drawing graphs of relations

LB page 168

Activity 1: Revise the previous lesson with learners. Place learners into convenient groups and give them graph sheets.

Write this equation and domain on the board: $-y = 3x - 1$ and $\{0, 1, 2, 3\}$.

Guide learners to draw up a table and find the values for y .

Activity 2: Ask learners to find y -values:

$$x = 0 \text{ and } y = (3 \times 0) - 1 = -1.$$

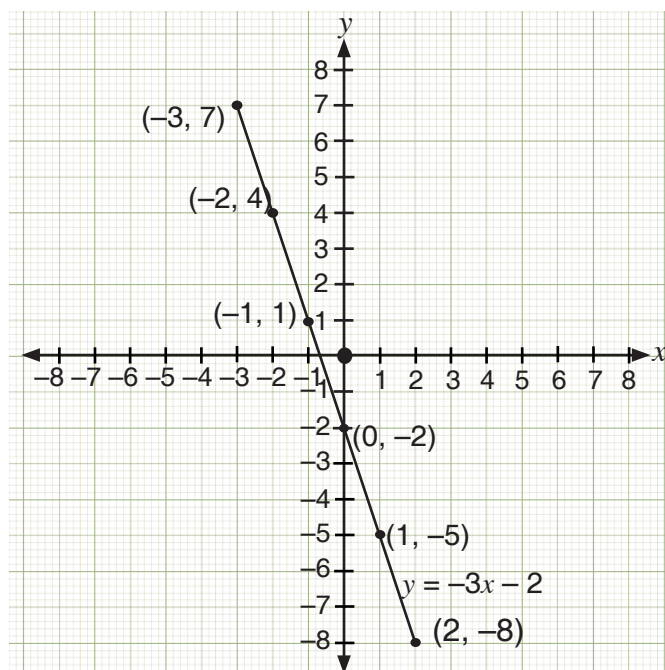
$$\text{When } x = 1, y = (3 \times 1) - 1 = 2.$$

$$\text{When } x = 2, y = (3 \times 2) - 1 = 5.$$

$$\text{When } x = 3, y = (3 \times 3) - 1 = 8.$$

Activity 3: Ask learners to plot the points on their graph sheets and join the lines. They will realise that the graph is a straight line.

The graph of a linear relation is a straight line.



Activity 4: Work through Worked examples 1 and 2 on page 168 in the Learner's Book with learners.

Review exercise

Ask learners to work in mixed-ability pairs.

Ask learners to find values for y and draw the graph for this relation:

$y = x + 1$ for the domain $\{0, 1, 2, 3\}$.

Assessment tasks ----- LB page 172

Learners plot values on a coordinate plane, draw graphs and interpret graphs.

Suggested homework

Draw the graph for the relation $2x - 1$ for the domain $D = \{0, 1, 2, 3, 4\}$.

Revision 5

Patterns and relations ----- LB page 173

Learners write answers to questions in the Revision exercise on page 173 in the Learner's Book.

Answers to Assessment tasks

Main Idea 1

(LB page 165)

1. $y = 3x - 2$ and $D = \{-2, -1, 0, 1, 2\}$

x	-2	-1	0	1	2
y	-8	-5	-2	1	4

2. $y = x^2 + 3$ and $D = \{-3, -2, -1, 0, 1, 2, 3\}$

x	-3	-2	-1	0	1	2	3
y	12	7	4	3	4	7	12

3. $y = 2x + 5$ and $D = \{-1, 0, 1, 2, 3, 4\}$

x	-1	0	1	2	3	4
y	3	5	7	9	11	13

Set of ordered pairs:

$\{(-1, 3), (0, 5), (1, 7), (2, 9), (3, 11), (4, 13)\}$

Main Idea 2

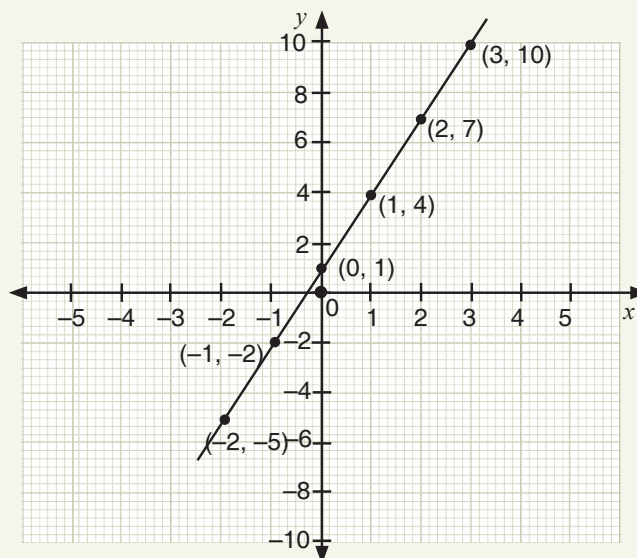
(LB page 167)

1. $y = 3x + 1$ and $D = \{-2, -1, 0, 1, 2, 3\}$

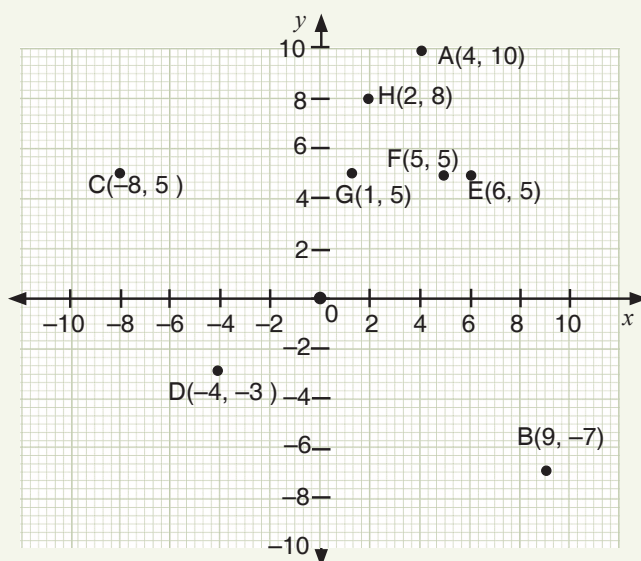
a. Table

x	-2	-1	0	1	2	3
y	-5	-2	1	4	7	10

b.



2.



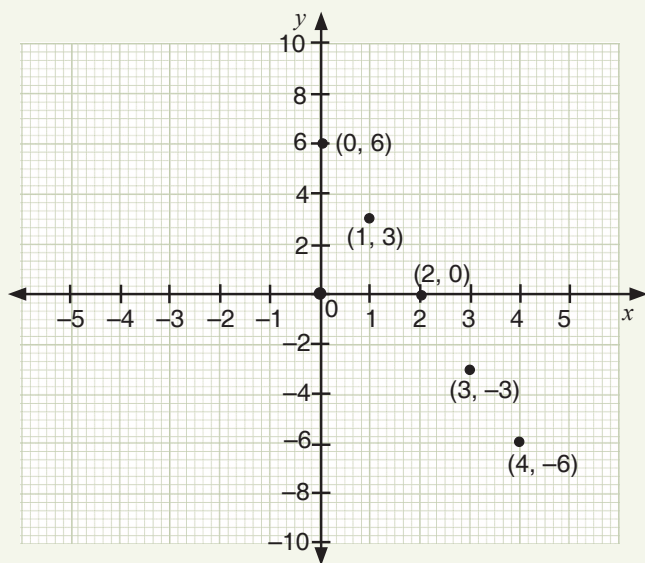
$A(4, 10), B(9, -7), C(-8, 5), D(-4, -3), E(6, 5), F(5, 5), G(1, 5), H(2, 8)\}$

3. $A(1, 3), B(3, -4), C(4.5, 0), D(0, 7), E(-5, -6), F(-2, -2), G(-5, 4)$

Main Idea 3

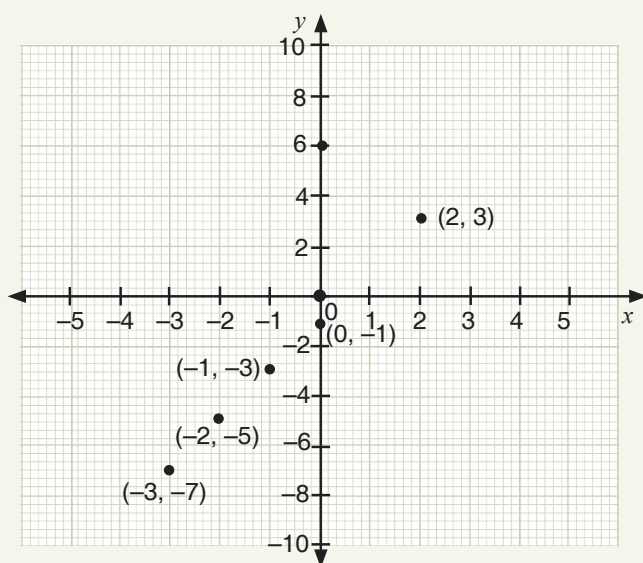
(LB page 172)

1.



2. $y = 2x - 1$, $D = \{-3, -2, -1, 0, 1, 2\}$

x	-3	-2	-1	0	2
y	-7	-5	-3	-1	3



3. a. Suley Muntari

b. Asamoah Gyan

c. Michael Essien

d. (3, -5)

e. Charles Taylor

f. Abedi Pele

(LB page 173)

1. a. Third pattern (3)



- Fourth pattern (4)



- Fifth pattern (5)



- Sixth pattern (6)



- b. There are 5 and 6 triangles in the fifth and sixth patterns, respectively.

c.

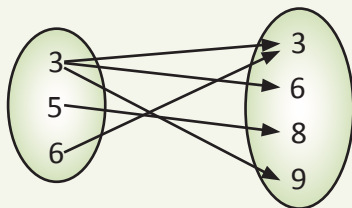
Number of triangles	1	2	3	4	5	6
Number of matchsticks	3	6	9	12	15	18

- d. The table shows that number of triangles times 3 gives the number of matchsticks.

So, the seventh pattern has 21 matchsticks and the eighth pattern has 24 matchsticks.

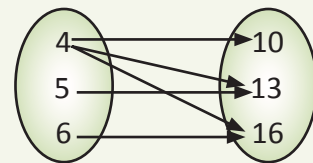
2. a.

R_1



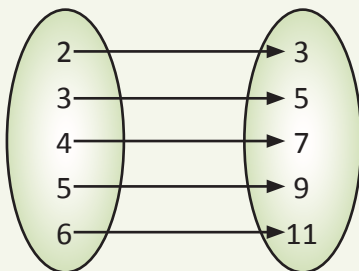
- b.

R_2



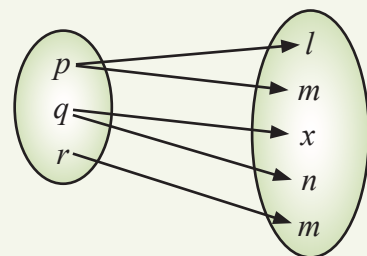
- c.

R_3



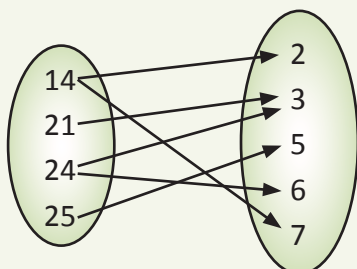
- d.

R_4



3. a. $\{(14, 2), (14, 7), (25, 5), (21, 3), (24, 2), (24, 3), (24, 6)\}$

- b.



4. a. The rule is $x + 6$

b.

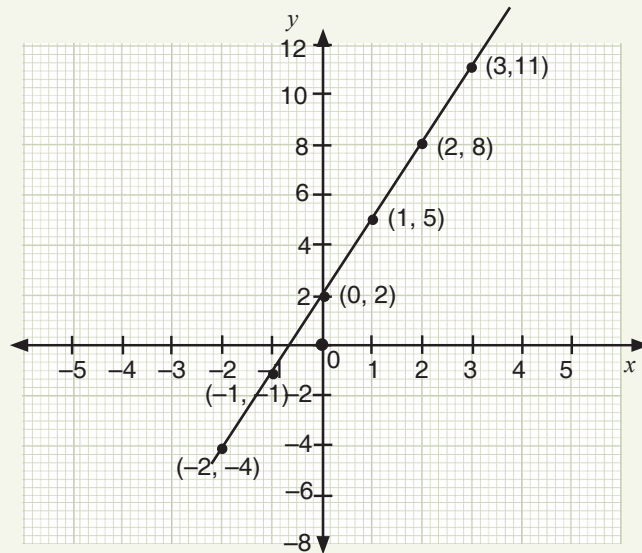
x	2	3	4	5
y	8	9	10	11

5. $y = 3x + 2$

a.

x	-2	-1	0	1	2	3
y	-4	-1	2	5	8	11

b.



Sub-strand 2: Algebraic expressions

Module 1

Algebraic expressions

Content standard

B7.2.2.1 Derive the rule for a set of points of a relation, draw a table of values to graph the relation in a number plane and make predictions about subsequent elements of the relation.

Indicator

B7.2.2.1.3 Identify the relation or rule in a pattern/mapping presented numerically or symbolically and predict subsequent elements.

Learning expectations: In this module, learners will learn how to:

- Write an algebraic expression for a given mathematical statement and from real-life situations.
- Add and subtract algebraic expressions.
- Perform multiplication and division of algebraic expressions.

Essential for learning: Learners can do multiplication and division of whole numbers.

Resources: work cards

Keywords: algebra, expression, term, variable.

Competencies: Creativity and innovation, critical thinking and problem-solving, communication and collaboration

Starter: Ask learners to answer the questions in the Starter activity on page 174 in the Learner's Book.

Main idea 1

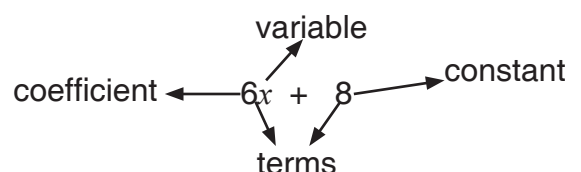
Algebraic expression

LB page 174

Activity 1: Refer learners to the main idea on page 174 in the Learner's Book.

Discuss the explanation with them.

Explain to learners that an algebraic expression in mathematics is made up of variables and constants, along with algebraic operations such as addition, subtraction, multiplication and division. It is made up of terms. Examples: $2a + a + b$, etc.



- A variable is a letter whose value is unknown.
Example, x is a variable in the expression, $4x + 2$.
- The coefficient is the numerical value used together with a variable.
Example: 4 is the coefficient in the expression $4x + 2$.
- The constant is a term that has a definite value. In the example, 2 is the constant in the expression $4x + 2$.

Write the expression $5x + 6$ on the board and let learners identify the following.

- The variable
- The co-efficient
- The constant
- The term

Activity 2: Write an expression on the board.

Ask learners to work in pairs to write an algebraic expression where y equals:

1. the sum of 2 times a number and 2
2. 6 more than three times a number.

Activity 3: Work through the Worked examples on pages 175 and 176 in the Learner's Book with learners.

Review exercise

Place learners in mixed-ability groups and answer the questions.

1. Write two algebraic expressions:
 - a. y is 5 less than twice a number.
 - b. y is the sum of 6 times a number and 10.
2. Ask learners to find values for y and draw the graph for the relation:
 $y = x + 1$ for the domain $\{0, 1, 2, 3\}$.

Assessment tasks ----- LB page 176

Learners write equations and solve word problems.

Suggested homework

Write an algebraic expression for each problem.

1. Six times the difference between a number and eight.
2. The product of six fewer than a number and three more than the number.

Activity 1: Write a question on the board and guide learners to simplify the expressions.

1. $3a + 4a$
2. $10y - 4y$

Check how well learners understand that since the variables are the same in each question, we can add or subtract the co-efficient.

So, $3a + 4a = 7a$ and $10y - 4y = 6y$. Ask learners to give their own examples of similar expressions.

Activity 2: Ask learners to work in pairs to simplify the expressions.

1. $\frac{1}{7}a + \frac{4}{7}a$
2. $2x + 3a + x + a$
3. $2x + 2 = 2x + 2$
4. $3x + 6 + 2x - 2$

Discuss the expressions with the class and help learners correct their answers, where necessary.

Activity 3: Work through the Worked examples on pages 177 to 179 in the Learner's Book with the class.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs.

Write an expression for this with x as the variable:

The sum of 6 times a number and 8

Challenging activities

Write an expression with x as the variable:

Six times the difference between a number and 10.

Assessment tasks ----- LB page 179

Learners simplify expressions

Suggested homework

Write algebraic expressions.

1. Five times the difference between a number and 8
2. The product of 20 less than a number and 10 more than the number

Main idea 3

Multiplication and division of algebraic expressions

LB page 180

Activity 1: Revise the previous lesson with learners. Write examples on the board e.g.

1. $3a \times 4a$

2. $\frac{6a^2b^2}{2ab}$

Place learners into convenient groups and ask them to solve the problem that follows.

Make sure that learners know that when we multiply the variables and, we the exponents if the bases are the same.

So, $3a \times 4a = 3 \times 4 \times a \times a = 12a^2$.

Activity 2: Explain to learners that when we divide, we need to:

- Factorise the algebraic expression.
- Cancel out factors in the numerator and the denominator.
- Simplify the co-efficient.
- Cancel out variables of the same type in the numerator and in the denominator.

Demonstrate by simplifying $\frac{6a^2b^2}{2ab}$ on the board:

$$\frac{6a^2b^2}{2ab} = \frac{\overset{3}{\cancel{6}} \times \cancel{a} \times \cancel{a} \times \cancel{b} \times b}{\cancel{2} \times \cancel{a} \times \cancel{b}} = 3ab \quad \text{So, } \frac{6a^2b^2}{2ab} = 3ab$$

Activity 3: Work through the Worked examples on pages 180 to 183 with learners.

Review exercise

Differentiated lessons

Remedial activity

Simplify.

1. $4q^2r^2 \div 2qr$

2. $6a + 6b - 2a - b$

Challenging activities

Work in pairs to simplify the expressions.

1. $6x + 5 - 4a + 2x + 2a - 2$

2. $4ab^2 \times 3a^2b^3$

Assessment tasks ----- LB page 183

Learners simplify expressions and write expressions.

Suggested homework

Simplify:

- $12x^3y^4 \div 6x^2y^2$
- $4a^2b \times 6a^2b^3$
- $12a + 8b - 6a - 3b$

Revision 6

Algebraic expressions ----- LB page 185

Refer learners to revision on page 185 of the Learner's Book as class test.

Answers to Assessment tasks

Main Idea 1

(LB page 176)

- $7n + 9$
- $150x$
- $(x - 28)(x + 12)$
- $x - 6$
- $2x + 25$

Main Idea 2

(LB page 179)

- $x + y$
 - $6m + 2mn$
 - $-5xz$
 - $5p + 2q$
- $7a - 10b + 4$
 - $6a - 11b$
 - $2xz - 6xy - 4$
 - $11pq - 4fg - 5$
- $(p + q + 10) \text{ cm}$
 - $4a + b$
 - $(a + x + 9) \text{ cm}$
 - $12a + 6b$
- $2b + 22$

Main Idea 3

(LB page 183)

- $12y^3$
 - $30a^5b^3$
 - $36x^4z^3y$
 - $15y^4z^3x$
 - x^4y^6
 - $21a^2b^3c^5$
- $16xy^2$
 - $30x^2y^2$
 - $12pq \text{ cm}^2$
 - $20yz - 6xy$
 - $x^2 + 5xy \text{ cm}^2$
 - $\frac{35}{3}y^3w^2$
- $8a^2b$
 - $5z^2y^2$
 - $\frac{y^2}{2fg^5}$
 - $2b$
 - $\frac{x^3}{2y^2}$
 - az^2
- $4x^2y$
 - $-2zy - 4z - 3$
 - az^2
 - $8a^2b$
 - $4z^2$
 - $8pq + 3rq - 4$
- $5pqr - 2rq + 2$
 - $3p^2q^3r^2$
 - $72z^3q^4$
 - $3pq^2$
 - $\frac{4}{ab^2}$

1.
 - a. $8a$
 - b. $2x + 5y$
 - c. $19n - 40n^2 - 6$ or $40n^2 + 19n - 6$
 - d. $7x^2 + 3x + 20$
 - e. $3xy^2$
2.
 - a. 18
 - b. 21
 - c. -1
 - d. 6
 - e. 4
3. $5n + 10$
4. $590x$
5.
 - a. $19x$
 - b. $-80xyv$
6.
 - a. $11xy$
 - b. $98x^2 \text{ cm}^2$
7.
 - a. $4xy^2$
 - b. $10a^2c$
 - c. $5x^2z$
 - d. $4x^5y$
 - e. $\frac{2b^2}{3a}$
8.
 - a. $10ab - 7a^2 - 5b^2 - 2b$
 - b. $2x^2 - 15xy + 10y^2 - 8$
 - c. $-x^4 - 3x^3 + 5x^2 - 5x$
9.
 - a. $\frac{16a^2b}{3}$
 - b. $6c^3d^2$
 - c. $7y^3w^2$
 - d. $5y$
 - e. $\frac{x^3}{2y^2}$
 - f. $\frac{b^4}{2g^5f}$

Sub-strand 3: Variables and equations

Module 1

Linear equations 1

Content Standard

B7.2.3.1 Demonstrate an understanding of linear equations of the form $x + a = b$ (where a and b are integers) by modelling problems as a linear equation and solving the problems concretely, pictorially, and symbolically.

Indicator

B7.2.3.1.1 Translate word problems to linear equations in one variable and vice versa.

Learning expectations: In this module, learners will learn how to:

- Use flag diagrams to solve linear equations.
- Translate word problem to linear equations and solve them.
- Write word problems from given linear equations.

Essential for learning: Learners can perform the four basic operations on algebraic expressions.

Resources: Flag diagram.

Keywords: model, equation, linear, polynomial

Competencies: Communication and collaboration, critical thinking and problem-solving

Starter: Learners play how many make 100 in the Starter activity. Learners call out a number and other learners add number to make the sum 100. Example: 70 and learners respond 30.

Main idea 1

Using flag diagram to solve equations

LB page 180

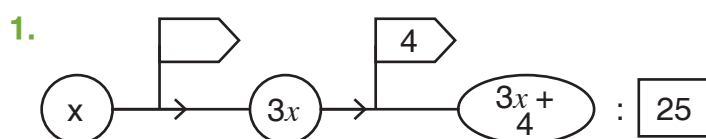
Activity 1: Place learners in convenient groups. Write an equation on the board. For example: $2x - 6 = 30$

Demonstrate to the class how to draw the flag diagram on the board.

Point out to learners that we solve the problem by using the inverse and moving in the opposite direction.

Activity 2: Demonstrate another question to learners.

Example: $3x + 4 = 25$



Activity 3: Guide learners to translate word problems into linear equations and solve them. Work through Main idea 1 with learners on page 186 in the Learner's Book.

Activity 4: Guide learners to solve problems; for example: the product of 4 and 12 is 48 and, find the number when the sum of 13 and another number is 52.

Activity 5: Work through the Worked examples on page 187 in the Learner's Book with learners.

Review exercise

Remedial activity

Work in pairs. Use flag diagrams to solve the equations.

1. $2x + 5 = 15$

2. $4x - 2 = 14$

Challenging activities

Learners work on their own to solve the problem:

When 2 is taken away from 3 times a certain number, the result is 17, Find the number.

Assessment tasks ----- LB page 188

Refer learners to Learner's Book page 188 for exercise.

Suggested homework

1. Solve these using flag diagrams.

a. $10y - 5 = 35$

b. $3x + 2 = 36$

2. I am a number, if you multiply me by 8, and add 2, the final result will be 50. What number am I?

Main idea 2

Translating word problem to linear equations and vice versa
LB page 188

Activity 1: Revise the previous lesson with learners. Place learners in convenient groups.

Write a word problem on the board. Ask learners to write it in equation form and solve it. Below is an example.

Twice the difference of x and 4 gives 20. What is the number?

Solution

$$2(x - 4) = 20$$

$$2x - 8 = 20$$

$$2x = 20 + 8$$

$$2x = 28$$

$$x = 14$$

Activity 2: Let learners write word problem and solve it e.g. $3x + 5 = 35$.
Ask each group to present what they wrote.

Activity 3: Go through the Worked examples with learners. Take them through Worked example 1 and 2 on page 189 – 191.

Review exercise

Put learners into mixed ability groups to solve this.

1. The difference of twice a number x and thirteen is the same as ninety-three. What is the number?

Assessment tasks ----- LB page 191

Suggested homework

1. Solve the equations.

a. $5x + 10 = 45$

b. $3y - 6 = 30$

2. Write a word problem for this.

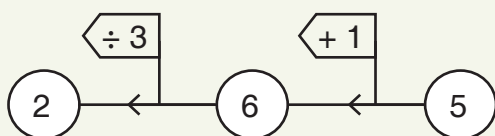
$$3(x + 2) = 21$$

Answers to Assessment tasks

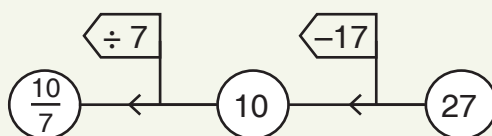
Main Idea 1

(LB page 188)

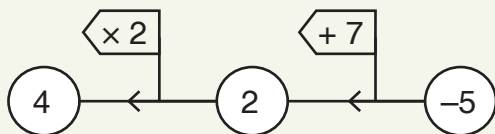
1.



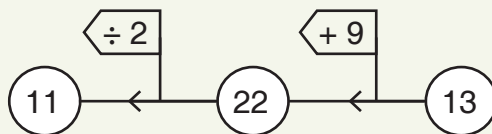
2.



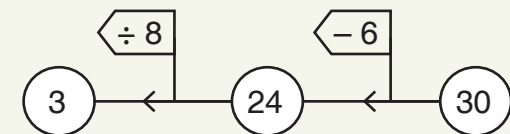
3.



4.



5.



Exercise 2

(LB page 191)

1. $4x + 14 = 30$; $x = 4$
2. $3(x - 8) = x$; $x = 12$
3. $9x = x + 4$; $x = 2$
4. $x + 5 = 10$; $x = 5$
5. $2x - 15 = 45$; $x = 30$
6. $3(x + 11) = 45$; $x = 4$
7. $6(x - 3) = x + 2$; $x = 4$
8. $4(x + 4) = 72$; $x = 14$
9.
 - a. Five more than the product of a certain number x and 4 is 25.
 - b. Six less than the product of a number m and 3 is 21.
 - c. The difference between a certain number x and 28 is negative 14.
 - d. 9 more than six times y is 45
10.
 - a. Five times 2 less than three times a number x is 20.
 - b. Three times the sum of a number x and 8 gives 27.
 - c. The quotient of 4 less than twice a number x , and 6 is 36.
 - d. The product of one-quarter and 5 more than a number a is 16.
 - e. Two less than five times a number x multiplied by two-seventh gives 5.
 - f. Twice 8 less than 6 times a number x is negative 16.

Sub-strand 2: Variables and equations

Module 2

Linear equations 2

Content standard

B7.2.3.1 Demonstrate an understanding of linear equations of the form $x + a = b$ (where a and b are integers) by modelling problems as a linear equation and solving the problems concretely, pictorially, and symbolically.

Indicator

B7.2.3.1.2 Model and solve linear equations using concrete materials (e.g., counters and integer tiles) and describe the process orally and symbolically.

Learning Expectation: In this module, learners will learn how to:

- Solve linear equation using models.

Essential for learning: Learners can solve linear equations in one variable.

Resources: Balance scale, hangers, counters, stones, dresses

Keywords: balance scale, blocks, shapes

Competencies: Communication and collaboration, critical thinking and problem-solving

Starter: Refer learners to the Starter activity on page 192 in the Learner's Book. Learners translate the word problem into linear equation.

Main idea 1

Modelling and solving linear equations using concrete materials

LB page 192

Activity 1: Place learners in sizeable groups.

Give each group a balance scale, hangers, dresses, and so on.

Ask a learner to demonstrate how to hang some dresses on a hanger. There should be more dresses on one side than on the other side. Ask learners what they notice.



Activity 2: Ask learners to put five bottle caps at one side and three bottle caps on the other side of the scale. Ask them to discuss what they can do to make the scale balance. Learners should realise that they have to add 2 to the side with 3 or remove 2 from the the side with 5.

Activity 3: Work through Worked examples 1 and 2 on pages 193 to 196 in the Learner's Book.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs and use the balanced scale to solve this the problem:

$$2x + 2 = 12$$

Challenging activities

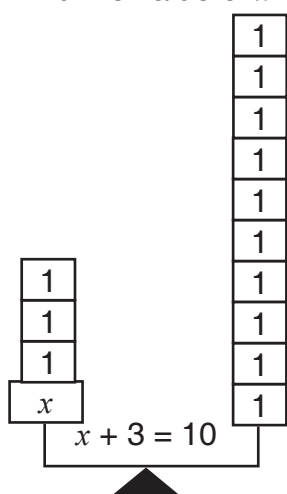
Ask learners to model and solve the equation: $4x + 3 = 14$

Assessment tasks ----- LB page 196

Learners model and solve equations using balance scales.

Suggested homework

1. Model and solve the equation using balance scale: $x + 3 = 10$
2. Find the value of x .

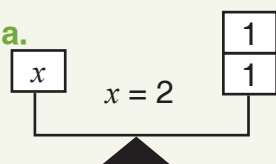


Answers to Assessment tasks

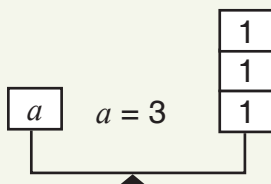
Main Idea 1

(LB page 196)

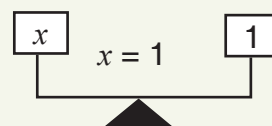
1. a.



b.



c.



2. a.

$$\square = 3$$

b.

$$\square = 80$$

c.

$$\square = 25$$

d.

$$\square = 20$$

e.

$$\square = 500$$

f.

i.

$$\square + \square \times (\square - \square) = 195$$

ii.

iii.

$$\square + \square \times (\square - \square) = 42$$

Sub-strand 2: Variables and equations**Module 3****Linear equations 3****Content standard**

B7.2.3.1 Demonstrate an understanding of linear equations of the form $x + a = b$ (where a and b are integers) by modelling problems as a linear equation and solving the problems concretely, pictorially, and symbolically.

Indicator

B7.2.3.1.3. Model linear equations, then write mathematical expressions and describe the process of solving the equation using algebraic tiles.

Learning expectations: In this module, learners will learn how to:

- Model linear equations using algebra tiles.
- Solve linear equations using algebra tiles.
- Solve linear equation in one variable.

Essential for learning: Learners can model linear equation using tiles.

Resources: Cut-out shapes of squares and rectangles in different colours

Keywords: model, expression, linear equation, represent

Competencies: Communication and collaboration, critical thinking and problem-solving.

Starter: I am a number when you subtract 10 from two times of me, you will get 60. What is my number? Refer learners to the Starter activity on page 197 in the Learner's Book.

Main idea 1

Modeling linear equations using algebra tiles

LB page 197

Activity 1: Revise the previous lesson with learners. Refer learners to page 197 in the Learner's Book. Work through the explanation of how to model linear equation using tiles with learners.

Activity 2: Ask learners to work in pairs. Give each pair green rectangles and red rectangles. Demonstrate how to model $2x + 3 = 15$ on the board.

Activity 3: Ask learners to work in pairs and model some equations and find the solutions. See the examples.

1. $x + 3 = 10$

2. $3x - 2 = 13$

Activity 4: Work through the Worked examples 1 and 2 on pages 198 to 201 in the Learner's Book with learners.

Review exercise

Differentiated lessons

Remedial activity

Ask learners to work in pairs and use algebraic tiles to solve a problem.

$$2x + 1 = 5$$

Challenging activities

Ask learners to work in pairs and solve two problems.

1. $6x - 4 = 26$

2. $3y + 1 = 8$

Assessment tasks ----- LB page 202

Refer learners to Learner's Book page 202 – 203 for exercise.

Suggested homework.

Learners solve equations.

1. $3x + 4 = 13$

2. $6y - 8 = 64$

3. $5x + 2 = 12$

4. $3x - 2 = -5$

Main idea 2

Solving linear equation in one variable

LB page 203

Activity 1: Discuss the steps to follow to solve linear equations with learners:

- Add, subtract, multiply or divide an equation by the same number or an expression on both sides of the equation.
- Isolate the variable on one side of the equation.
- When you multiply the variable by a coefficient in the final stage, multiply both sides of the equation by the reciprocal of the coefficient or divide both sides by the coefficient.

Activity 2: Place learners in convenient groups and ask them to solve the two equations:

1. $3x + 4 = 19$

2. $2x + 3 = 5$

$$3x + 4 - 4 = 19 - 4$$

$$2x + 3 - 3 = 5 - 3$$

$$3x = 15$$

$$2x = 2$$

$$x = 5$$

$$x = 1$$

Activity 3: Ask learners in their groups to write their own equations and solve them.

Activity 4: Work through the Worked examples 1 and 2 on pages 204 and 205 with learners.

Review exercise

Place learners in mixed-ability groups and ask them to solve the two linear equations:

1. $3x + 2 = 17$
2. $4y - 6 = 6$

Assessment tasks ----- LB page 205

Suggested homework

Learners solve three linear equations.

1. $2x - 1 = 5$
2. $6y - 6 = 12$
3. $3(x + 1) = 5x - 5$

Revision 7

Variables and equations ----- LB page 206

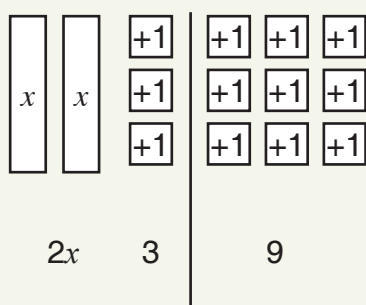
Learners write the Revision exercise on page 206 in the Learner's Book as class test.

Answers to Assessment tasks

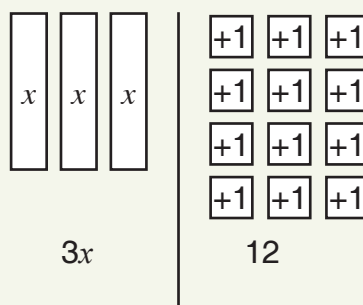
Main Idea 1

(LB page 202)

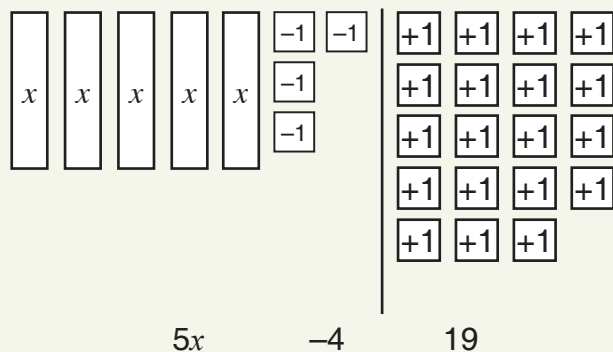
1. a.



b.



c.



2. b. $3x - 3 = 9$; Three times a number x minus three is nine.
- c. $6x - 8 = 5$; The difference between six times a number x and eight is five.
- d. $3x - 6 = 4$; Six less than the product of three and a number x is four.
- e. $3x = -9$; Three times a number x is negative nine.

3. a. x | $\begin{array}{|c|c|c|} \hline -1 & -1 & -1 \\ \hline -1 & -1 & -1 \\ \hline -1 & & \end{array}$
 $x = -3$

b. x | $\begin{array}{|c|c|c|c|} \hline +1 & +1 & +1 & +1 \\ \hline +1 & +1 & +1 & +1 \\ \hline \end{array}$
 $x = 8$

c. x | $\begin{array}{|c|c|c|} \hline +1 & +1 & +1 \\ \hline \end{array}$
 $x = 3$

d. x | $\begin{array}{|c|} \hline -1 \\ \hline \end{array}$
 $x = -1$

Main Idea 2

(LB page 205)

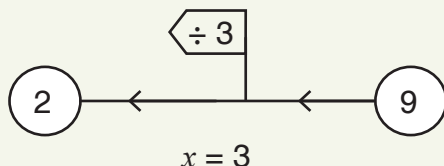
- | | | | | |
|----------------|-------------|--------------|-------------|-----------------------|
| 1. a. $x = -2$ | b. $r = 5$ | c. $b = 1$ | d. $y = -3$ | e. $x = 1\frac{1}{3}$ |
| 2. a. $x = 2$ | b. $x = -2$ | c. $x = 7$ | d. $x = -4$ | e. $x = -1$ |
| 3. a. $x = 4$ | b. $x = 2$ | c. $x = -22$ | d. $x = 7$ | e. $x = 5$ |

Answers to Revision

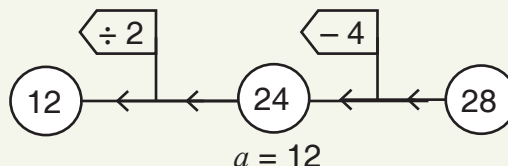
7

(LB page 206)

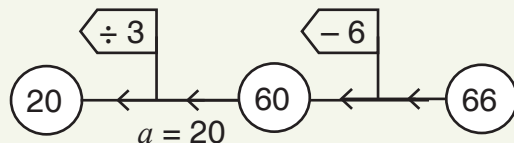
1. a.



b.



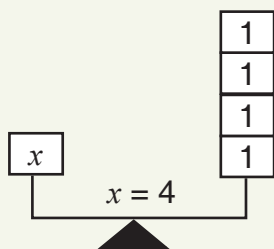
c.



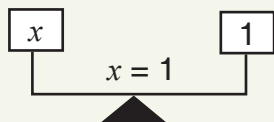
- | | | |
|-----------------------------------|-------------------------------|-----------------|
| 2. a. $4(2x + 3) = 52$
$x = 5$ | b. $3(x + 4) = 30$
$x = 6$ | c. $5x + 6 - y$ |
|-----------------------------------|-------------------------------|-----------------|

3. a. The product of 3 and the sum of a number x and 4 is 21.
 b. The difference between 18 and 7 times a number x is equal to negative 3.
 c. Seven less than a number x times 3 is negative 19.
 d. Three times a number y minus two is equal to 88.
 e. Six more than two times a number x is zero.
 f. Three times a number v minus negative one is equal to 13.

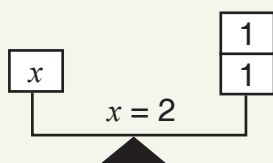
4. a.



c.



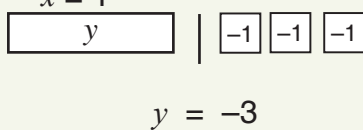
e.



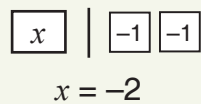
5. a.



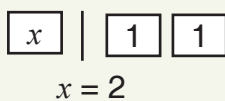
c.



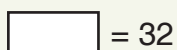
e.



g.



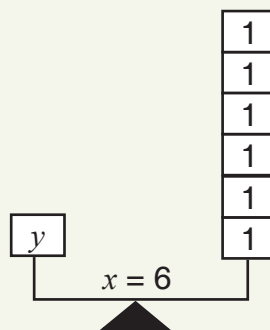
6. a.



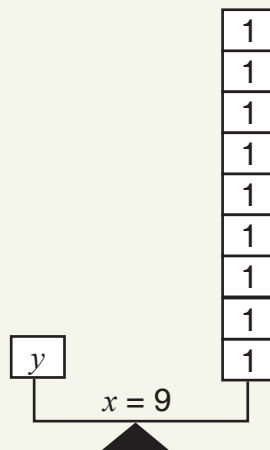
b.  = 75

c.  = 120

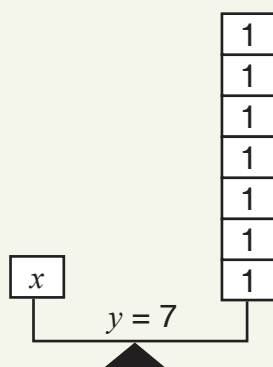
b.



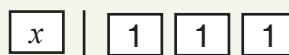
d.



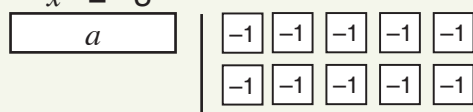
f.



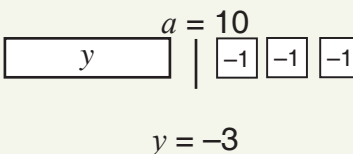
b.



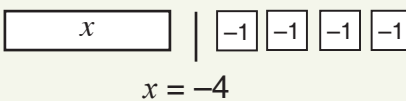
d.



f.



h.



Sub-strand 1: Shape and space

Module 1

Angles

Content Standard

B7.3.1.1 Demonstrate understanding of angles including adjacent, vertically opposite, complementary, supplementary and use them to solve problems.

Indicator

B7.3.1.1.1 Measure and classify angles according to their measured sizes – right, acute, obtuse and reflex.

Learning expectations: In this module, learners will learn how to:

- Identify and sort out angles according to their measure.
- Draw some angles using a protractor.

Essential for learning: Learners can draw line segment.

Resources: Mathematical set, cut-out shapes of angles drawn on sheet of paper

Keywords: angles, protractor, measure, acute, obtuse, reflex

Competencies: Creativity and innovation.

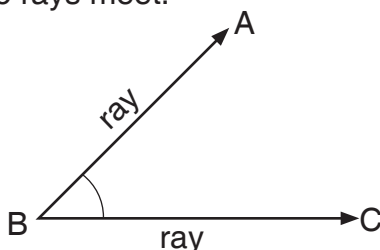
Starter: Ask learners to use parts of their bodies to form angles when answering questions in the Starter activity on page 208 in the Learner's Book.

Main idea 1

Types of angles

LB page 208

Activity 1: Ask learners to point out angles that they can see in the classroom. Examples include the corners of books and the chalk boards. Explain to learners that angles are formed when two rays meet.



Activity 2: Draw the types of angles on the board: acute, right angle, obtuse, straight angle and reflex on the board.

Activity 3: Place learners in convenient groups. Give cut-out angles to learners in their groups. Ask learners to identify angles and show the cut-out of each angle the teacher names.

Activity 4: Ask the group leaders to name angles and the group members.

The group leader can also show group members an angle and ask them to name the angle.

Activity 5: Work through the Worked examples on pages 210 and 211 with learners.

Review exercise

Working in their previous groups, ask learners to play the game, “what type of angle is this?”.

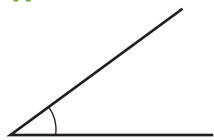
Assessment tasks ----- LB page 211

Learners identify types of angles.

Suggested homework

What type of angles are these?

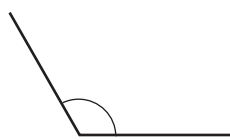
1.



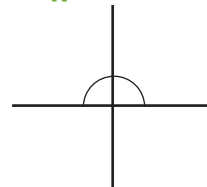
2.



3.



4.



Main idea 2

Drawing angles using a protractor

LB page 212

Activity 1: Ask learners to work in pairs and that they will need rulers and protractors. Demonstrate how to draw an angle, for example an angle of 80° on the board.

Activity 2: Work through the following steps with learners.

Steps to follow to draw an angle using a protractor

1. Draw a straight line (one arm of the angle).
2. Place a dot at one end of the arm. This dot represents the vertex of the angle.
3. Place the centre of the protractor at the vertex and the base line of the protractor along the arm of the angle.
4. Find the required angle on the scale and then mark a small dot at the edge of the protractor.
5. Join the small dot to the vertex with a ruler to form the second arm of the angle.
6. Label the angle with capital letters.

Ask learners to draw angles of 40° and 36° .

Work through the Worked examples with on pages 212 and 213 in the Learner's Book with the class.

Ask learners to draw the angles in their jotters.

- 1.** 100°

Learners draw angles.

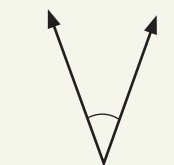
Use protractor to draw the following angles.

1. 68° 2. 15° 3. 150° 4. 340°

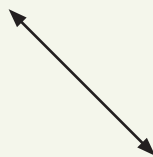
Main Idea 1

(LB page 211)

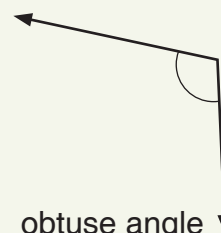
1. a. acute angle b. reflex angle c. acute angle
d. reflex angle e. obtuse angle f. right angle
2. a. acute angle b. reflex angle c. straight angle
d. obtuse angle e. right angle f. angle at a point or complete angle



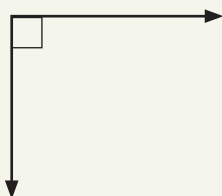
acute angle



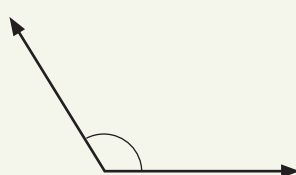
straight angle



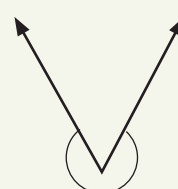
obtuse angle



right angle



obtuse angle

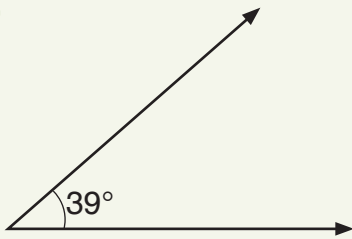


reflex angle

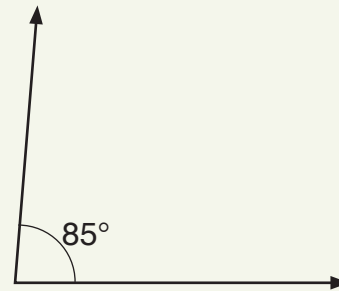
Exercise 2

(LB page 214)

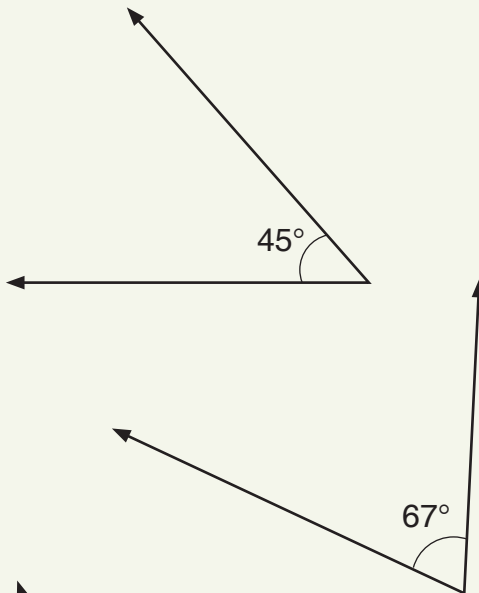
1. a.



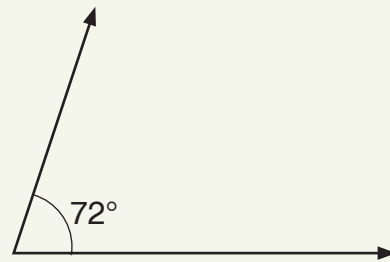
b.



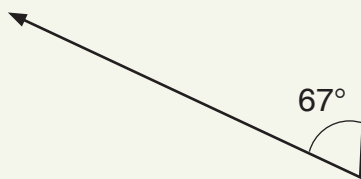
c.



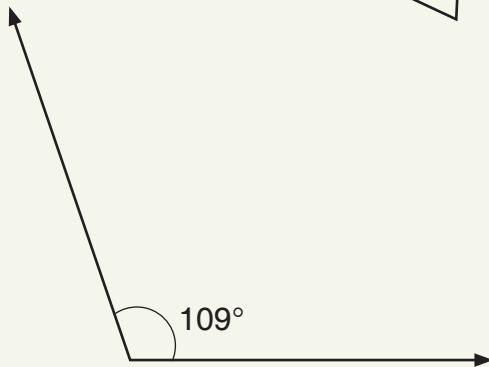
d.



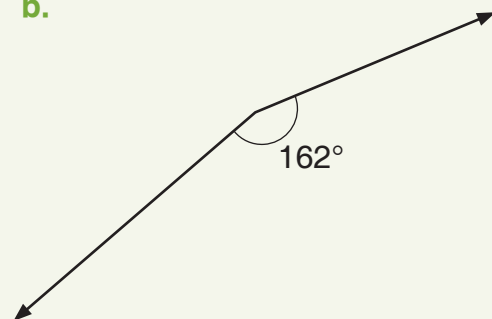
e.



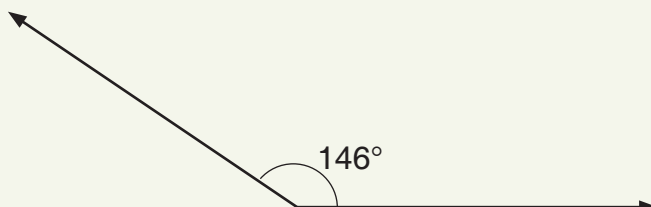
2. a.



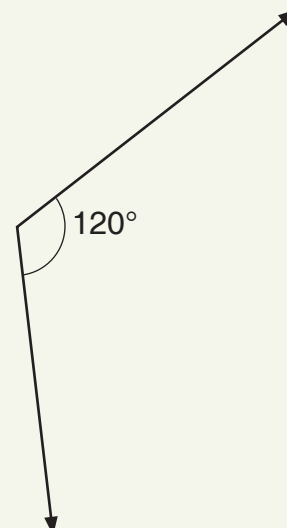
b.



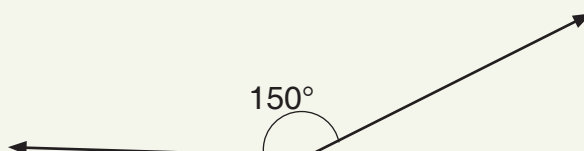
c.



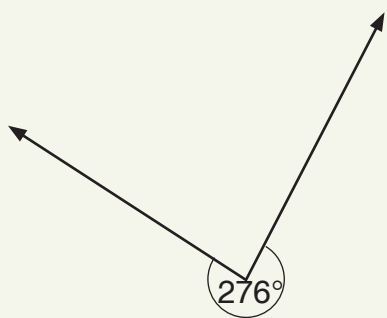
d.



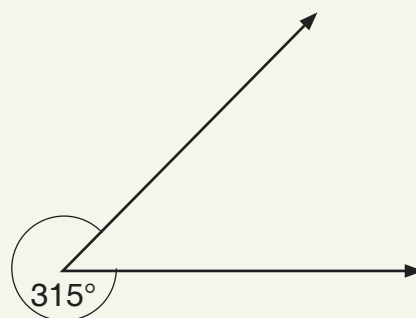
e.



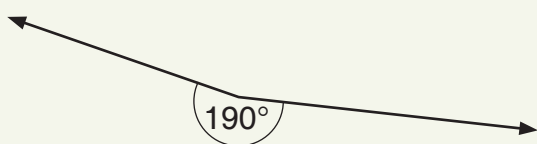
3. a.



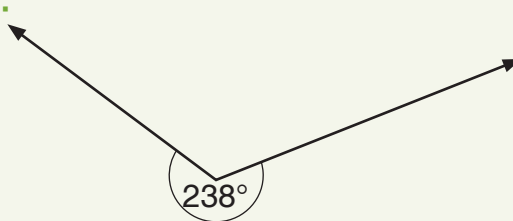
b.



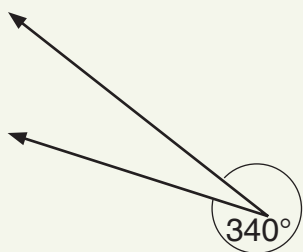
c.



d.



e.



Sub-strand 1: Shape and space

Module 2

Complementary and supplementary angles

Content standard

B7.3.1.1. Demonstrate understanding of angles including adjacent, vertically opposite, complementary, supplementary and use them to solve problems.

Indicator

B7.3.1.1.2 Apply the fact that (i) complementary angles are two angles that have a sum of 90° , and (ii) supplementary angles are two angles that have a sum of 180° to solve problems.

Learning expectations: In this module, learners will learn how to:

- Apply the fact that the sum of complementary angles is 90° .
- Apply the fact that the sum of supplementary angles is 180° .
- Solve problems involving adjacent, vertically opposite, supplementary and complementary angles.

Essential for learning: Learners can identify types of angles.

Resources: Mathematical set

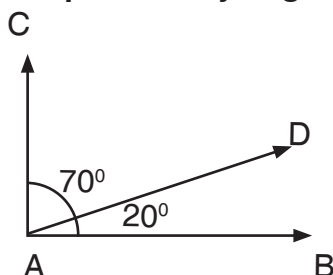
Keywords: supplementary angles, complementary angles, adjacent, vertically opposite

Competencies: Creativity and innovation

Starter: Refer learners to the Starter activity on page 215 in the Learner's Book. Learners identify the types of angles.

Activity 1: Revise with learners on the types of angles they have learnt about. Draw complementary angles on the board.

Complementary angles



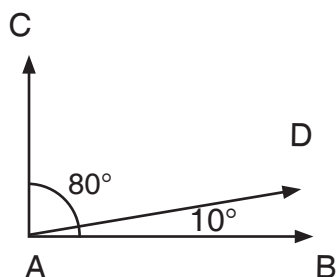
Ask learners what the sum is of the two angles in the drawing. When the sum of two angles is 90° , the two angles are complementary angles. Angle 20° is the complement of angle 70° and angle 70° is the complement of angle 20° .

Activity 2: Ask learners to work in pairs and to draw two different complementary angles.

Activity 3: Refer learners to pages 215 to 218 in the Learner's Book. Discuss the properties of angles with the class.

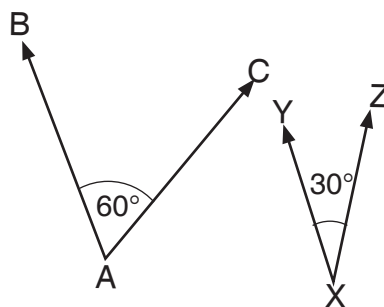
Activity 4: Discuss types of complementary angles with the class.

1.



Adjacent complementary angles

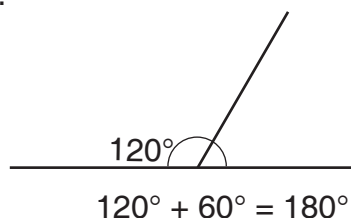
2.



Non-Adjacent complementary angles

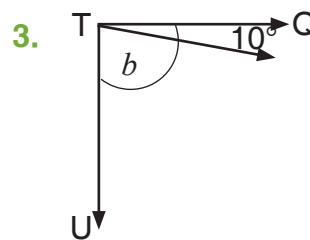
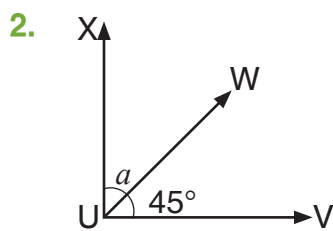
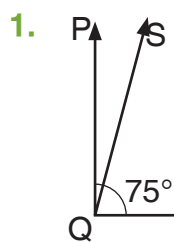
Supplementary angles

Activity 5: Draw supplementary angles on the board. Ask learners what the sum of the two angles is. (The sum is 180°). Ask learners what these angles are called. If learners do not know, tell them that when the sum of two angles is 180° , the angles are supplementary angles.



The angle 120° is the supplement of $\angle 60^\circ$, and $\angle 60^\circ$ is the supplement of $\angle 120^\circ$.

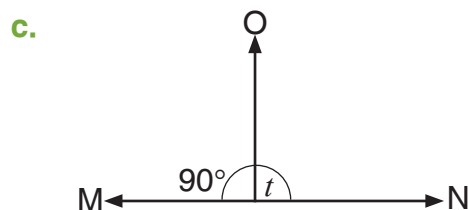
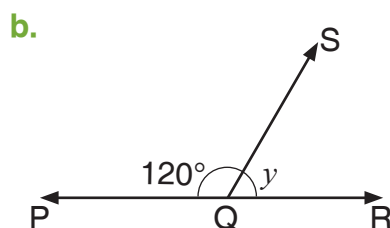
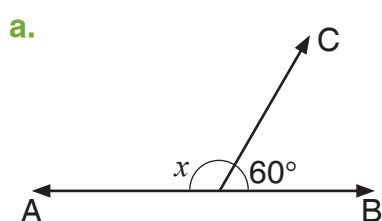
Activity 6: Draw some angles on the board and ask learners to find the complements.



Activity 7: Work through the Worked examples on supplementary and complementary angles on pages 218 to 220 in the Learner's Book with learners.

Review exercise

Ask learners to work in pairs to find the values of angles x , y and t .

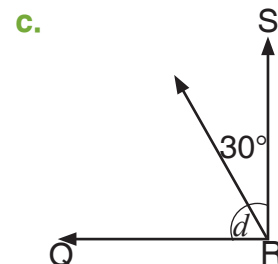
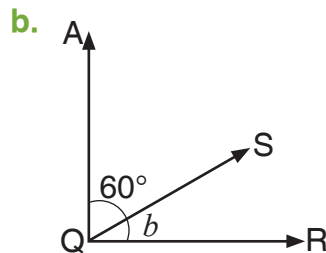
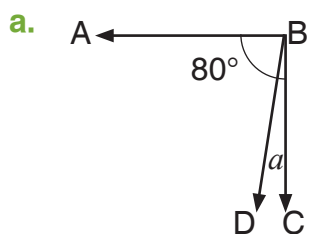


Assessment tasks ----- LB page 221

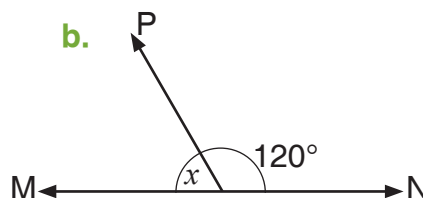
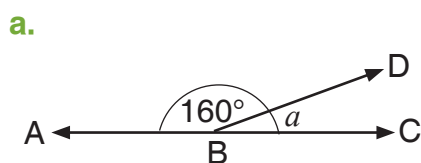
Learners answer questions about complementary and supplementary angles.

Suggested homework

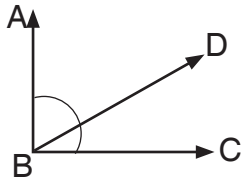
1. Find the complement of each angle.



2. Find the supplement s (angles a and x).

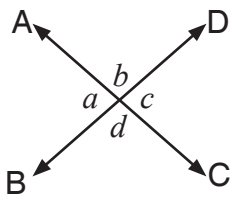


Activity 1: Revise the lessons on complementary and supplementary angles with learners. Draw angles on the board. Ask the learners to draw the angles.



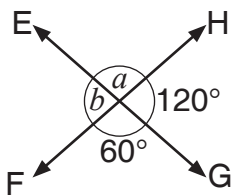
Ask learners what the two angles are called. $\angle ABD$ is adjacent to $\angle DBC$. Explain to learners that adjacent angles share a common vertex and a common side.

Activity 2: Ask learners to draw two lines to intersect each other.



Ask learners to tell you how many angles are formed at the intersection. (There are four angles.) Ask learners which angles are opposite angles. Opposite angles are a and b , and c and d . Tell learners that the two opposite angles are equal; so, $\angle a = \angle c$ and $\angle c = \angle b$.

Activity 3: Ask learners to give the sizes of angles a and b .



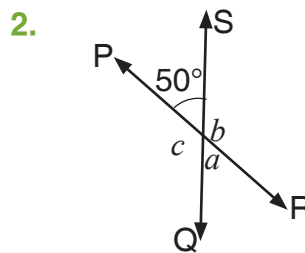
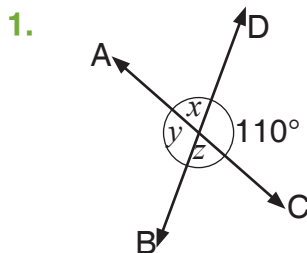
$\angle b$ is opposite to 120° ; so, $\angle b = 120^\circ$.

$\angle a$ is opposite to 60° ; so, $\angle a = 60^\circ$.

Activity 4: Work through the Worked examples on page 225 in the Learner's Book with learners.

Review exercise

Place learners in mixed-ability groups and ask them to find the sizes of the named angles.



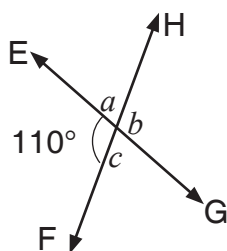
Assessment tasks ----- LB page 225

Learners identify types of angles.

Suggested homework

Find the sizes of angles a , b , c and give reasons.

1.



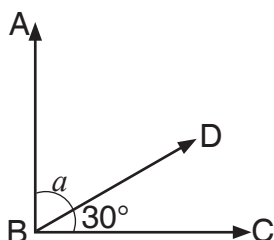
Main idea 3

Solving problems involving adjacent, vertically opposite, complementary and supplementary angles

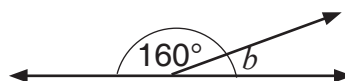
LB page 226

Activity 1: Revise complementary and supplementary angles with the class. Draw both types of angles on the board and ask learners to identify them.

Complementary angles



Supplementary angles



Activity 2: Ask learners to calculate the sizes of the named angles.

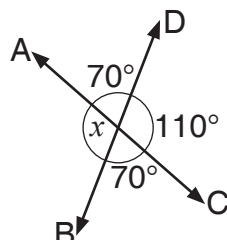
Activity 3: Ask learners to draw vertically opposite angles and adjacent angles in their jotters.

Activity 4: Refer learners to Worked examples on pages 226 and 227 in the Learner's Book. Discuss the examples with learners.

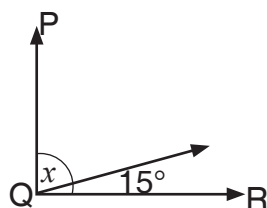
Review exercise

Ask learners to work in pairs to calculate the size of angle x in each diagram.

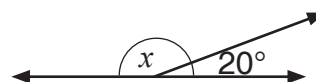
1.



2.



3.

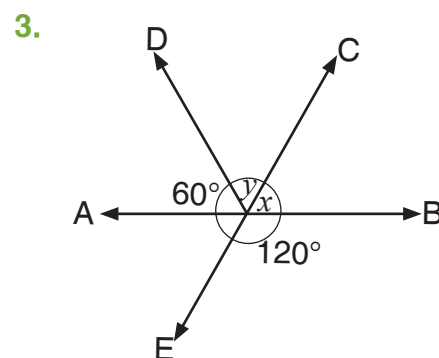
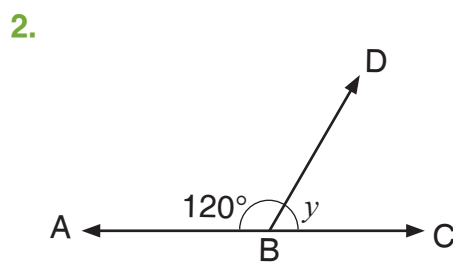
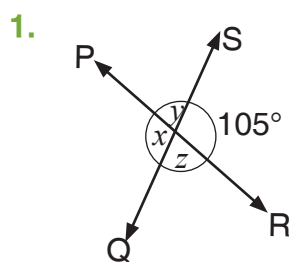


Assessment tasks ----- LB page 227

Learners use the properties of angles to calculate the sizes of angles in diagrams.

Suggested homework

Ask learners to calculate the sizes of angles x , y and z . the values of x , y and z in each figure.



Answers to Assessment tasks

Main Idea 1

(LB page 221)

1. a. $\angle ABD = 63^\circ$ b. $\angle ROP = 78^\circ$ c. $\angle AOB = 41^\circ$
 d. $\angle ZXU = 85^\circ$ e. $\angle UST = 21^\circ$ f. $\angle WOV = 55^\circ$
2. a. $\angle B = 55^\circ$ b. $\angle D = 31^\circ$
 c. $\angle Q = 45^\circ$ d. $\angle T = 83^\circ$
3. a. $\angle CBD = 164^\circ$ b. $\angle VYZ = 95^\circ$
 c. $\angle BOC = 152^\circ$ d. $\angle ROQ = 38^\circ$
4. a. $\angle B = 120^\circ$ b. $\angle A = 80^\circ$
 c. $\angle R = 90^\circ$ d. $\angle P = 167^\circ$
5. a. $\angle b = 122^\circ$ supplementary
 b. $\angle x = 82^\circ$ complementary
 c. $\angle r = 75^\circ$ supplementary
 d. $\angle q = 42^\circ$ complementary
 e. $\angle z = 100^\circ$ supplementary
 f. $\angle y = 50^\circ$ complementary

Main Idea 2

(LB page 225)

1. a. a and b adjacent angles
 b. c and d vertically opposite angles
 c. 27° and 63° complementary angles
 d. 105° and 75° supplementary angles
 e. r and t supplementary angles

2. a. $\angle EGF$ and $\angle BGD$

c. Check learner's answers.

b. $\angle EGB$ and $\angle FGD$

d. Check learner's answers.

3. $\angle EOD = 62^\circ$

Main Idea 3

(LB page 227)

1. a. $a = 19^\circ$

b. $b = 37^\circ$

$c = 85^\circ$

2. a. $\angle POR = 83^\circ$

b. $\angle QOR = 97^\circ$

3. a. $x = 40^\circ$

b. $\angle AOB = 136^\circ$

4. $x = 51^\circ$

5. $\angle DOE = 136^\circ$

Sub-strand 1: Shape and space

Module 3

Line segment

Content Standard

B7.3.1.2 Demonstrate how to construct a perpendicular to a line from a given point, bisect a line, bisect angles, and construct angles of the following sizes: 30° , 45° , 60° , 75° and 90° .

Indicator

B7.3.1.2.1 Construct a line segment perpendicular to another line segment.

Learning expectations: In this module, learners will learn how to:

- Construct a given line segment.
- Construct a perpendicular at a point on a line segment.
- Construct a perpendicular from a given point outside a line segment.
- Construct a perpendicular bisector of a given line segment.

Essential for learning: Learners can draw lines and draw angles.

Resources: Mathematical set, ruler, pencil

Keywords: line segment, perpendicular, construct, bisect, bisector, mediator, midpoint

Competencies: Critical thinking and problem-solving

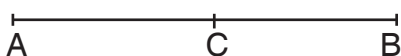
Starter: Refer learners to the Starter questions on page 229 in the Learner's Book for the warming up exercise.

Main idea 1

Constructing line segment

LB page 229

Activity 1: Ask learners to draw a line and name it AB in their jotters. Ask learners to measure 5 cm measure from A and label the point C.

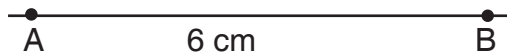


Guide learners to identify the line segments AB, AC and CB.

Activity 2: Ask learners to each construct a line segment that is 8 cm long. Give them guidelines.

Construct a line segment of length 6 cm with a compass

1. Mark any point A with a pencil.
2. Using a ruler, draw a line, that passes through A.
3. Measure 6 cm with the compass on the ruler.
4. Place the pointed end of the compass on A and draw an arc to cut the line at B.
5. Below is line segment AB of length 5 cm.

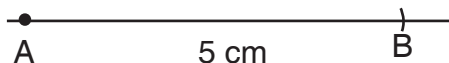


Activity 3: Ask learners to follow the steps to construct a copy of a line segment on of 5 cm as shown on page 230 in the Learner's Book.

Construct a copy of a line segment AB using a ruler and a compass.

Step 1

Draw line segment AB = 5 cm.



Step 2

Now draw a straight line using a ruler.

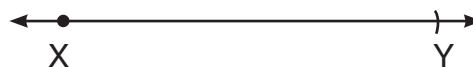


Step 3

Measure the length of AB with a compass

Step 4

Mark a point X on the line.



Step 5

With the compass point on X, draw an arc maintaining the measured length AB, to cut line at Y.

XY is the exact copy of line segment AB. The length of line AB is the same as the length of line XY. Thus $AB = XY$.

In pairs, ask learners to each construct line segment PQ of 4 cm in their jotters and make a copy of it and label it AB. Ask learners to exchange their work and measure their partner's line PQ and the copy of it.

Discuss the Worked examples 1 and 2 on page 231 in the Learner's Book with learners.

Review exercise

Ask learners to work in pairs, construct a line and make a copy of it..

1. Construct a line segment AB of 6.8 cm.
2. Copy line segment AB and label it CD.

Assessment tasks ----- LB page 232

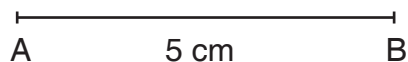
Learners construct line segments and draw copies of line segments.

Suggested homework

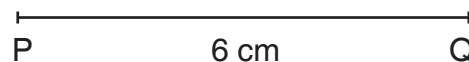
Construct a line segment TZ with a length of 8.8 cm.

Using a compass and a ruler only, construct a copy of each line below.

1.



2.



Main idea 2

Constructing perpendicular line

LB page 232

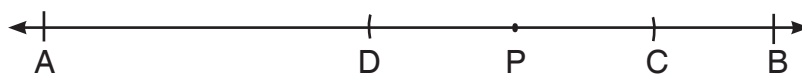
Activity 1: Work through the steps to construct line segment on pages 232 and 233 in the Learner's Book with learners.

Steps to construct a perpendicular line through a point on a given line segment

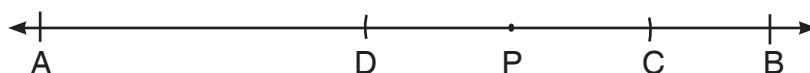
Step 1: Given: Line segment AB with point P on it.



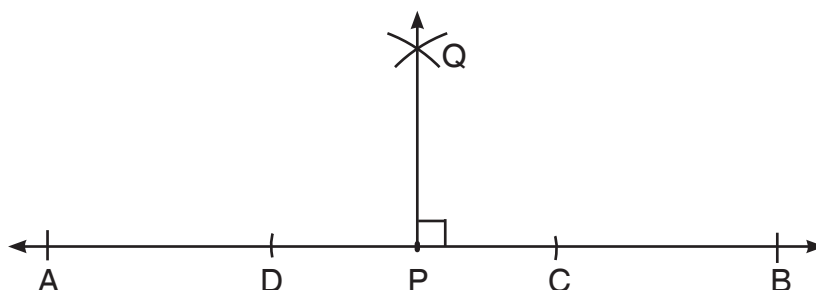
Step 2: With point P as centre and a convenient radius, draw two arcs (with the same radius) intersecting the line AB to the left and right of P. Label the points of intersection C and D.



Step 3: With points C and D as centres and any convenient radius, draw two arcs to intersect at Q.



Step 4: Draw a line, using a ruler, to pass through the points P and Q.



QP is perpendicular to line segment AB. So, $QP \perp AB$.

Activity 2: Ask learners to work in pairs and to construct line segments of 4 cm and 6 cm.

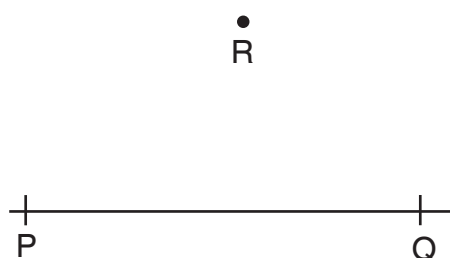
Activity 3: Guide learners to construct a perpendicular line through a point on a given line segment. Work through steps on pages 233 and 234 in the Learner's Book with learners.

Demonstrate the construction so that learners can watch your construction. Then ask learners to construct the same lines.

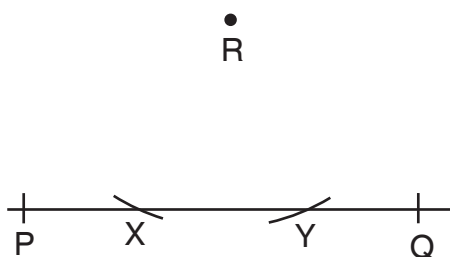
Activity 4: Demonstrate how to construct a perpendicular from a given point that is outside a line segment.

Explain the steps to learners as you go along.

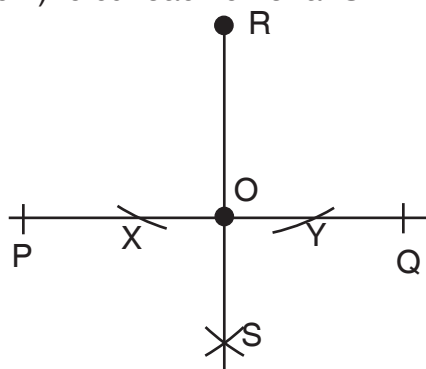
Step 1: Given: A line segment PQ and a point R outside PQ.



Step 2: Open your compass to a convenient radius. With R as centre, draw two arcs to cut PQ at X and Y (The set should cut the line at two distinct points on PQ).



Step 3: With X and Y as centres and a radius more than half XY, draw two arcs (same radius for both) to cut each other at S.



Step 4: Draw a line from R through the intersection of the arcs at S cutting PQ at O. RS is a perpendicular from R to PQ.

Check: Measure $\angle ROQ$ and $\angle ROP$ with a protractor. Is $\angle ROQ = \angle ROP = 90^\circ$?

Activity 5: Ask learners to construct a perpendicular from a point outside a line segment. Work through the Worked examples on page 234.

Review exercise

Ask learners to work in pairs.

Ask learners to construct a perpendicular line from a point Q outside the line segment AB with length 8 cm.

Assessment tasks ----- LB page 235

Learners construct copies of line segments and they construct lines that are perpendicular to other lines.

Suggested homework

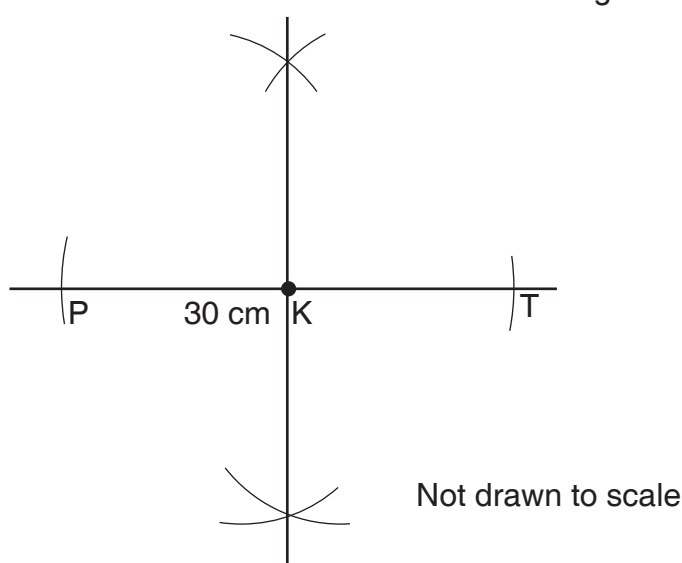
Construct a perpendicular line at the midpoint of the line segment 6 cm.

Main idea 3

Constructing a perpendicular bisector of a line segment
LB page 236

Activity 1: Review the previous lesson with learners. Refer learners to Learner's Book page 236. Ask them to read the information about a perpendicular bisector.

Demonstrate how to construct a perpendicular bisector on the board so that learners can watch you construct it. Ask a learner to measure lengths PT and KT. They should each be 15 cm.



Activity 2: Ask learners to construct the perpendicular bisector of line segment AC 10 cm. Work through the Worked examples on pages 236 and 237 in the Learner's Book.

Review exercise

Construct line segment CD of 10 cm. Construct the perpendicular bisector of the line segment CD.

Assessment tasks ----- LB page 238

Learners construct line segments and perpendicular bisectors of line segments.

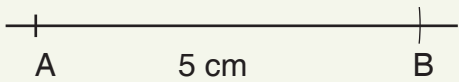
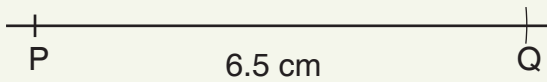
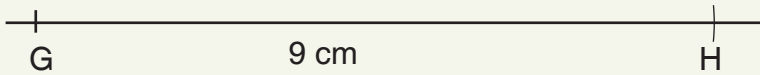
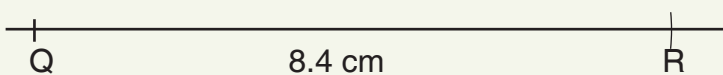
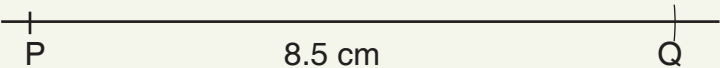
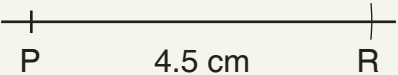
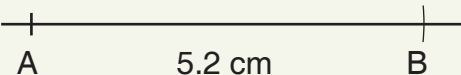
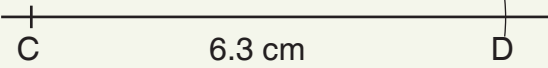
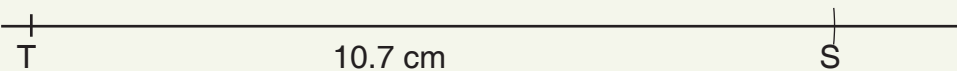
Suggested homework

Construct a perpendicular bisector of the line segment AC 6.8 cm.

Answers to Assessment tasks

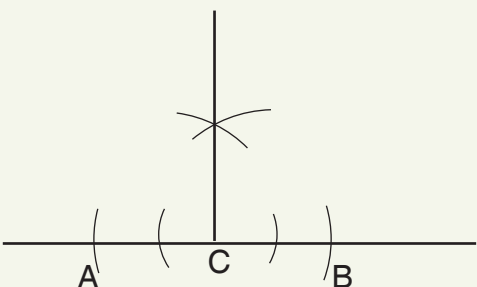
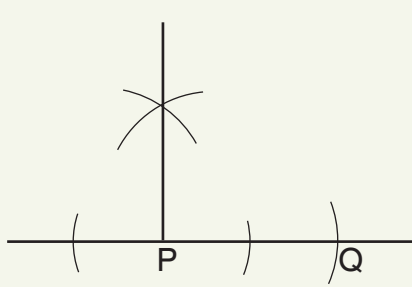
Exercise 1

(LB page 232)

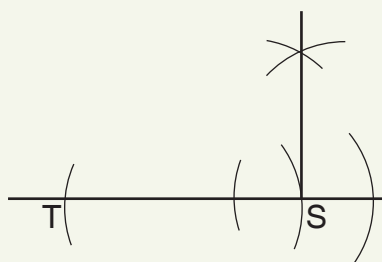
1. a.  b. 
- c.  d. 
2. a.  b.  c.  d.  e. 

Main Idea 2

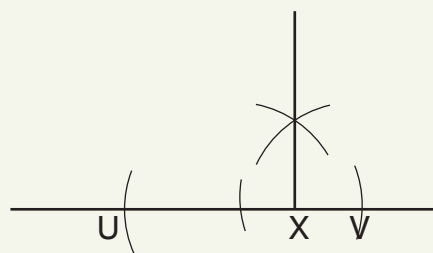
(LB page 235)

1. a.  b. 

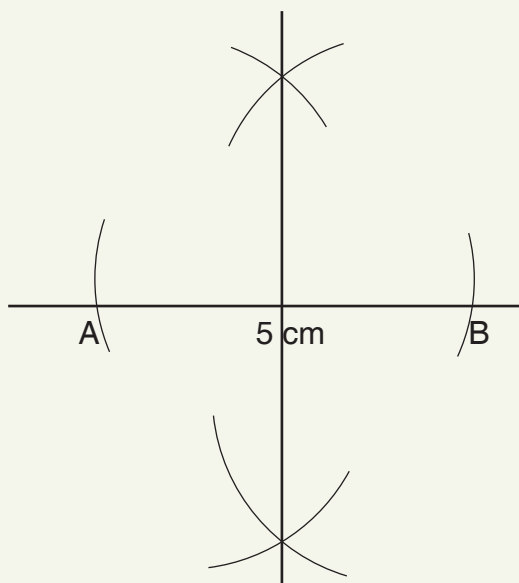
c.



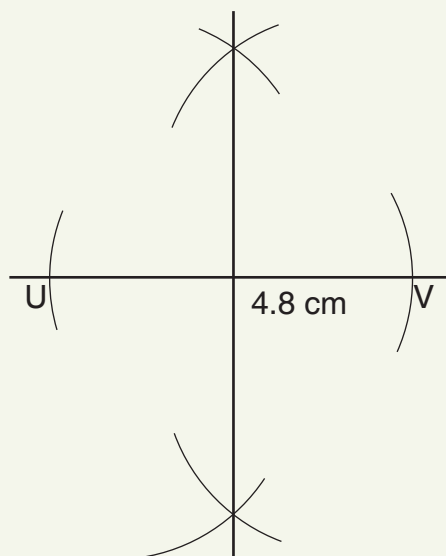
d.



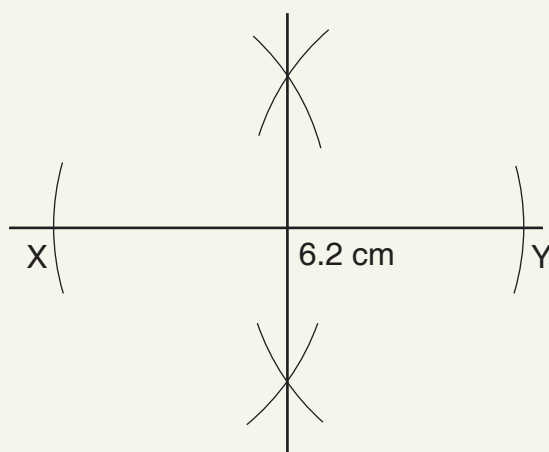
2. a.



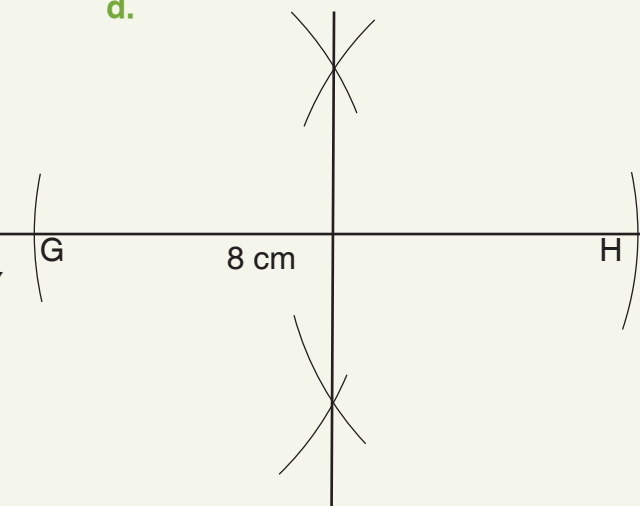
b.



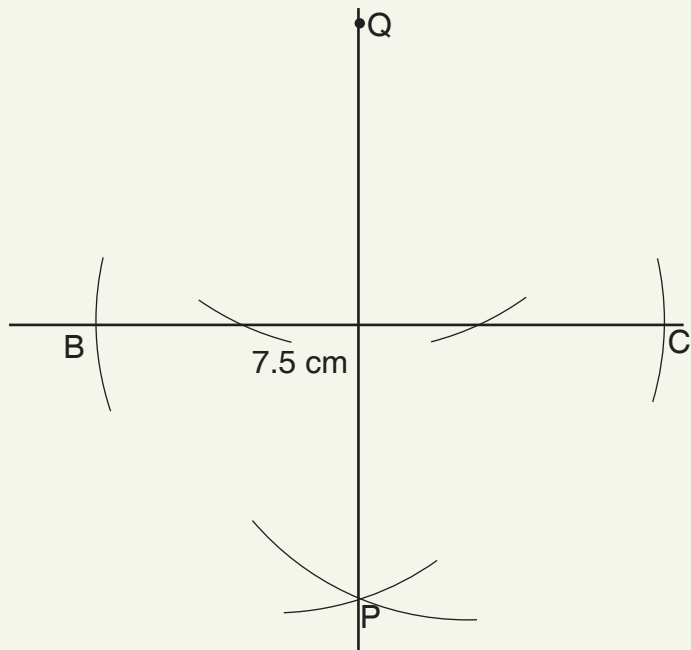
c.



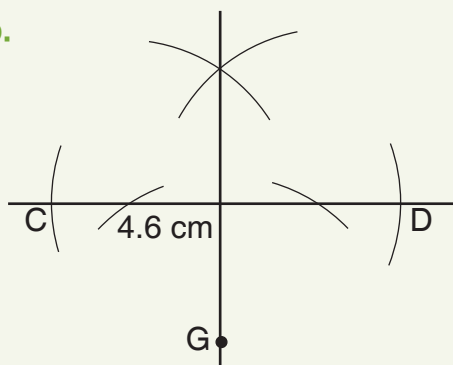
d.



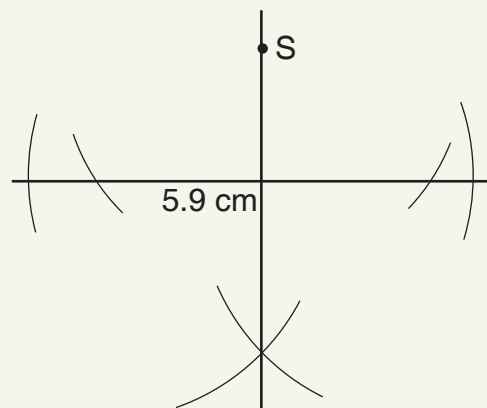
3. a.



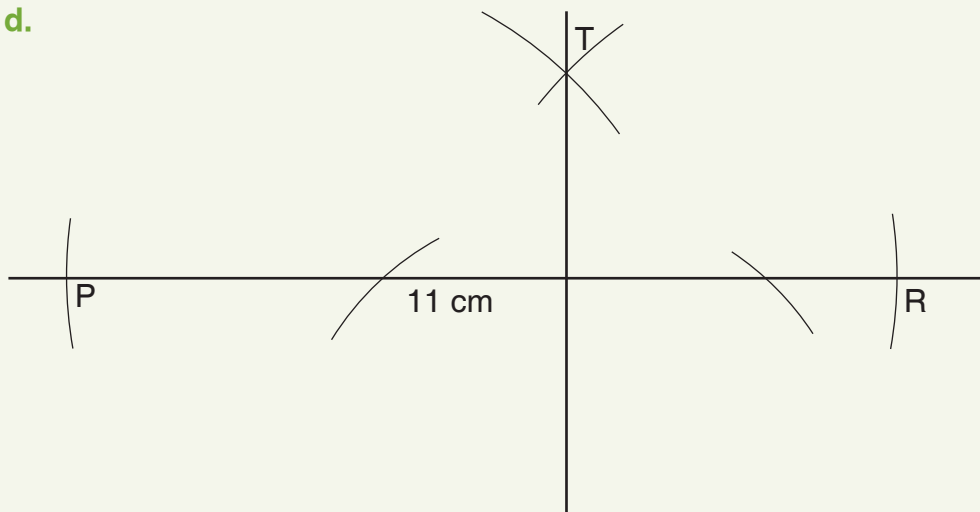
b.



c.



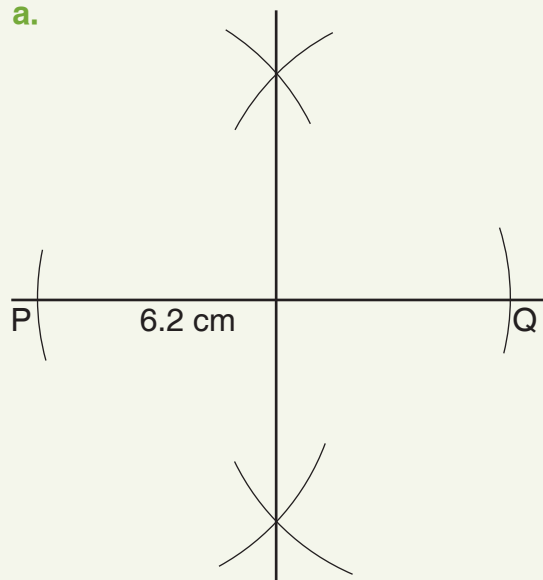
d.



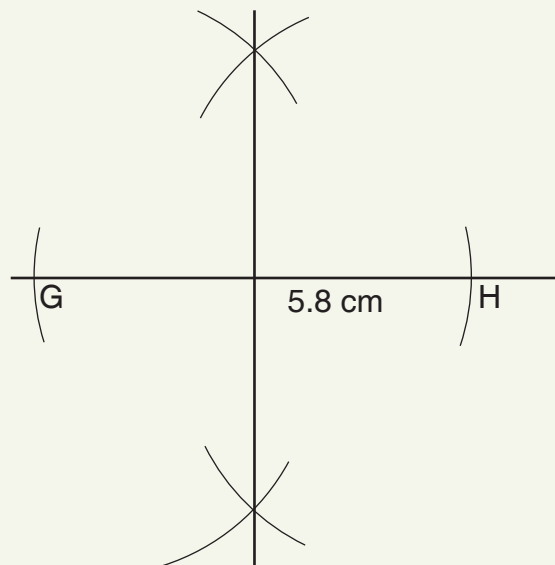
Main Idea 3

(LB page 238)

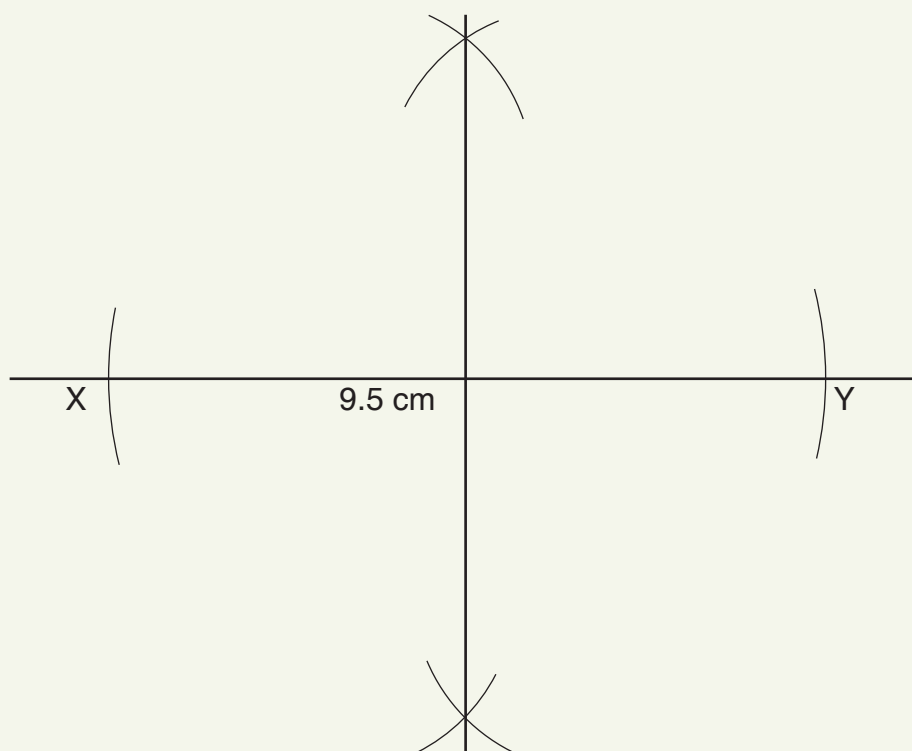
1. a.



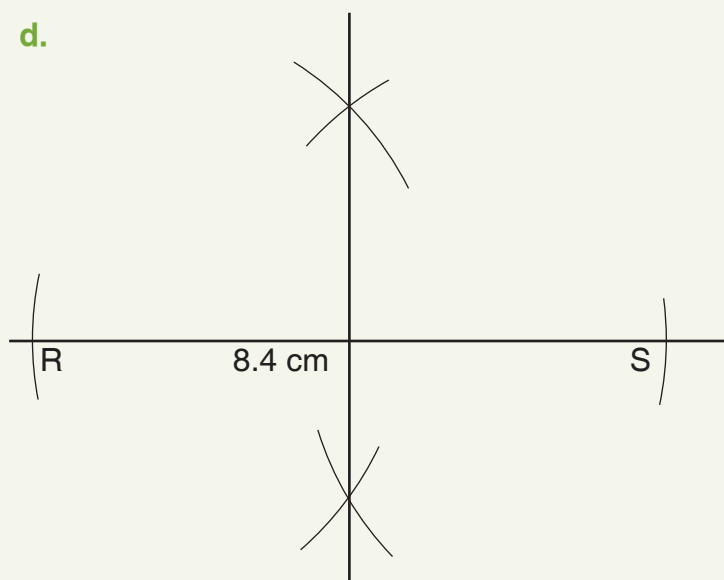
b.



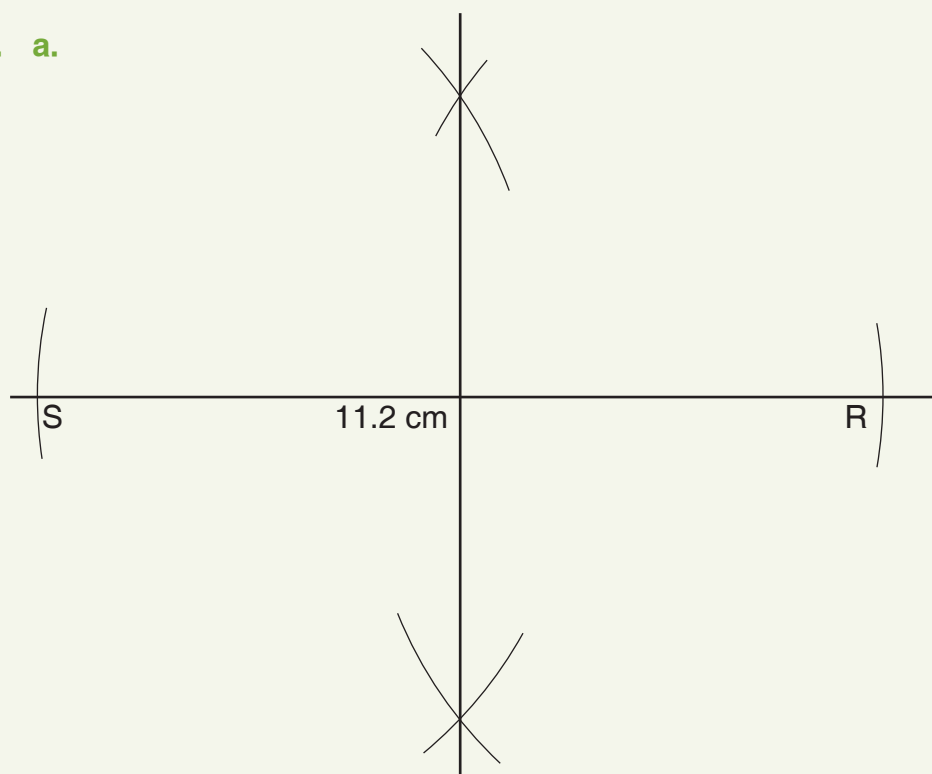
c.



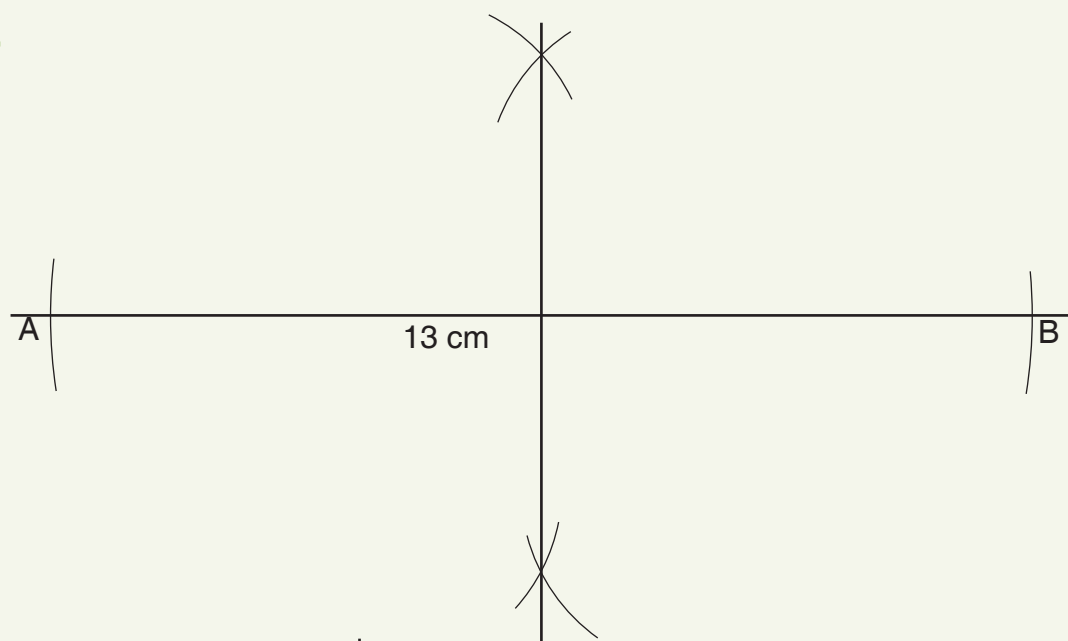
d.



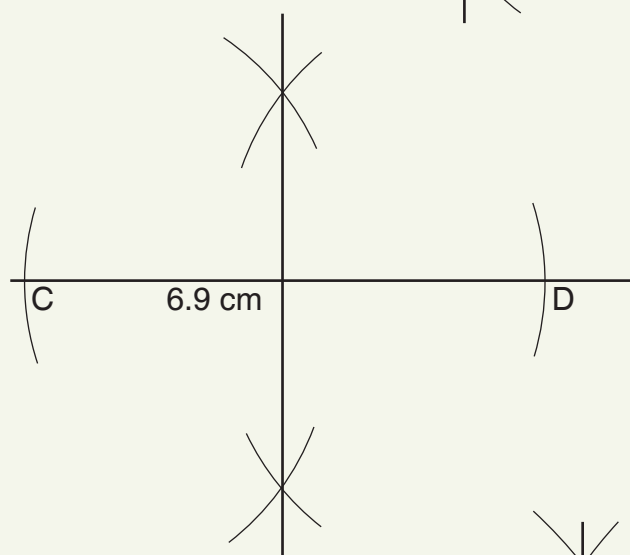
2. a.



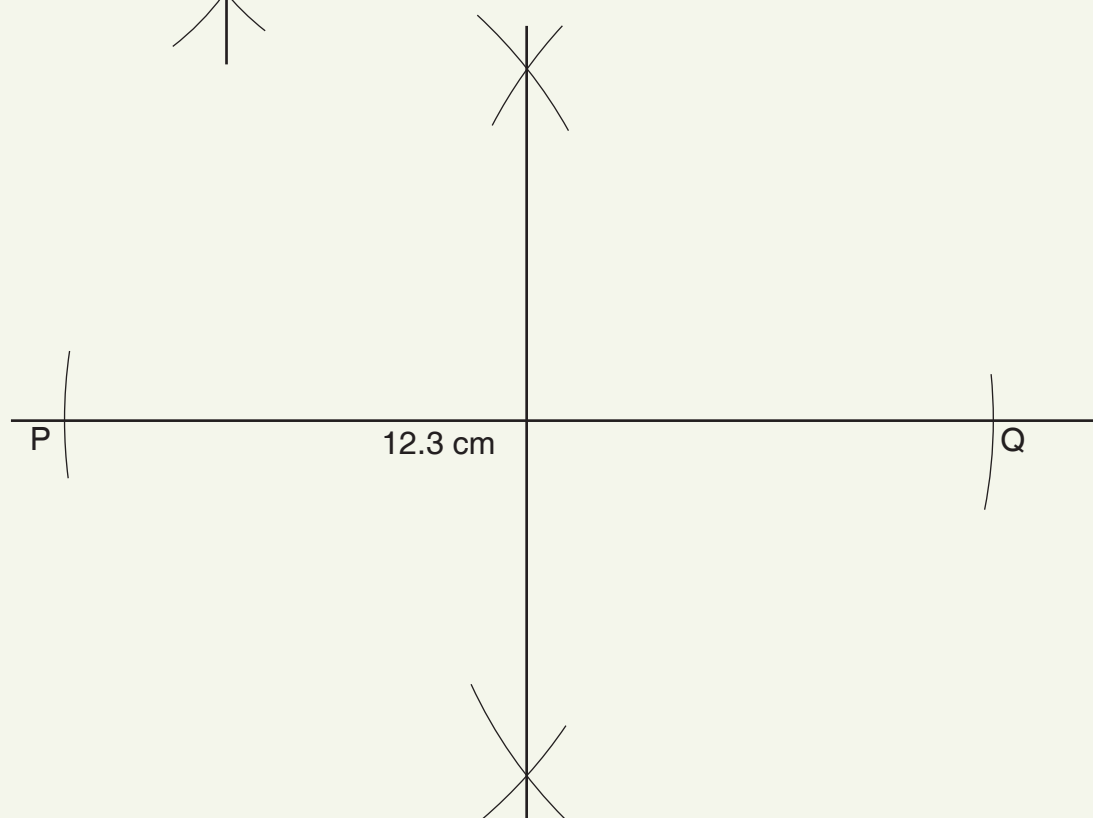
b.



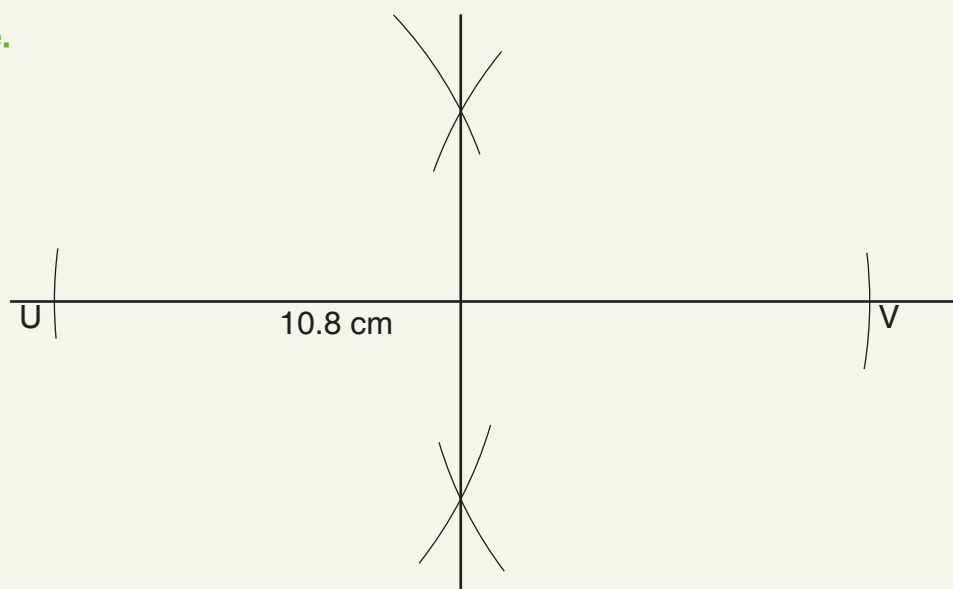
c.



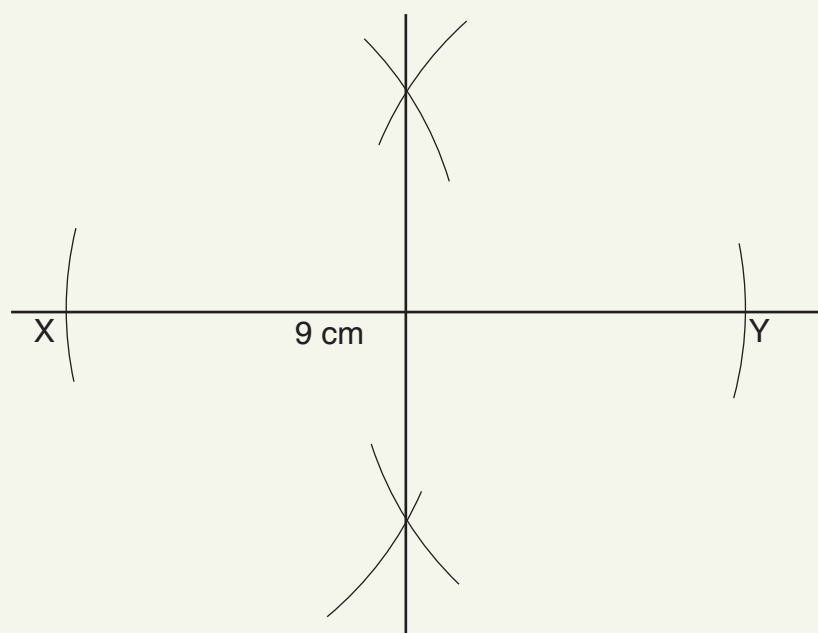
d.



e.



f.



Sub-strand 1: Shape and space

Module 4

Construction of angles 1

Content Standard

B7.3.1.2 Demonstrate how to construct a perpendicular to a line from a given point, bisect a line, bisect angles, and construct angles of the following sizes: 30° , 45° , 60° , 75° and 90° .

Indicator

B7.3.1.2.2 Construct the perpendicular bisector of a line segment.

Learning expectations: In this module, learners will learn how to:

- Copy and bisect angles.
- Construct angles 90° and 45° .

Essential for learning: Learners can construct perpendicular bisectors of line segments.

Resources: Mathematical set

Keywords: copy, bisect, angle, construct, perpendicular, segment, protractor, bisector

Competencies: Critical thinking and problem-solving

Starter: Refer learners to the Starter activity in the Learner's Book page 239 where learners identify three types of angles they know.

Main idea 1

Copying angles

LB page 239

Activity 1: Review the previous lesson with learners. Demonstrate how to copy an angle on the board. Explain the steps to learners as you go along.

Activity 2: Read the steps in the Main idea 1 with learners on pages 239 and 240 in the Learner's Book.

Activity 3: Ask learners to work in pairs and copy an angle. Work through the Worked examples with learners on pages 240 and 241 in the Learner's Book.

Review exercise

In pairs, learners each draw an angle $\angle ABC$ of 60° with a protractor. They use a compass and a ruler to draw a copy of $\angle ABC$.

Assessment tasks ----- LB page 241

Learners use protractors, rulers and compasses to construct and draw copies of angles.

Suggested homework

1. Draw angle 45° . Use a compass and a ruler to construct the angle and to draw a copy of it.
2. Draw $\angle BAC$ 100° with a protractor. Use your ruler and a compass to draw a copy of it.

Main idea 2

Bisecting angles

LB page 242

Activity 1: Review previous lesson with learners. Let learners tell you what they know about bisecting a line or angle, and the name given to the line that bisect the line or an angle.

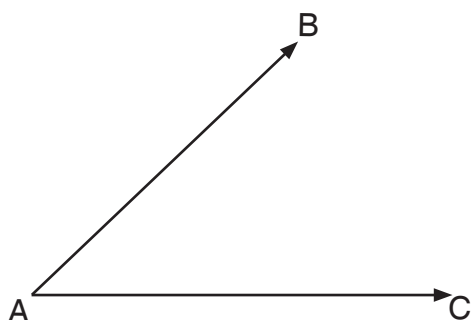
Let them know that bisect means to divide a line or an angle into two equal parts.

The line that divides the angle or line into two equal parts is called the **bisector**.

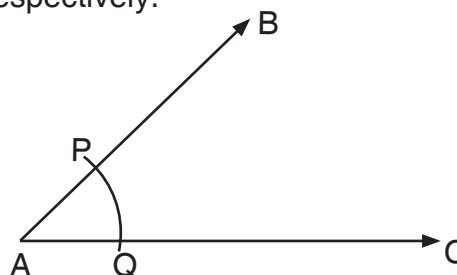
Activity 2: Take them through the following steps.

Steps to follow to construct a bisector

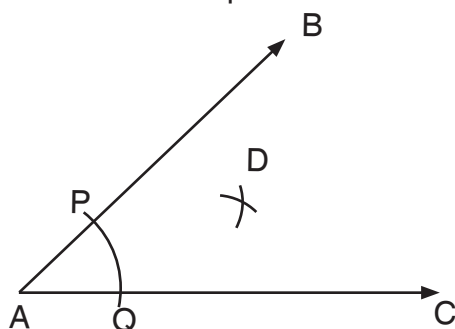
1. Draw any angle, say $\angle BAC$.



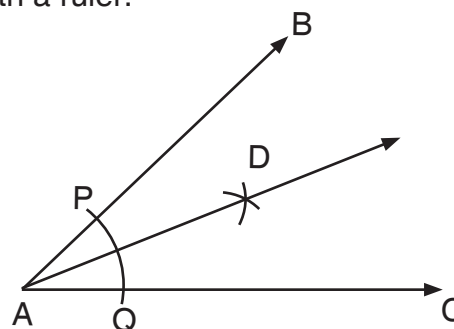
2. Open the compass to a convenient radius and with A as the centre, draw an arc to cut AB and AC at P and Q, respectively.



3. With P and Q as centres and with the same radius, draw arcs between AB and AC to intersect at point D.



4. Draw a line from the vertex to pass through the point where the arcs intersect with a ruler.



5. Measure $\angle DAB$ and $\angle DAC$.

6. $\angle DAB = \angle DAC$. Therefore, AD is the bisector of $\angle BAC$.

Activity 3: Working in pairs, ask learners to read through the Worked example on page 243 in the Learner's Book. They construct an angle of 60° and construct its bisector. Learners then measure the two angles. Each should be 30° .

Review exercise

Working in the same pairs, ask learners to construct an angle of 40° and bisect it.

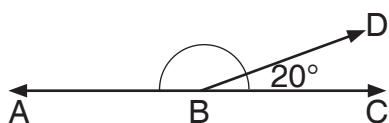
Assessment tasks ----- LB page 243

Learners construct angles and then bisect each angle by constructing bisectors.

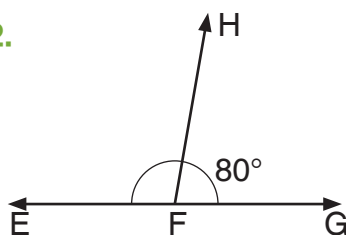
Suggested homework

Ask learners to construct the angles and construct a bisector for each angle.

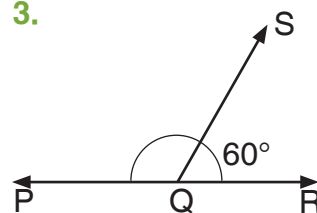
1.



2.



3.



Main idea 3

Constructing angles 90° and 45°

LB page 244

Activity 1: Demonstrate how to construct angle 90° on the board for learners to watch. Ask learners to work in pairs and to read the notes in the Learner's Book on pages 244 and 245. Since learners know how to construct perpendicular lines, they should be able to construct angles of 90° .

Activity 2: Ask a learner to bisect the 90° angle on the board. Ask learners to bisect one 90° angle they constructed.

Activity 3: Work through the Worked examples on page 243 in the Learner's Book with them. Ask each learners to construct an angle of 90° and bisect it.

Review exercise

Work in pairs.

Construct an angle of 45° . Construct a bisector for an angle of 90° to create an angle of 45° .

Assessment tasks ----- LB page 245

Learners construct line segments, angles and bisectors of angles.

Suggested homework

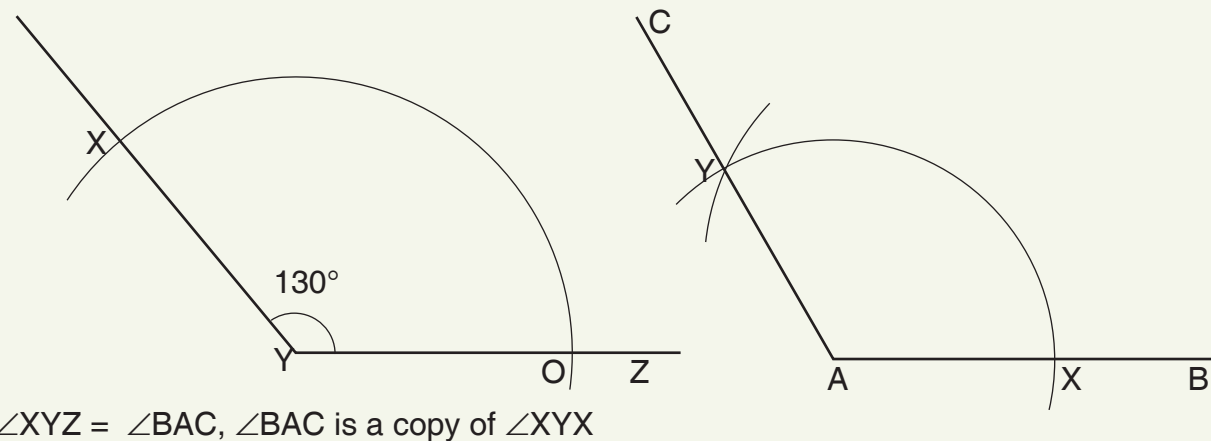
Construct an angle of 120° . Draw the angle bisector of the angle of 120° . Measure the two angles. What is the size of each angle?

Answers to Assessment tasks

Exercise 1

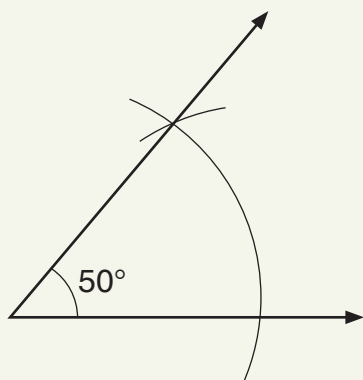
(LB page 241)

1.

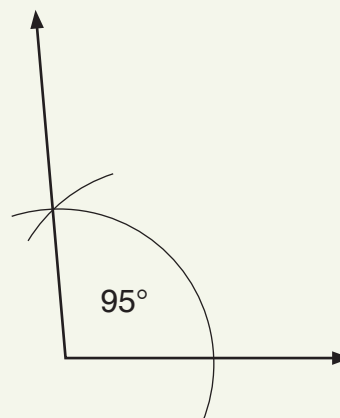


2.

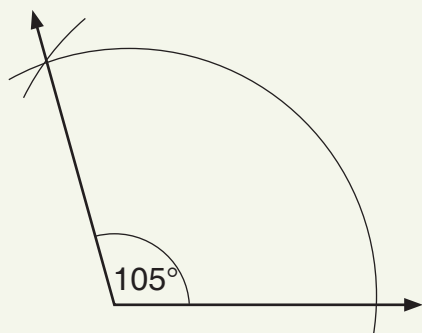
a.



b.

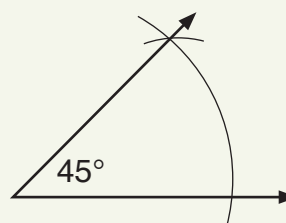
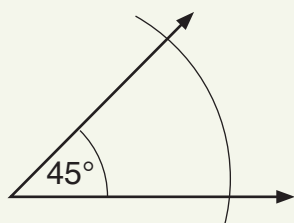


c.



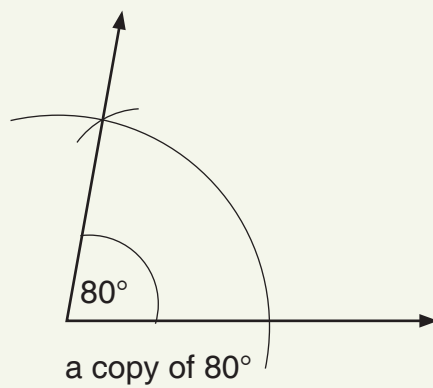
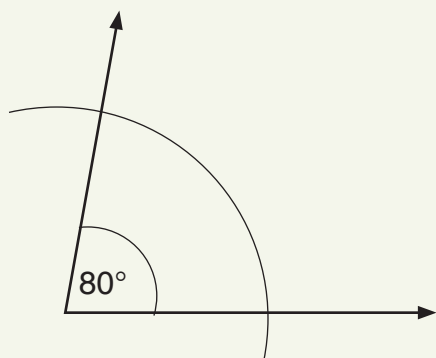
3.

a.

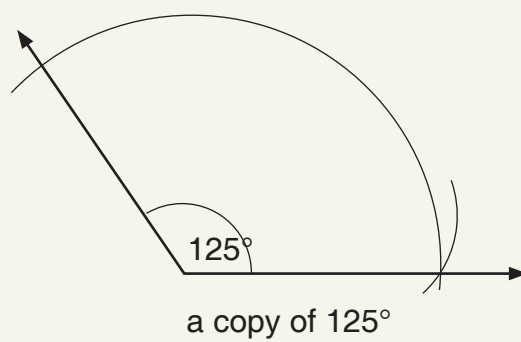
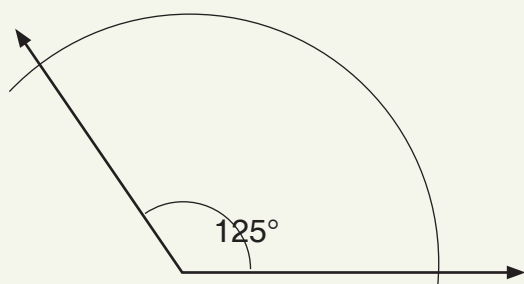


a copy of 45°

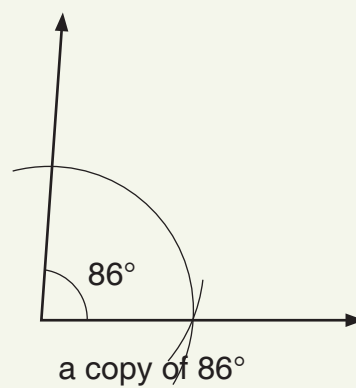
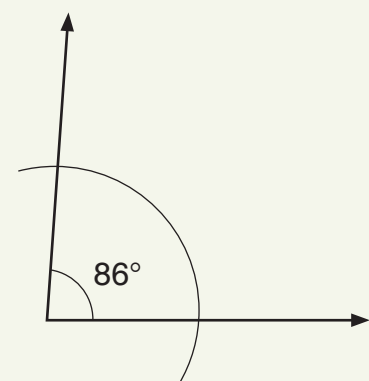
b.



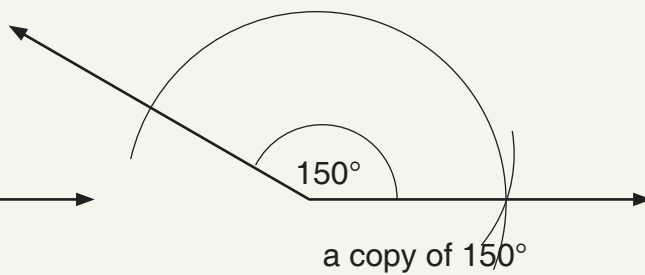
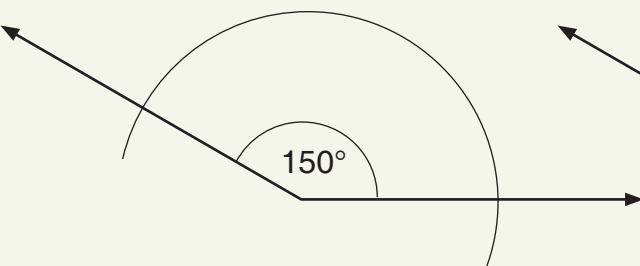
c.



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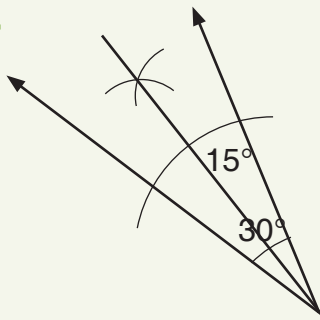


Exercise 2

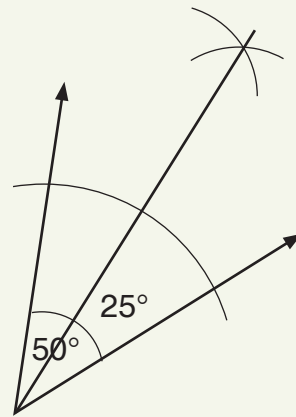
(LB page 243)

1.

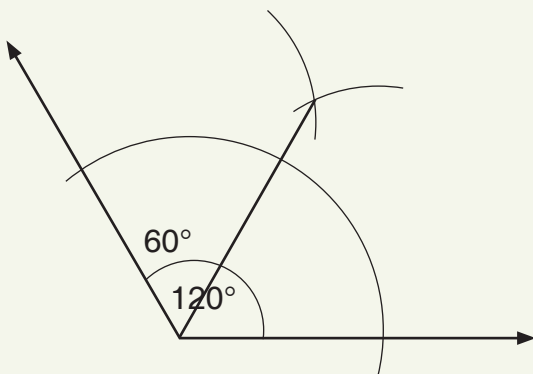
a.



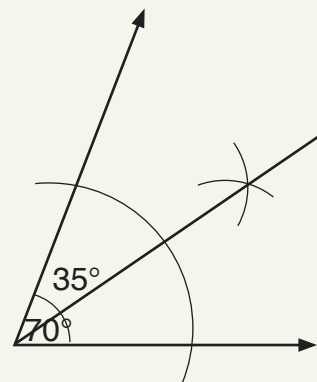
b.



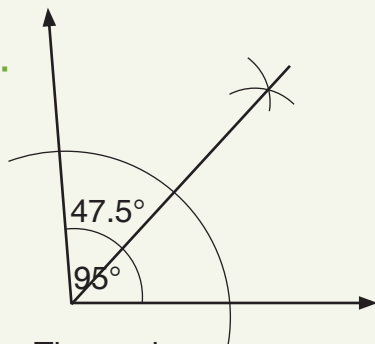
c.



d.



e.

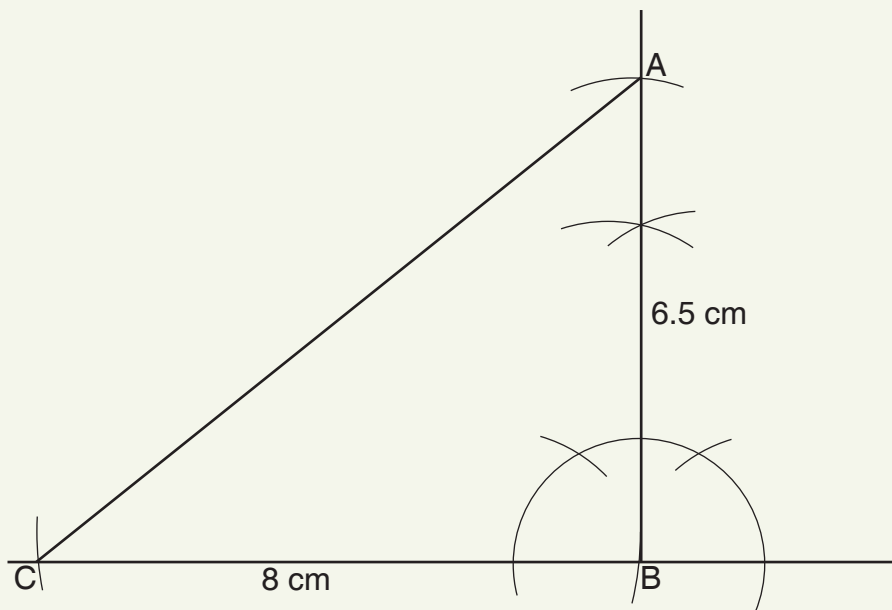


The angles are congruent.

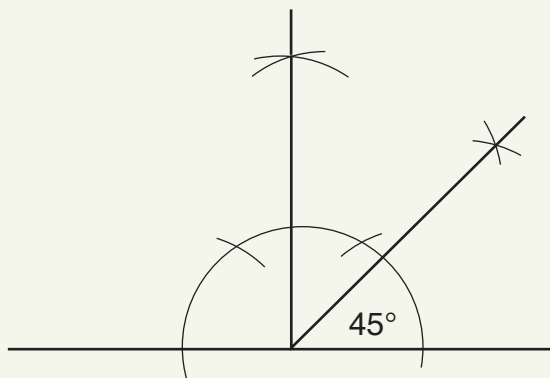
Exercise 3

(LB page 245)

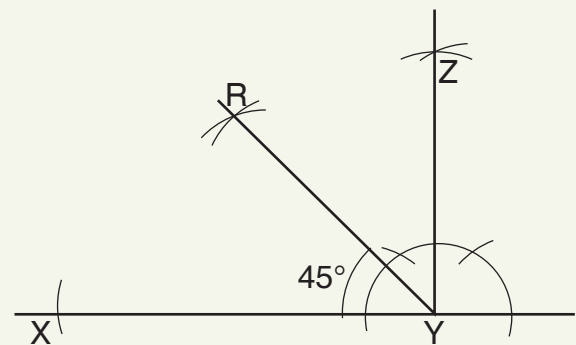
1.



2.

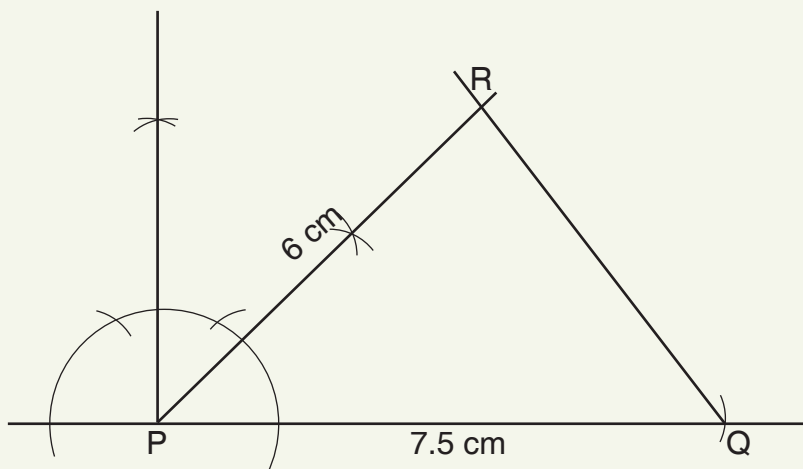


3.



$\angle XYR$ is a bisector of $\angle XYZ$

4.



Sub-strand 1: Shape and space

Module 5

Construction of angles 2

Content standard

B7.3.1.2 Demonstrate how to construct a perpendicular to a line from a given point, bisect a line, bisect angles, and construct angles of the following sizes: 30° , 45° , 60° , 75° and 90° .

Indicator

B7.3.1.2.5 Construct angles of 60° and 30° .

Learning expectations: In this module, learners will learn how to:

- Construct angles of 60° and 30° and verify the sizes with the protractor.
- Construct angles of 75° and 15° .
- Identify angle bisectors and perpendicular bisectors in the environment.

Essential for learning: Learners can construct angles of 90° and bisect angles.

Resources: Mathematical sets

Keywords: line segment, construct, verify, measure, bisect, perpendicular

Competencies: Critical thinking and problem-solving

Starter: Refer learners to the Starter activity on page 246 in the Learner's Book for the warming up activity.

Main idea 1

Constructing angles 60° and 30°

LB page 246

Activity 1: Demonstrate how to construct an angle of 60° on the board.

Activity 2: In pairs, ask learners to read through the steps on page 246 in the Learner's Book. Ask learners to construct an angle of 60° . Guide them to bisect an angle of 60° to construct two angles of 30° .

Activity 3: Ask learners to work through the Worked examples on pages 247 and 248 in the Learner's Book.

Review exercise

Place learners in mixed-ability groups.

Using a compass and a ruler only, ask learners to construct $\angle ABC$ 60° , AB 6 cm and BC 5.5 cm. They should measure the length of AC.

Assessment tasks ----- LB page 248

Learners use a compass and a ruler to construct and bisect angles.

Suggested homework

Ask learners to construct the bisector of an angle of 60° .

Main idea 2

Constructing angles 75° and 15°

LB page 249

Activity 1: Ask learners to open the Learner's Book on page 249 and read through the seven steps that explain how to construct angles of 75° and 15° . Ask learners to construct an angle of 75° .

Activity 2: Ask learners to read through the three steps about how to construct an angle of 15° on page 250 in the Learner's Book. Ask learners to construct an angle of 60° , bisect it to create two angles of 30° then bisect one angle of 30° to create two angles of 15° .

Activity 3: Work through the Worked examples on pages 247 and 248 in the Learner's Book with learners.

Review exercise

Using a compass and ruler only, construct angles of 60° , 30° and 15° .

Assessment tasks ----- LB page 250

Learners construct different angles and bisect an angle.

Suggested homework

1. Construct an angle of 70° , bisect it and measure the two angles.
2. Construct an angle of $7\frac{1}{2}^\circ$.

Main idea 3

Identifying perpendicular and angle bisectors in the environment

LB page 251

Group activity: Place learners in convenient groups. Ask them walk around the school compound and identify objects that have been made using perpendicular bisectors. When they return to the class, they record their findings and report to the class.

Assessment tasks ----- LB page 251

Learners identify right angles on objects and they estimate sizes of angles.

(Suggested project work)

Continuing to work in their groups, learners identify objects in their environment. They look for perpendicular bisectors in structures such as buildings. The groups take notes and present their findings to the class two days later.

Revision 8

Shapes and space ----- LB page 253

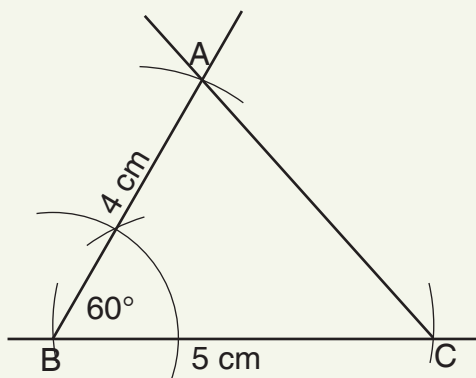
Learners answer the Revision questions on page 253 of the Learner's Book as a class test.

Answers to Assessment tasks

Main Idea 1

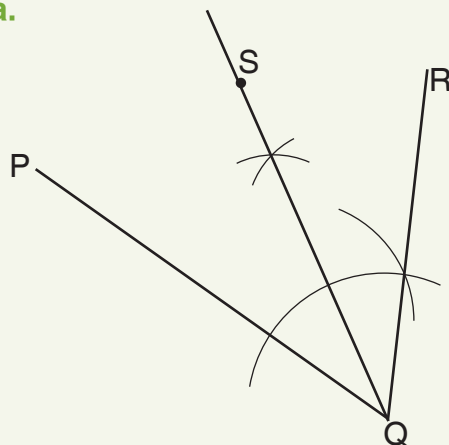
(LB page 248)

1.



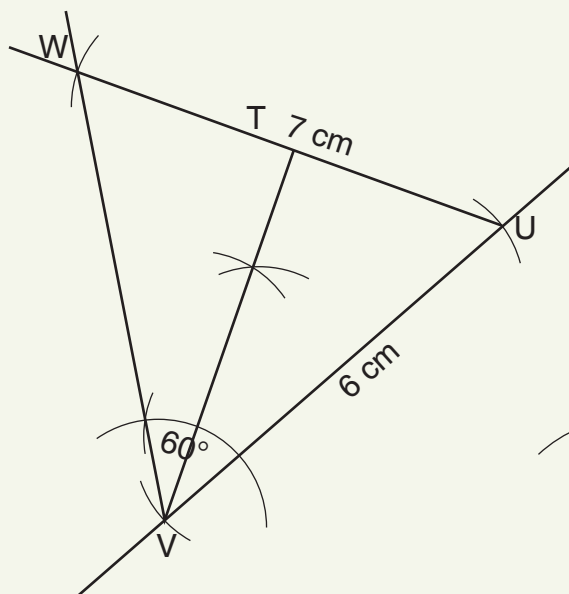
Measure: $AC = 5 \text{ cm}$

2. a.



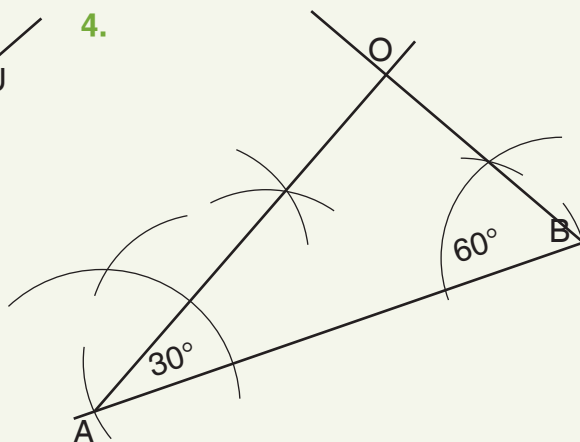
b. Measure: $\angle PQS = \angle SQR = 30^\circ$

3. a.



b. $\angle WVT = 30^\circ$

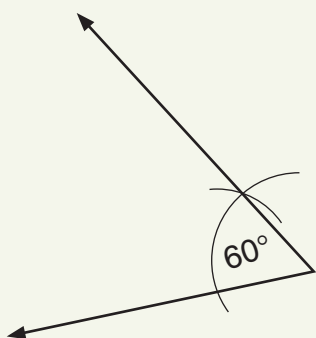
4.



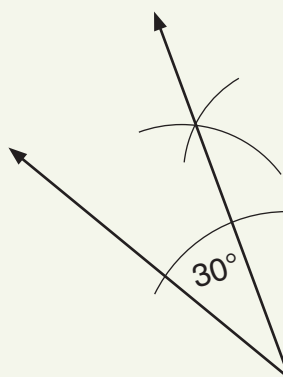
Main Idea 2

(LB page 250)

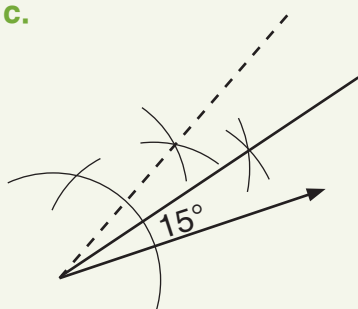
1. a.



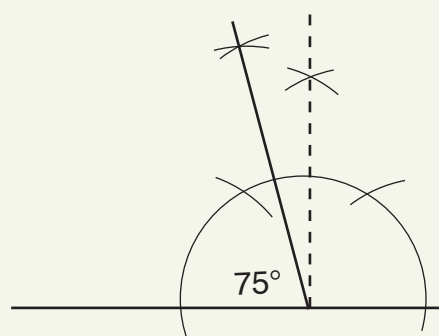
b.



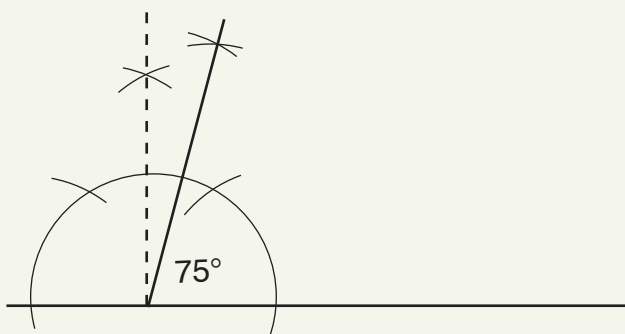
c.



d.



2.



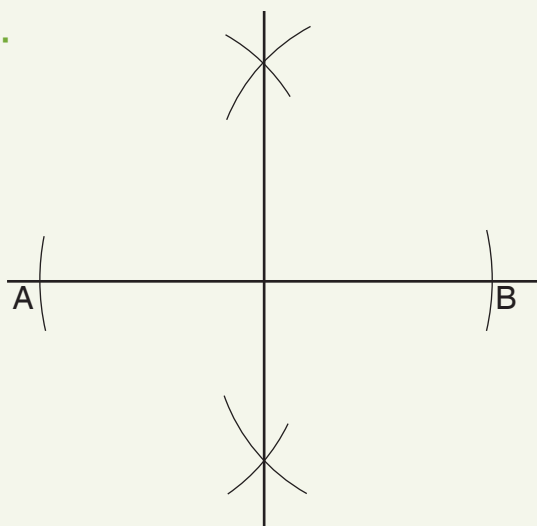
Main Idea 3

(LB page 251)

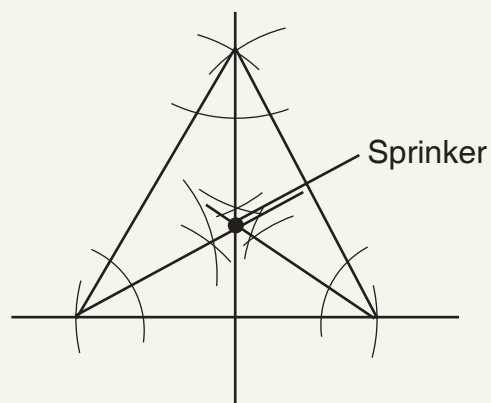
1. Check learners' answers.

2. Check learners' answers.

3.

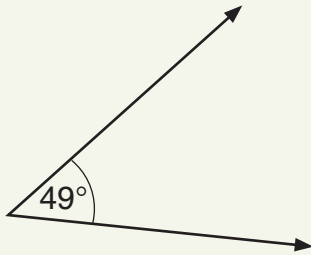


5.



(LB page 253)

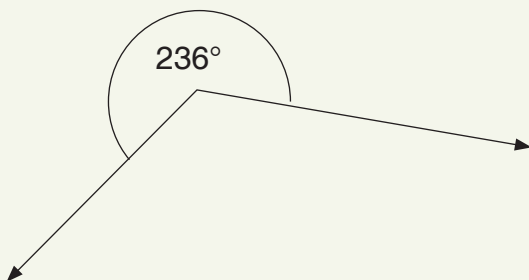
1. a. acute angle



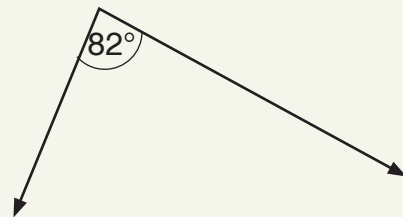
b. obtuse angle



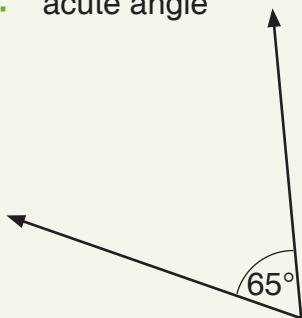
c. reflex angle



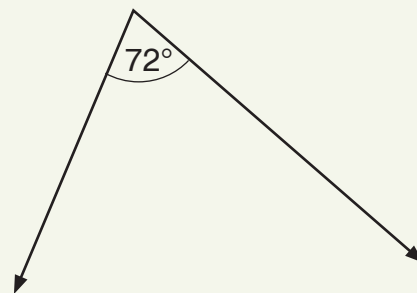
d. acute angle



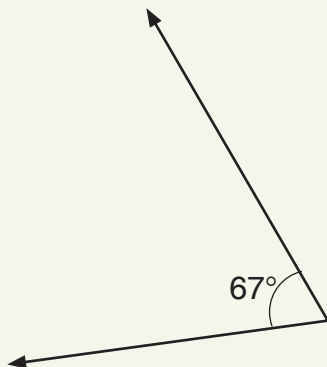
e. acute angle



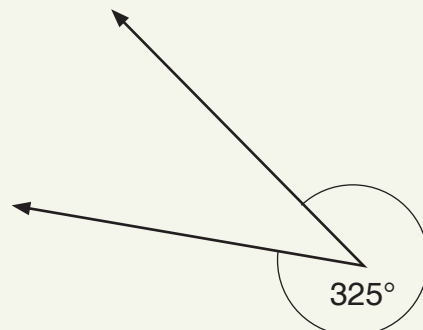
f. acute angle



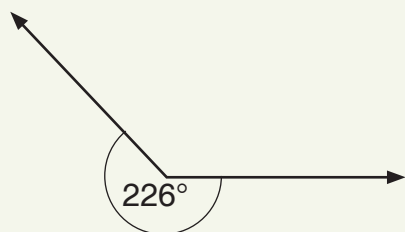
g. acute angle



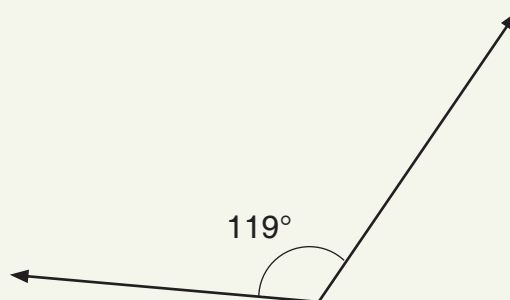
h. reflex angle



i. reflex angle



j. obtuse angle



2. a. $x = 45^\circ$

b. $x = 50^\circ$

c. $x = 10^\circ$

3. a. 27°

b. 63°

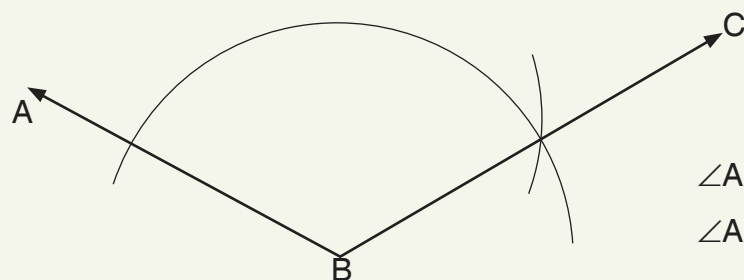
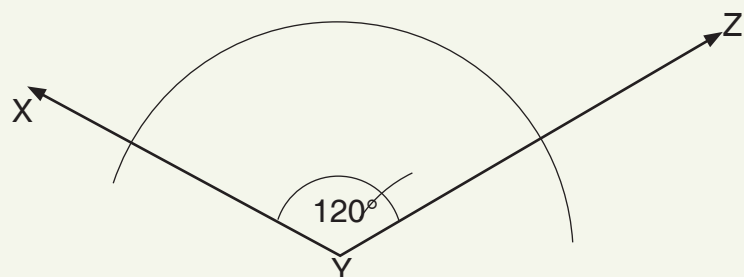
c. 45°

4. a. 70°

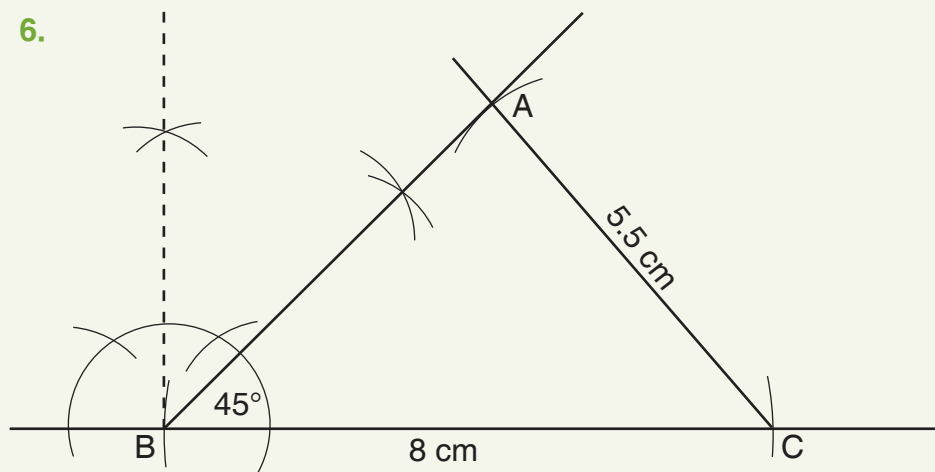
b. 21°

c. 82°

5.

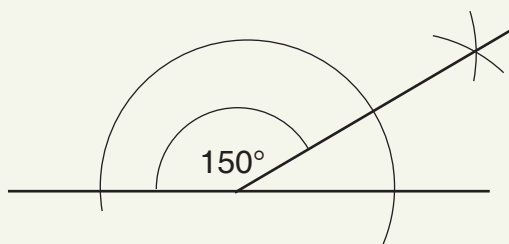


6.

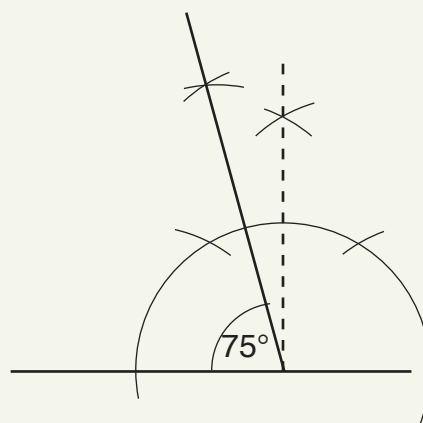


Measure: $\overline{AB} = 6.1$ cm

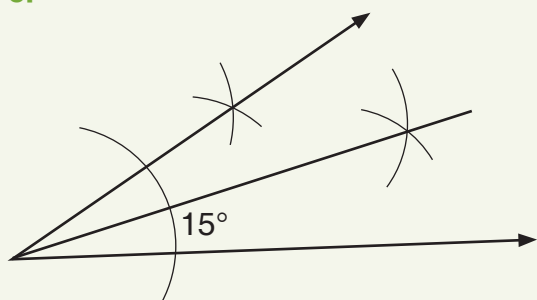
7. a.



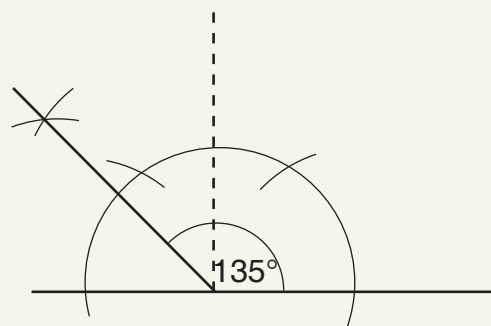
b.



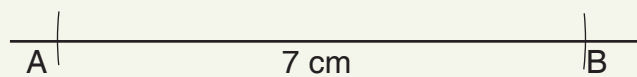
c.



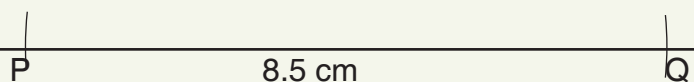
d.



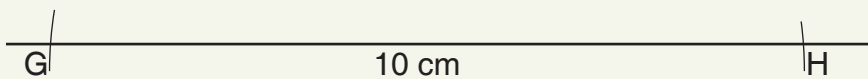
8. a.



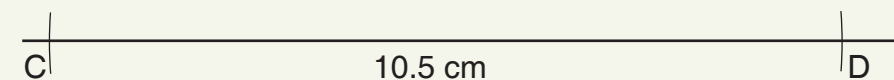
b.



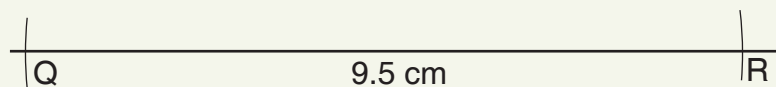
c.



d.



e.



Sub-strand 2: Measurement**Module 1****Perimeter of plane shapes****Content standard**

B7.3.2.1 Demonstrate the ability to find the perimeter of plane shapes including circles using the concept of pi (π) to find the circumference of a circle.

B7.3.2.2 Derive the formula for determining the area of a triangle and use it to solve problems.

Indicator

B7.3.2.1.1 Calculate the perimeter of given shapes whose dimensions are in two units (i.e. cm and mm, m and cm, or km and m)

B7.3.2.1.2 Use the relationships between the diameter and the circumference to deduce the formula for finding the circumference of a circle and use it to solve problems.

B7.3.2.1.3 Draw in a square grid rectangles and triangles with given dimensions.

B7.3.2.2.1 Use the relationships between a triangle and a rectangle (or parallelogram) to deduce the formula for determining the area of a triangle.

B7.3.2.2.2 Determine the area of a triangle.

Learning expectation: In this module, learners will learn how to:

- Calculate the perimeters of given shapes.
- Solve real-life problems that involve perimeter.
- Circumference of a circle.
- Solve problems on circumference of a circle.
- Draw rectangles with given dimensions.
- Draw triangles with given dimensions.
- Deduce the formula area of a triangle.
- Determine the area of a triangle.

Essentials for learning: Learners can:

- Identify the various plane shapes.
- Draw simple plane shapes.
- Recognise the differences in the various units of measurement of length.
- Determine the perimeter of given plane shapes (ideas from Primary school).

Resources: Pencils, notebooks, a straight rule, geodot/graph sheet, empty containers (milk, Milo, tin tomatoes etc.)

Keywords: perimeters, distance, plane shapes, circumference

Competencies: Critical Thinking and problem-solving, creativity and innovation, communication and collaboration, personal development and leadership and digital literacy

Starter: Refer to the Starter activity on in the Learner's Book on page 254. Ask learners to pair share their ideas during a class discussion..

Main idea 1

Calculating the perimeter of given shapes

LB page 254

Activity 1: Lead a class discussion about what a perimeter is. Draw learners' attention to what they learnt about perimeter in primary school. You may use these guided questions;

- What does perimeter mean to you in your everyday activities?
- For which objects have you measured perimeter?
- What units did you use when you measured perimeter?
- What is the relationship between perimeter and area?

Place learners in convenient groups and task them to measure the perimeter of some items they can find in the classroom (such as exercise books and desk tops)

Give learners questions from the Learner's Book to solve in their groups.

Activity 2: Demonstrate how to determine the perimeter when different parts are given in different units.

Give each groups similar problems to solve. Visit groups to offer assistance where necessary.

Ask groups to present their work to the class.

Give learners the opportunity to contribute to and react to the presentations.

Wrap up the presentations by giving all information that is missing from learners' presentations and address all misconceptions.

Refer learners to Worked examples on pages 257 to 259 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Learners determine the perimeter of given shapes in different units.

Challenging activity

Learners determine the perimeter of given shapes in different units and solve real-life problems involving perimeter.

Assessment tasks ----- LB page 259

Learners answer questions about perimeter.

Main idea 2

Real-life problems involving perimeter

LB page 260

Activity 1: Review learners' previous knowledge of perimeter and discuss how they learners handled homework about perimeter. Encourage them to talk about their successes and challenges too.

Give learners a few real-life examples to solve by referring to examples in the Learners' Book.

Ask learners to explain the strategies they used in breaking the word problem into a mathematical sentence.

Activity 2: Place learners in mixed-ability groups.

Ask them to create their own simple word problems about perimeter and solve them together.

Ask a few groups to present their work to the whole class.

Encourage members of the class to ask questions and make contributions to the presentation.

Wrap up on the presentations by giving all information missing from learners' presentations and address all misconceptions.

Refer learners to the Worked examples on pages 260 and 261 in the Learner's Book. Work through the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to solve real-life problems that involve perimeter.

Challenging activity

Learners create their own questions about real-life applications of perimeter and solve their questions. Then they explain the strategies they used to solve the problems.

Assessment tasks ----- LB page 262

Learners solve word problems that involve perimeter.

Activity 1: Assess with a few questions what learners' previous knowledge is about finding the perimeter of plane shapes.

Place learners in convenient groups and ask them to discuss the parts of a circle.

Ask a few groups to take turns to tell the class what they know about the parts of a circle. Allow the class take part in the presentations.

Activity 2: As learners are in their groups, show them a few circular containers of different sizes.

Ask each group to investigate the relationship between the diameter and circumference of a few containers.

Ask a few groups to present their findings to the class.

Give the class the opportunity to contribute to the presentations.

Write the diameters and circumferences learners obtained in a table on the board for whole class discussions.

Engage learners to critically think through why measurements have approximately the same value even though they used different containers.

Conclude the discussion by giving learners all the information that learner did not include in their presentations and address all misconceptions.

Activity 3: Refer learners to the Learner's Book for examples and ask learners to solve problems; this will help them to consolidate their ideas on the circumference and perimeter of a circle.

Give learners with some real-life examples to solve.

Ask learners to explain the strategies they used to work out how to solve a word problem and write a mathematical sentence.

Wrap up on the lesson by providing any further information and addressing all misconceptions.

Refer learners to the Worked examples on page 265 in the Learner's Book. Discuss the examples with them.

Review exercise

Differentiated assessment

Remedial activity

Ask the learners to name the parts of a circle and give the function of each part. State the (formula) relationship between diameter and circumference.

Find the circumference or perimeter of a given circle.

Challenging activity

Ask learners to name the parts of a circle and state the function of each part and to determine the relationship between diameter and circumference and give reasons.

Ask learners to create and solve real-life problems involving the perimeter or circumference of a circle.

Assessment tasks ----- LB page 266

Learners answer questions that involve the radius, diameter and circumference of circles.

Main idea 4

Drawing rectangles and triangles on a square grid
LB page 266

Activity 1: Review previous lessons on drawing plane shapes and finding the perimeter of plane shapes.

Place learners in convenient groups and present each group with pieces of paper with geodots, graph paper or grids.

Ask groups to draw any two different rectangles with different perimeters.

Ask groups to present their work to the class.

Activity 2: Ask each group to draw rectangles with given perimeters.

Ask groups to present their work to the class.

Give the class the opportunity to contribute to the presentations.

Ask groups to find more examples in the Learner's Book.

Activity 3: Ask groups to draw two different triangles with different perimeters of their choice.

Ask groups to present their work to the class.

Ask each group to draw triangles with given perimeters.

Ask a few groups to present their work to the class.

Ask groups to find more examples in the Learner's Book.

Wrap up on the presentations by giving all information that was missing from learners' presentations and addressing all misconceptions.

Activity 4: Ask groups to draw a rectangle on a geodot or on a grid.

Ask each group to create two triangles inside the rectangle.

Lead a class discussion about the relationship between the triangle and the rectangle.

Help learners to deduce the formula for calculating the area of a triangle by realising that the area of a triangle is half the area of a rectangle.

Activity 5: Ask groups to determine the area of rectangles that are drawn on the square grid.

Ask a few groups to present their work to the class.

Give the class the opportunity to contribute to the presentations.

Ask groups to look for more examples of calculating area in the Learner's Book.

Wrap up on the presentations by giving all information that missing from learners' presentations and addressing all misconceptions.

Refer learners to the Worked examples on pages 269 and 270 in the Learner's Book. Go through the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to draw rectangles and triangles for given perimeters.

Ask them to give the formula for calculating the area of a triangle.

Ask learners to calculate the area of given drawn triangles or when they have only been given dimensions.

Challenging activity

Ask learners to draw different triangles and rectangles for the same given perimeters.

Ask learners to deduce the formula for calculating the area of a triangle that is drawn on a square grid.

Ask learners to calculate the area of two triangles that are drawn on a grid or or when only given dimensions.

Ask learners to draw a few triangles and determine the area of each one.

Assessment tasks ----- LB page 270

Learners draw squares, rectangles and triangles with given areas and the calculate the areas of triangles.

Answers to Assessment tasks

Main Idea 1

(LB page 259)

- | | | |
|----------|----------|----------|
| 1. 12 cm | 2. 16 cm | 3. 13 cm |
| 4. 90 cm | 5. 36 cm | 6. 6 cm |

Main Idea 2

(LB page 262)

- | | | | |
|----------|-----------|-----------|------------|
| 1. 555 m | 2. 58.5 m | 3. 165 cm | 4. 64 feet |
|----------|-----------|-----------|------------|

Main Idea 3

(LB page 266)

- | | | | |
|------------|---------|-----------|-------------|
| 1. 66 cm | 2. 42 m | 3. 154 cm | 4. 75.36 cm |
| 5. 24.5 cm | 6. 5 cm | 7. 18 cm | 8. 47 cm |

9. a. 88 cm
b. 132 cm
c. 264 cm
d. 176 cm

Main Idea 4

(LB page 270)

1. Check learner's answers.
2. Check learner's answers.
3. a. 6 cm^2 b. 16 m^2 c. 6 ft^2 d. 70 m^2 e. 20 m^2 f. 63 in^2

Sub-strand 2: Measurement

Module 2

Describing the bearing of a point from another point

Content standard

B7.3.2.3 Demonstrate understanding of bearings, vector and its components using real life cases

Indicator

B7.3.2.3.1 Describe the bearing of a point from another point.

B7.3.2.3.2 Explain how to find the back bearing when the direction of travel has a bearing that is less than 180° and/or greater than 180° .

Learning expectation: In this module, learners will learn how to:

- Describe the bearing of a point from another point.
- Determine the back bearing of a given bearing.

Essentials for learning: Learners can:

- Measure angles using the protractor.
- Describe and use the Cartesian plane.

Resources: Pencils, notebooks, a straight rule, protractor

Keywords: bearing, vector

Competencies: Critical thinking and problem-solving, creativity and innovation, communication and collaboration, personal development and leadership and digital literacy

Starter: Refer to the Starter activity on page 271 in the Learner's Book. Tell learners they can play the trick among themselves.

Main idea 1

Describing the bearing of a point from another point
LB page 272

Activity 1: Assess how well learners can use a protractor to measure angles and how well they remember the different the quadrants on the Cartesian plane.

Discuss the meaning of bearing with the class and demonstrate some examples for learners.

Activity 2: Place learners in convenient groups. Ask them to draw the Cartesian plane and measure a given angle with the protractor.

Guide learners to describe the angles in terms of bearings. Explain to learners that bearings are written in three figures.

Also, discuss the concept of true bearings. Then ask the groups to express vector components graphically including drawing vectors given their length and bearing.

Wrap up on the presentations by giving all information that is missing from learners' presentations and addressing all misconceptions.

Activity 3: Demonstrate the concept of back bearing to the class.

Place learners in convenient groups.

Give learners a few examples on back bearing from the Learner's Book to solve.

Activity 4: Engage learners in a discussion about the conditions for forward bearing and for back bearing.

Engage learners with some more examples on both forward and back bearings to solve in pairs.

Wrap up by giving all necessary information and addressing all challenges and misconceptions.

Refer learners to the Worked examples on pages 272 and 273 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to measure an angle and describe it in bearing form.

Find the back bearing of a given bearing.

Challenging activity

Ask learners to draw a vector given its length and bearing.

Differentiate between back and forward bearing and calculate the back bearing of a given bearing.

Assessment tasks ----- LB page 277

Learners find bearings.

Answers to Assessment tasks

Main Idea 1

(LB page 277)

- | | | | | |
|----|-----------------|-----------------|-----------------|-----------------|
| 1. | A1: 065° | A2: 075° | A3: 125° | A4: 105° |
| | B1: 230° | B2: 250° | B3: 280° | B4: 280° |
| | C1: 105° | C2: 070° | C3: 050° | C4: 255° |
| 2. | a. 235° | b. 125° | c. 315° | d. 270° |
| | | | | e. 135° |

Sub-strand 2: Measurement

Module 3

Scalar and vector quantities

Content standard

B7.3.2.3 Demonstrate understanding of bearings, vector and its components using real-life cases.

Indicator

B7.3.2.3.3 Distinguish between scalar and vector quantities.

B7.3.2.3.4 Represent a vector in the column (component) form $\begin{pmatrix} x \\ y \end{pmatrix}$ and determine its magnitude and direction.

B7.3.2.3.5 Convert vectors in the column (component) form $\begin{pmatrix} x \\ y \end{pmatrix}$ to the magnitude-bearing form $\begin{pmatrix} k \\ \theta \end{pmatrix}$ and vice versa.

Learning expectation: In this module, learners will learn how to:

- Distinguish between scalar and vector quantities.
- Determine the magnitude and direction of a given vector.
- Convert column vectors to magnitude-bearing form.

Essentials for learning: Learners can:

- Describe the bearing of a point from another point.
- Represent the vector in the column form $\begin{pmatrix} x \\ y \end{pmatrix}$ and determine its magnitude and direction.
- Convert vectors in the column form $\begin{pmatrix} x \\ y \end{pmatrix}$ to the magnitude-bearing form $\begin{pmatrix} x \\ y \end{pmatrix}$ and vice versa.

Resources: Pencils, notebooks, a straight rule

Keywords: magnitude, volume, direction, acceleration, velocity, speed, time

Competencies: Critical thinking and problem-solving, creativity and innovation, communication and collaboration, personal development and leadership and digital literacy

Starter: Refer learners to the Starter activity on page 279 in the Learner's Book and ask them to play the game.

Main idea 1

Distinguish between scalar and vector quantities

LB page 279

Activity 1: Review learners' understanding of how to describe the bearing of one point from another point and determining the back bearing of a given bearing.

Place learners in convenient groups. Ask them to discuss the differences between scalar and vector quantities using ideas from their Science lessons.

Ask a few groups to make a presentation to the class and then conclude the presentations by addressing any misconceptions.

Activity 2: Discuss zero vector with examples from the Learner's Book.

Wrap up the lesson by giving all information that is missing from learners' contributions and addressing all misconceptions.

Refer learners to the Worked examples on page 280 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to give examples of scalar and vector quantities.

Challenging activity

Ask learners to distinguish between scalar and vector quantities with examples.

Assessment tasks ----- LB page 281

Learners draw vectors on graph paper.

Main idea 2

Expressing vectors graphically

LB page 281

Activity 1: Assess learners' understanding of how to distinguish between scalar and vector quantities.

Demonstrate to the class how to represent vectors graphically.

Allow learners to ask questions for clarification.

Activity 2: Place learners in convenient groups. Ask them to solve a few examples in the Learner's Book.

Ask a few groups to make a presentation to the class.

End the presentations by giving all information that missing from learners' presentations and addressing all misconceptions.

Refer learners to the Worked example on pages 281 and 282 in the Learner's Book. Discuss the examples with learners.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to represent vectors graphically.

Challenging activity

Ask learners to represent vectors graphically and create their own problems for others to solve.

Assessment tasks ----- LB page 282

Learners represent vectors graphically and determine the magnitude and direction of a vector.

Main idea 3

Drawing a vector graphically

LB page 282

Activity 1: Assess how well learners remember how to represent vectors graphically.

Demonstrate to the class how to draw a given vector graphically.

Allow learners to ask questions for clarification.

Activity 2: Place learners in convenient groups. Ask learners to solve a few examples from the Learner's Book.

Ask a few groups to make a presentation to the class.

End the presentations by giving all information that is missing from learners' presentations and addressing all misconceptions.

Refer learners to the Worked examples on pages 283 - 284 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to draw vectors graphically.

Challenging activity

Ask learners to draw vectors graphically and create their own problems for others to solve.

Assessment tasks ----- LB page 284

Learners draw vectors.

Main idea 4

Converting a bearing from distance-bearing to component form **LB page 284**

Activity 1: Assess how well learners remember how to draw vectors graphically.

Discuss the the examples given in the Learner's Book about how to convert a distance-bearing into component form.

Activity 2: Place learners in convenient groups. Give learners a few problems to solve (look at the examples in the Learner's Book).

Ask a few groups to make a presentation to the class.

End the presentations by giving all information missing from learners' presentations and addressing all misconceptions.

Refer learners to the Worked examples on page 285 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to convert a distance-bearing into component form

Challenging activity

Ask learners to convert a distance-bearing into component form and create their own examples to solve.

Assessment tasks ----- LB page 286

Learners convert bearings into component form.

Main idea 5

Converting vectors in the column (component) form to the Magnitude-Bearing form **LB page 286**

Activity 1: Assess how well learners remember how to represent vectors graphically and how to represent vectors in the column form and determine its magnitude and direction.

Discuss the information given in the learners' book on how to convert a vector in the column (component) form to the magnitude-bearing form.

Activity 2: Place learners in convenient groups. Give learners problems where they need to convert vectors in the column (component) form to the magnitude-bearing form (look at examples in the Learner's Book).

Ask a few groups to make a presentation to the class.

End the presentation by giving all information that is missing from learners' presentations and addressing all misconceptions.

Refer learners to the Worked examples on page 287 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated Assessment

Remedial activity

Ask learners to convert vectors in the column (component) form to the magnitude-bearing form.

Challenging activity

Ask learners to convert vectors in the column (component) form to the magnitude-bearing form and to create a few examples to solve.

Assessment tasks ----- LB page 287

Learners find the magnitudes of vectors.

Main idea 6

Converting vectors from component form to distance-bearing form

LB page 288

Activity 1: Assess how well learners remember how to convert vectors in the column (component) form to the magnitude-bearing form.

Discuss the information given in the Learner's Book about how to convert vectors in the column (component) form to the magnitude-bearing form.

Activity 2: Give groups problems to solve where they have to convert from component form to distance-bearing form. Learners can work with examples given in the Learner's Book.

- Ask groups to present their work to class.
- End the presentations by giving all information that is missing from learners' presentations and addressing all misconceptions.
- Refer learners to the Worked examples on pages 288–290 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to convert vectors from component form to distance-bearing form.

Challenging activity

Ask learners to write examples that show how to convert vectors from component form to distance-bearing form.

Assessment tasks ----- LB page 290

Learners write vectors in distance-bearing form.

Revision 9

Measurement ----- (LB page 291)

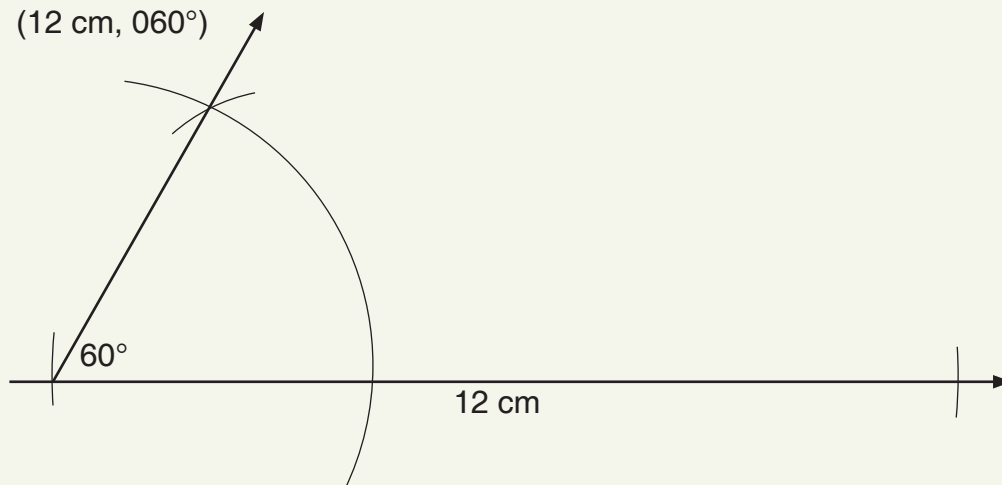
Learners answer the Revision questions as a class test.

Answers to Assessment tasks

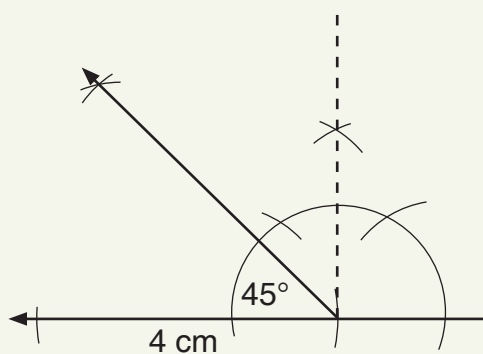
Main Idea 1

(LB page 281)

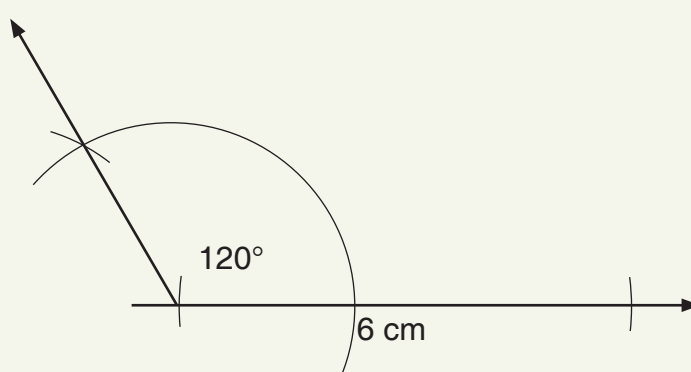
1. a. (12 cm, 60°)



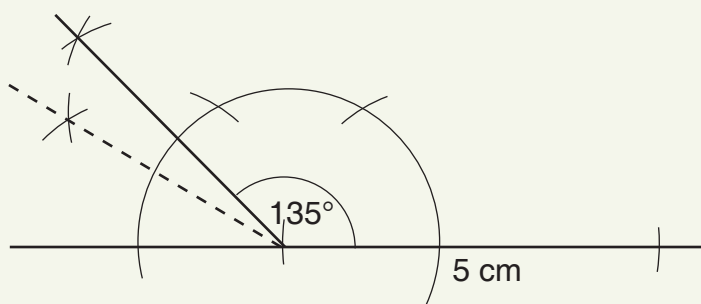
b. (4 cm, 45°)



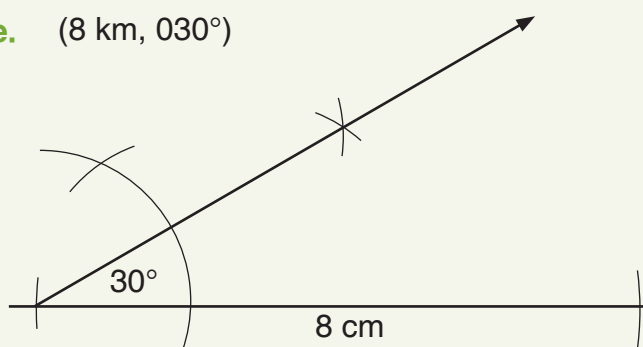
c. (6 cm, 120°)



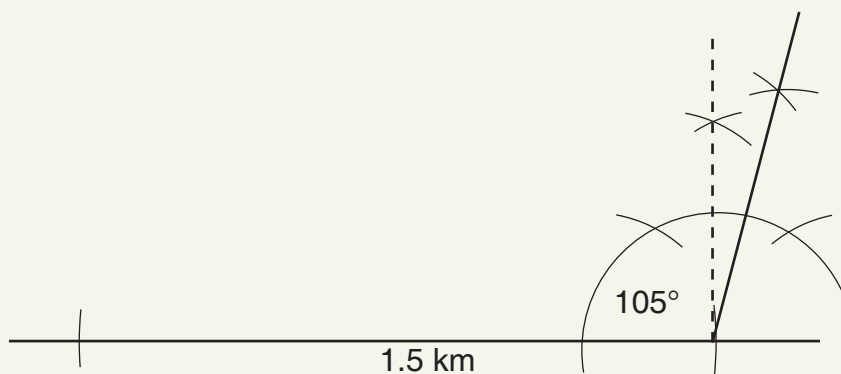
d. (5 km, 135°)



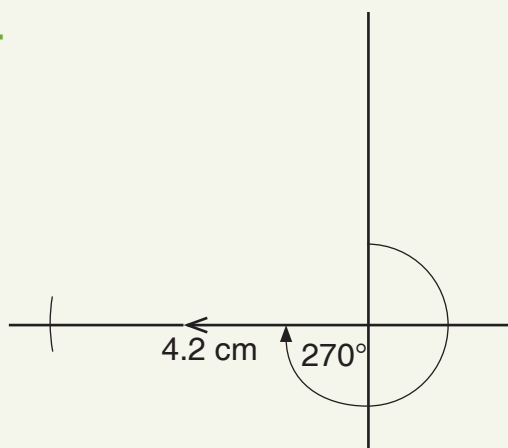
e. (8 km, 30°)



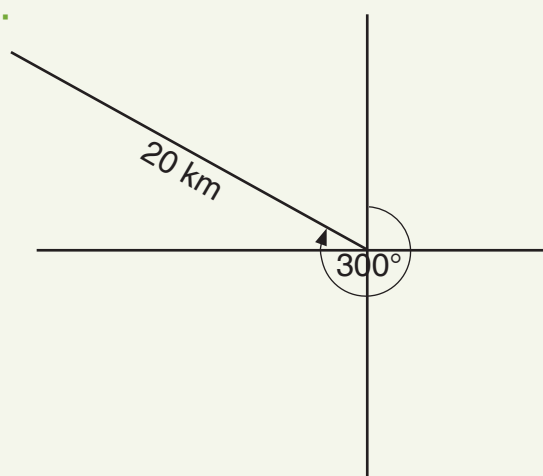
f. 1.5 km, 105°)



g.



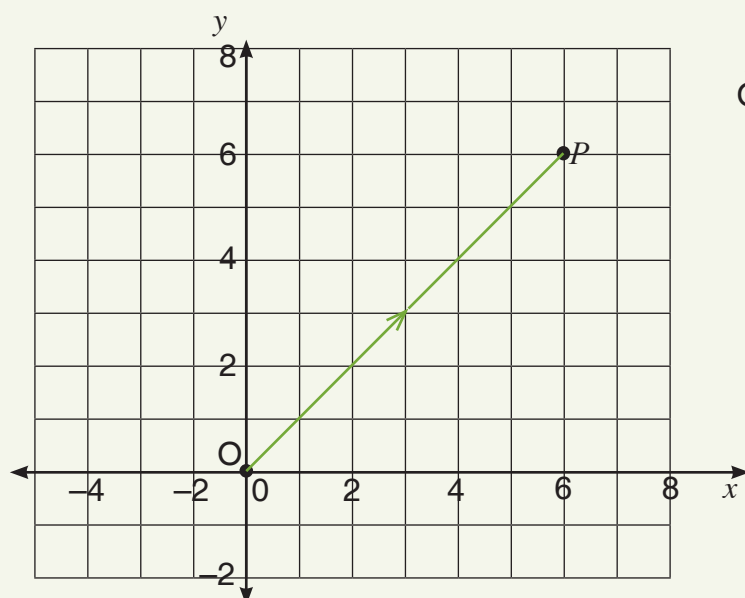
h.



Main Idea 2

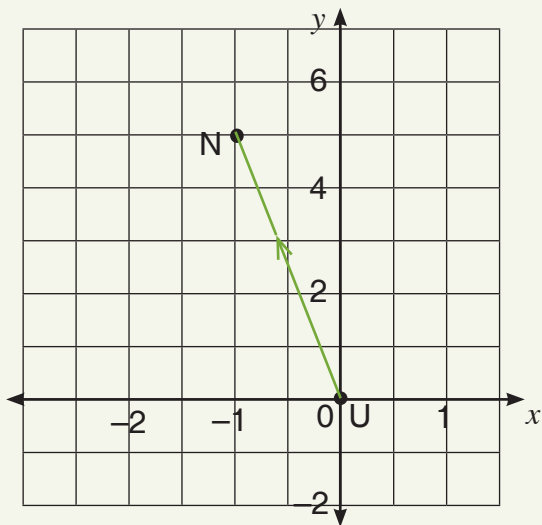
(LB page 282)

1. a.

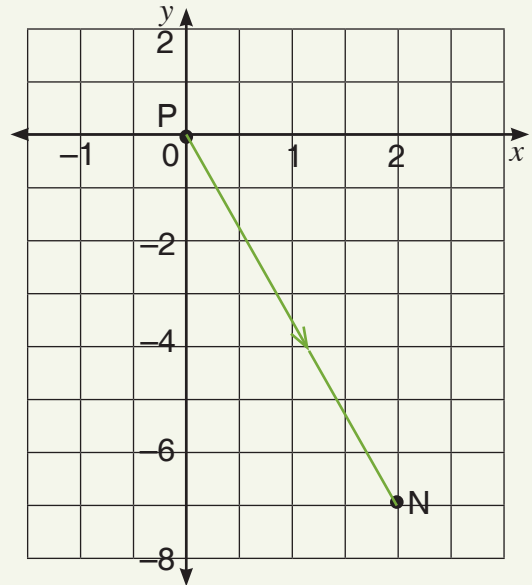


$$\vec{OP} = \begin{pmatrix} 6 \\ 6 \end{pmatrix}$$

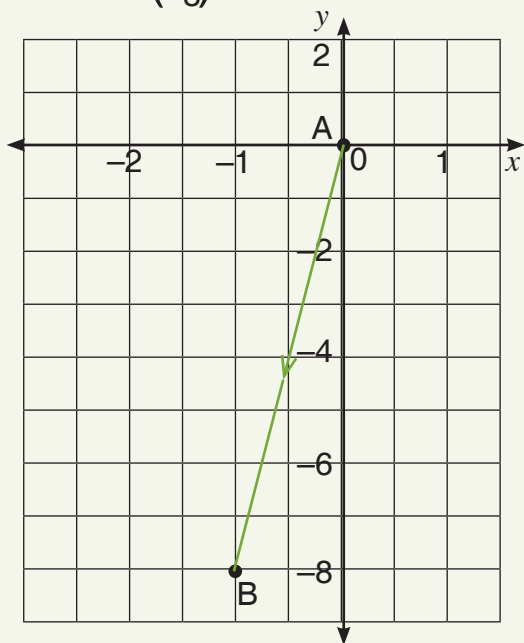
b. $\vec{UN} = \begin{pmatrix} -1 \\ 5 \end{pmatrix}$



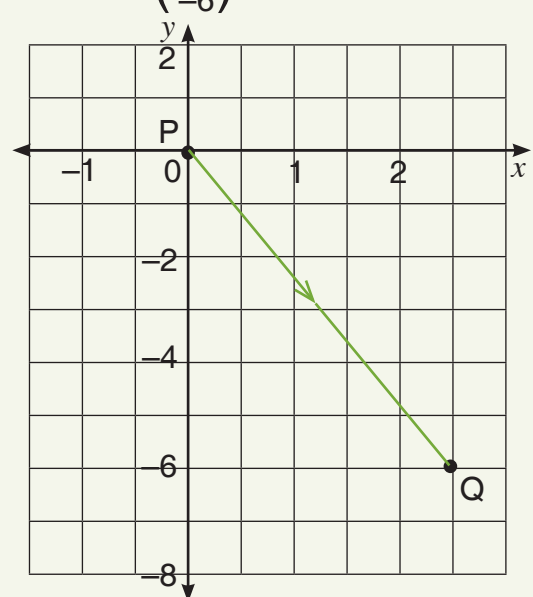
c. $\vec{PN} = \begin{pmatrix} 2 \\ -7 \end{pmatrix}$



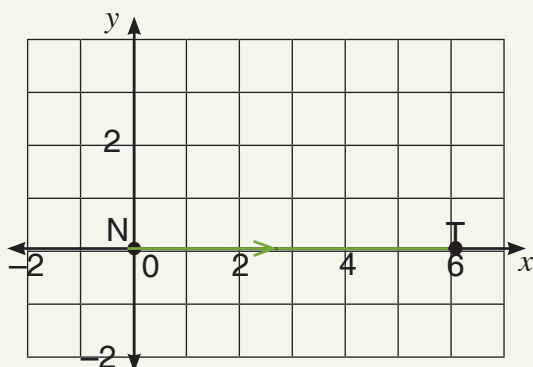
d. $\vec{AB} = \begin{pmatrix} -1 \\ -8 \end{pmatrix}$



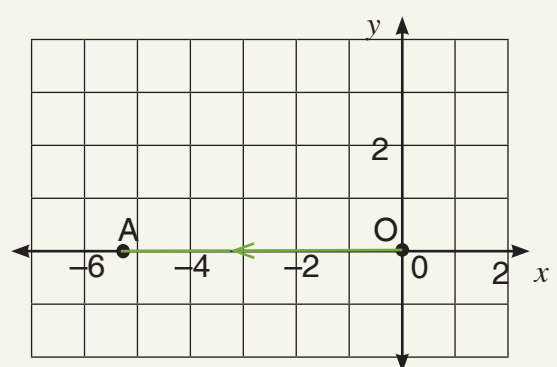
e. $\vec{PN} = \begin{pmatrix} 2.5 \\ -6 \end{pmatrix}$



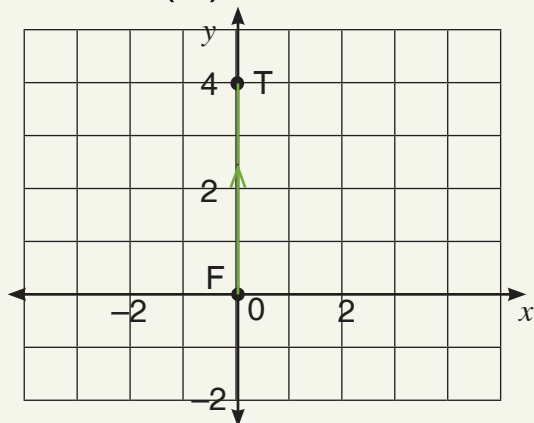
f. $\vec{NT} = \begin{pmatrix} 6 \\ 0 \end{pmatrix}$



g. $\vec{OA} = \begin{pmatrix} -5.2 \\ 0 \end{pmatrix}$



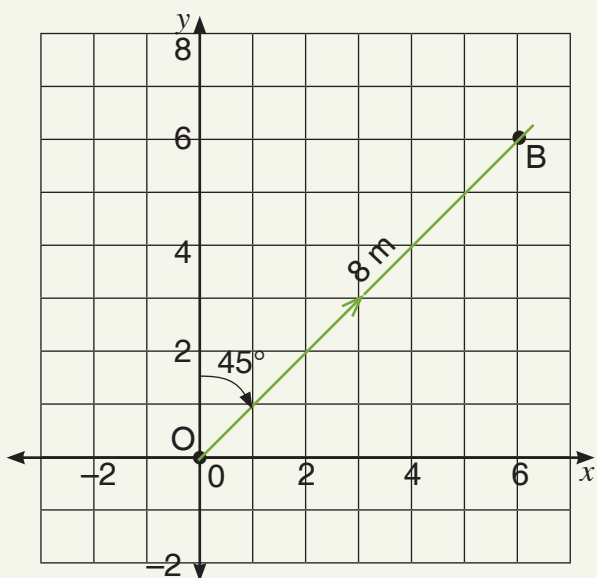
h. $\vec{FT} = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$



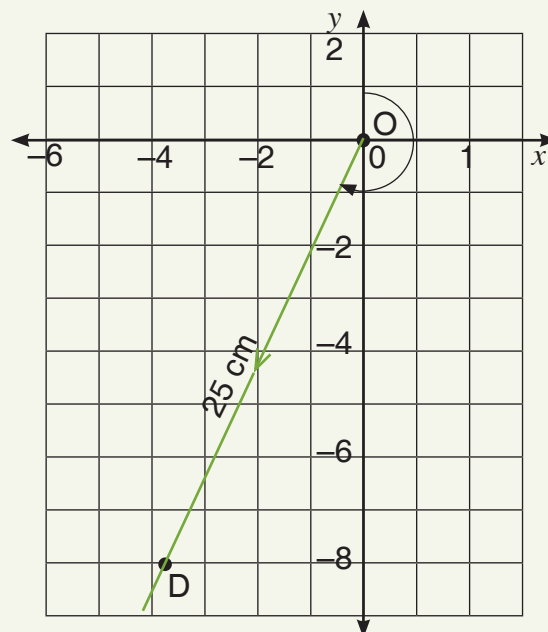
Main Idea 3

(LB page 284)

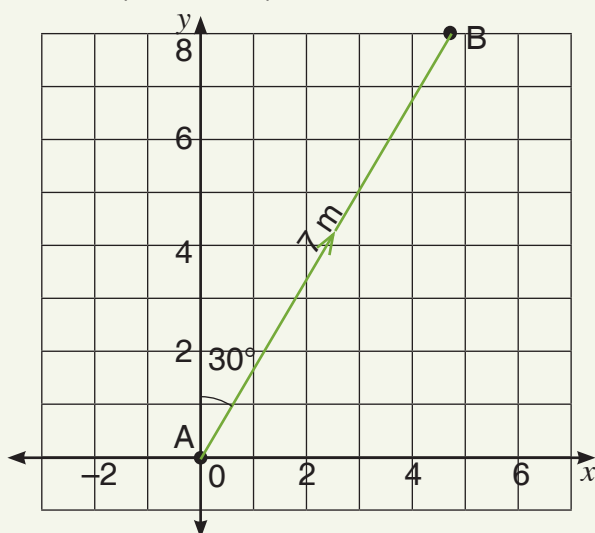
1. $\vec{OB} = (8 \text{ m}, 045^\circ)$



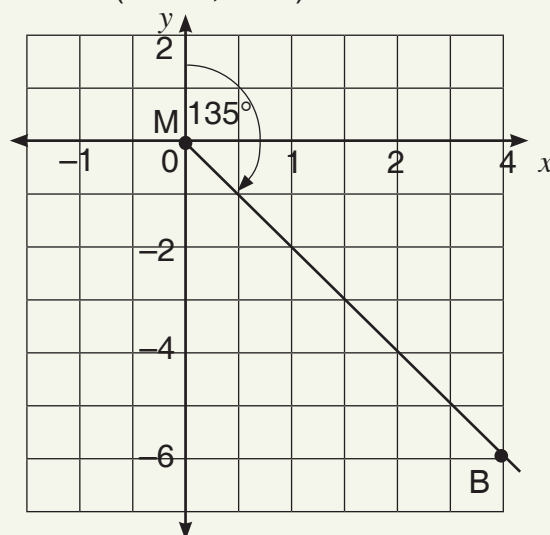
2. $\vec{OD} = (25 \text{ cm}, 205^\circ)$



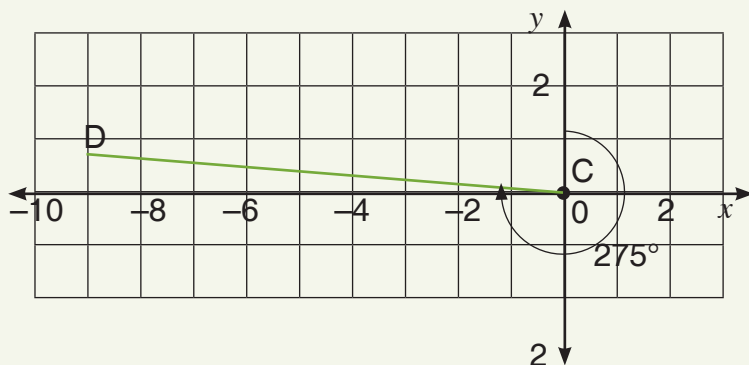
3. $\vec{AB} = (7 \text{ m}, 030^\circ)$



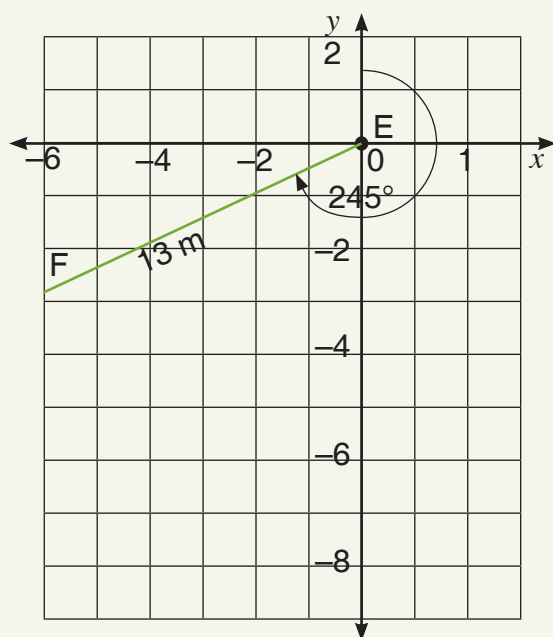
4. $\vec{MB} = (45 \text{ km}, 135^\circ)$



5. $\vec{CD} = (22 \text{ mm}, 275^\circ)$



6. $\vec{EF} = (13 \text{ m}, 245^\circ)$



Main Idea 4

(LB page 286)

1. $\begin{pmatrix} 5 \\ 0 \end{pmatrix}$

2. $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$

3. $\begin{pmatrix} 0 \\ 7 \end{pmatrix}$

4. $\begin{pmatrix} -3 \\ -1 \end{pmatrix}$

5. $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$

6. $\begin{pmatrix} -2 \\ 5 \end{pmatrix}$

Main Idea 5

(LB page 287)

1. 5

2. 11

3. 10

4. 6

5. 15

Main Idea 6

(LB page 290)

1. $\vec{OY} = (5 \text{ units}, 140^\circ)$

2. (10 units, 128°)

3. (6 units, 000°)

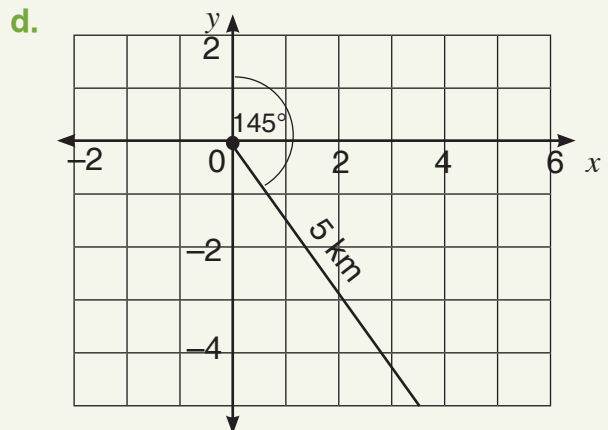
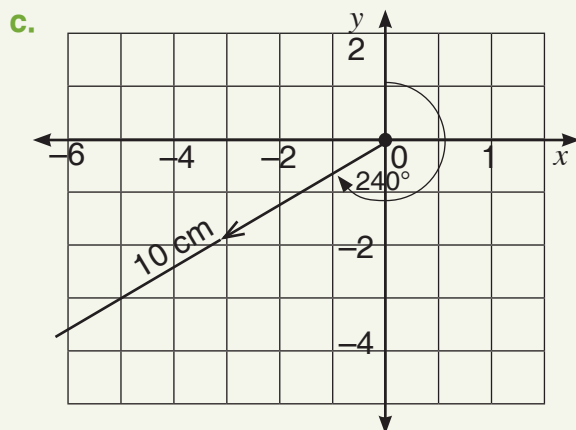
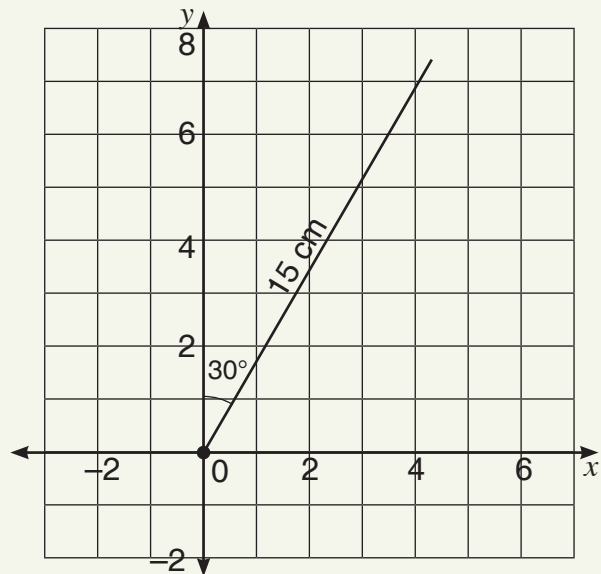
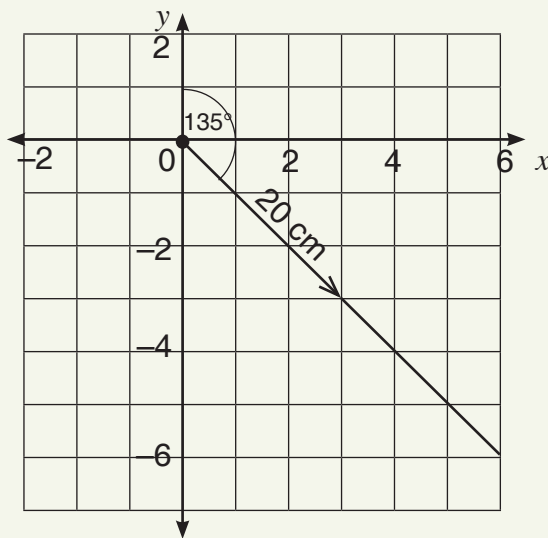
4. (5 units, 220°)

5. (11 units, 090°)

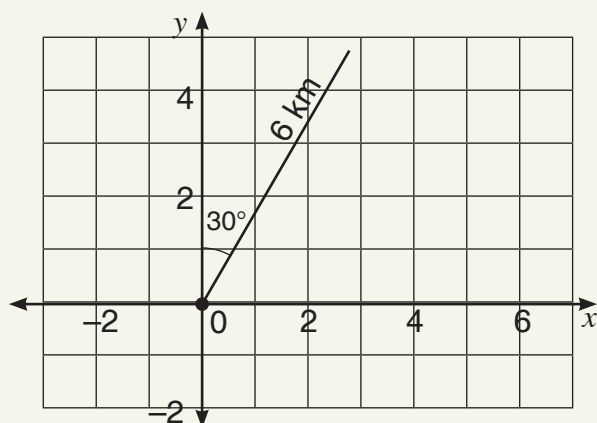
6. (17 units, 310°)

(LB page 291)

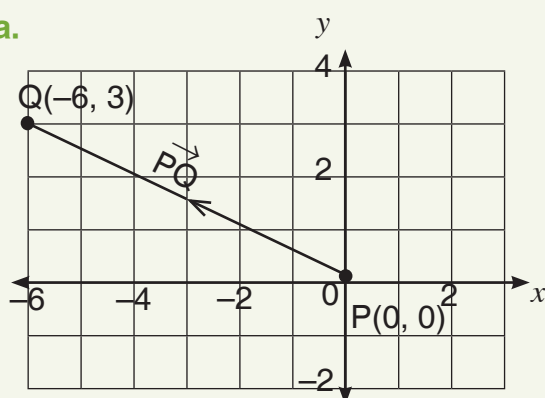
1. a. 48 cm
2. 24 cm
3. 9 cm
4. 59.71 cm (to two decimal places)
5. 19.09 cm (to two decimal places)
6. Check learners' answers.
7. Check learners' answers.
8. a. 2 units = 10 cm
- b. 2 unit = 15 cm



e.



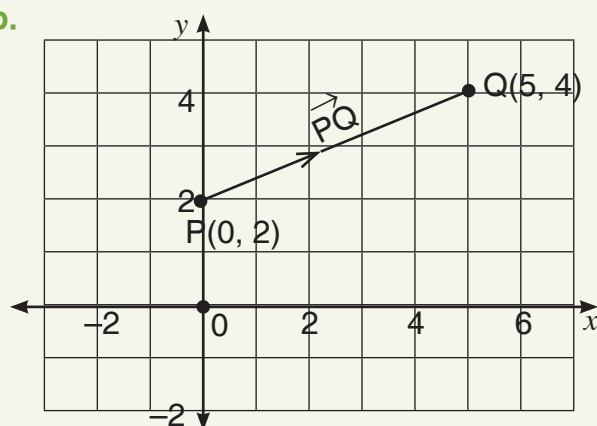
9. a.



The component form of \vec{PQ} is $\begin{pmatrix} -6 \\ 3 \end{pmatrix}$.

The magnitude is $3\sqrt{5}$.

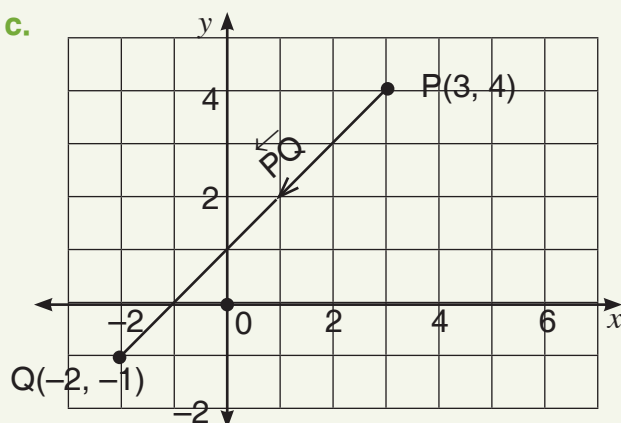
b.



The component form \vec{PQ} is $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$.

The Magnitude is $\sqrt{29}$.

c.



The component form is $\begin{pmatrix} 5 \\ 5 \end{pmatrix}$.

The magnitude is $5\sqrt{2}$.

Sub-strand 3: Position and transformations**Module 1****Transformations****Content standard**

B7.3.3.1 Perform a single transformation (i.e. reflection and translation) on a 2D shape using graph paper (including technology) and describe the properties of the image under the transformation (i.e. congruence, similarity, etc.)

Indicator

B7.3.3.1.1 Determine shapes in real life that have reflectional (or fold) symmetries. (Use as a starter.)

B7.3.3.1.2 Plot points and shapes (i.e. plane figures) on a coordinate plane and draw their images under reflection in given lines.

B7.3.3.1.3 Plot points and shapes (i.e. plane figures) on a coordinate plane and draw their images under translation by a given vector.

B7.3.3.1.4 Verify the concept of congruent and similar shapes on a coordinate plane using properties of both the object(s) and image(s); and in real-life situations (carpet designs and fabric pattern.)

Learning expectation: In this module, learners will learn how to:

- Identify symmetry in real-life situations.
- Draw images under reflection in given lines.
- Draw images under translation by a given vector.
- Determine congruence and similarity.

Essentials for learning: Learners can:

- Draw the Cartesian plane and plot given coordinates.
- Describe shapes that are similar.
- Identify and discuss the properties of common plane shapes.

Resources: Pencils, notebooks, a straight rule

Keywords: image, reflection, translation, vector, congruence, similarity

Competencies: Critical thinking and problem-solving, creativity and innovation, communication and collaboration, personal development and leadership and digital literacy

Starter: Refer to the Starter activity in the Learner's book page 292. Ask learners to share ideas in groups.

Main idea 1

Symmetry in real-life situations

LB page 292

Activity 1: Assess how much learners remember about symmetry from primary school.

Place learners in convenient groups. Task them to brainstorm real-life examples of symmetry. Groups may make drawings to support their examples where necessary.

Ask a few groups to make a presentation to the class.

Activity 2: Present learners with some Adinkra symbols and ask learners working in their groups to identify the symmetrical and non-symmetrical symbols.

Groups present their work to the class and motivate their answers. Encourage learners in the class to make contributions and ask for motivations when they do not agree with statements.

Wrap up on the presentations by giving all information that was missing from learners' presentations and addressing all misconceptions.

Refer learners to the Worked examples on page 293 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to identify symmetrical and non-symmetrical shapes that are included in pictures.

Challenging activity

Ask learners to identify symmetrical and non-symmetrical shapes in real objects around the school compound and home.

Assessment tasks ----- LB page 293

Learners identify symbols that are symmetrical.

Main idea 2

Transforming shapes by drawing their images under reflection in given lines

LB page 294

Activity 1: Assess how well learners understand symmetry. Then use the idea of symmetry to explain reflection.

Place learners in convenient groups. Ask them to discuss on the characteristics or features of the Cartesian plane.

Ask groups to draw the Cartesian plane and mark out a scale.

Ask a few groups to show the class examples of reflection.

Activity 2: Demonstrate to learners how to plot points and join the points to form shapes on the Cartesian plane.

Take time to discuss examples that show how to reflect the shape in both the x -axis and y -axis.

Ask learners to solve a few examples from the Learner's Book.

Groups present their work to the class and motivate their answers. Allow learners in class to make contributions and ask for reasons when they do not agree with a statement.

Wrap up on the presentations by giving all information that is missing from learners' presentations and addressing all misconceptions.

Refer learners to the Worked examples on pages 294 to 297 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to reflect shapes in the x - and y -axes and write down the coordinates of the image shape.

Challenging activity

Ask learners to write down the coordinates for the image shape then draw the reflection in the x - and y -axes

Assessment tasks ----- LB page 298

Learners draw lines and images on graph paper.

Main idea 3

Drawing the images of shapes under translation Vectors

LB page 299

Activity 1: Assess how well learners understand translation.

Ask learners to work in the same groups they worked in for the previous lesson.

Ask learners to draw the Cartesian plane and mark out a scale.

Activity 2: Demonstrate to learners how to translate a point. Refer learners to examples in the Learner's Book.

Ask learners to solve examples from the Learner's Book.

Ask groups to present their work to the class and to motivate their answers. Ask learners in class to make contributions and ask questions when they do not agree with a learner.

Wrap up on the presentations by giving all information that is missing from learners' presentations and addressing all misconceptions.

Refer learners to the Worked examples on pages 299 to 302 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to translate shapes and write down the coordinates of the image shape.

Challenging activity

Ask learners to write down the coordinates for the image shape then translate the shape.

Assessment tasks ----- LB page 302

Learners plot points and draw images on the Cartesian plane.

Main idea 4

Congruence and similarity

LB page 303

Activity 1: Revise reflection and translation with the class.

Ask learners to work in the same groups as for the previous few lessons.

Ask groups to discuss the terms congruence and similarity.

Ask groups to take part in a class discussion about the concepts, congruence and similarity.

Activity 2: Present learners with some examples from the Learner's Book where they have to identify shapes that are similar and shapes that are congruent.

Groups take part in a class discussion and motivate their answers. Allow learners in the class to make contributions and ask for reasons for statements with which they do not agree.

Wrap up on the presentations by giving all information that is missing from learners' presentations and addressing all misconceptions.

Refer learners to the Worked examples on pages 303 and 304 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to identify congruent and similar shapes.

Challenging activity

Ask learners to identify congruent and similar shapes and to explain the differences.

Assessment tasks ----- LB page 305

Learners answer questions about congruent and similar shapes.

Revision 10 Position and transformation ----- (LB page 307)

Learners answer the questions as a class test.

Answers to Assessment tasks

Main Idea 1

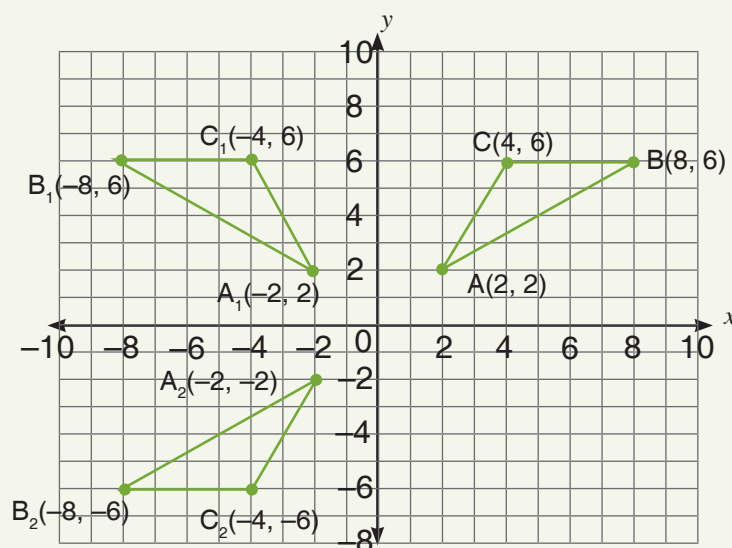
(LB page 293)

- | | | |
|---------------------|--------------------|---------------------|
| 1. Not symmetrical | 2. Symmetrical | 3. Symmetrical |
| 4. Symmetrical | 5. Not symmetrical | 6. Symmetrical |
| 7. Symmetrical | 8. Symmetrical | 9. Not symmetrical |
| 10. Symmetrical | 11. Symmetrical | 12. Not symmetrical |
| 13. Not symmetrical | 14. Symmetrical | 15. Not symmetrical |
| 16. Symmetrical | 17. Symmetrical | 18. Symmetrical |

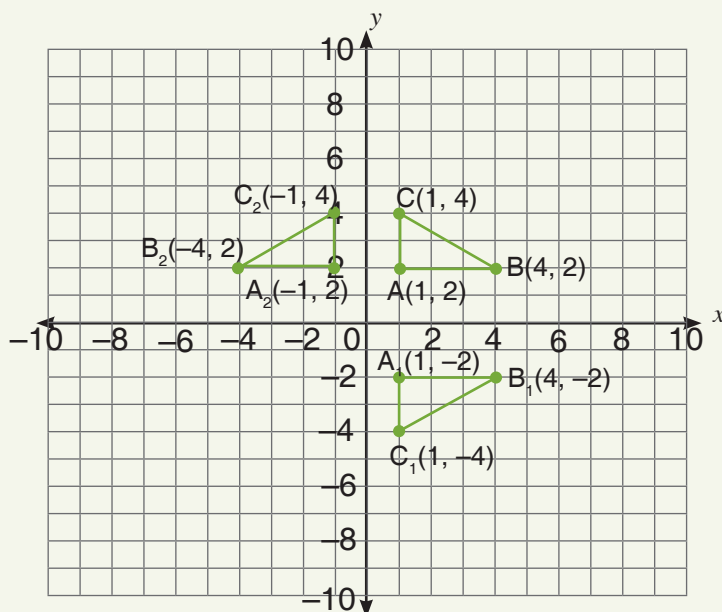
Main Idea 2

(LB page 298)

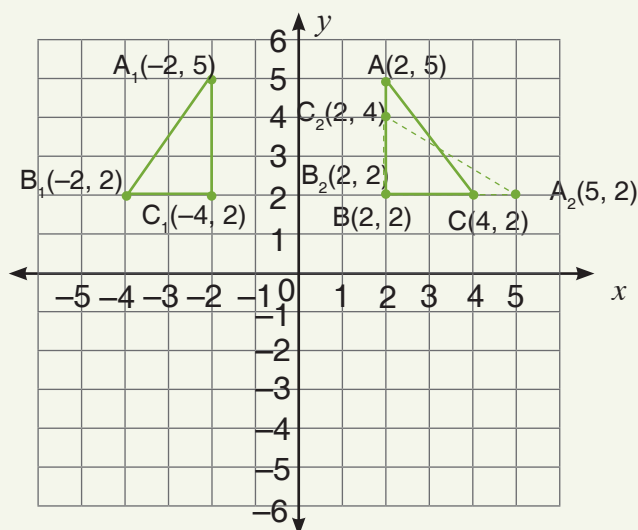
1.



2.



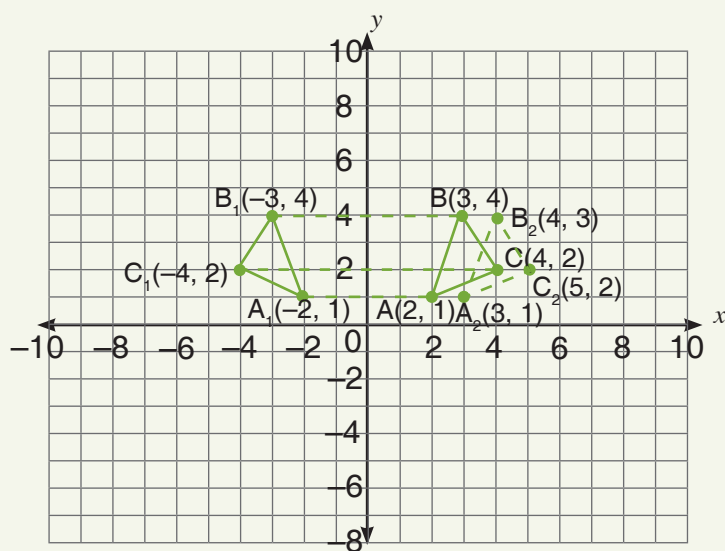
3.



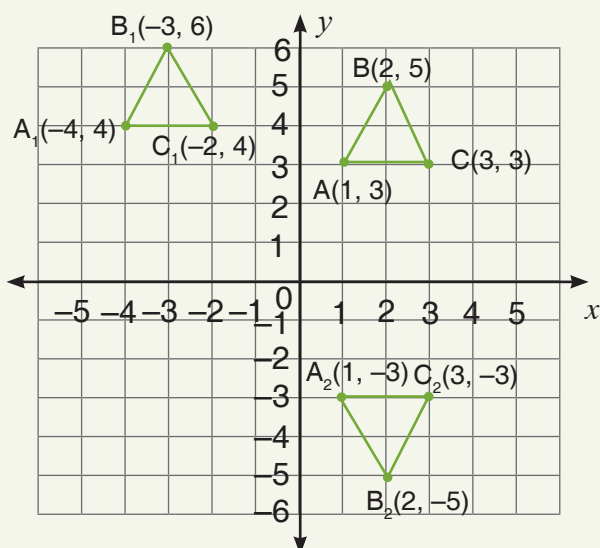
Main Idea 3

(LB page 302)

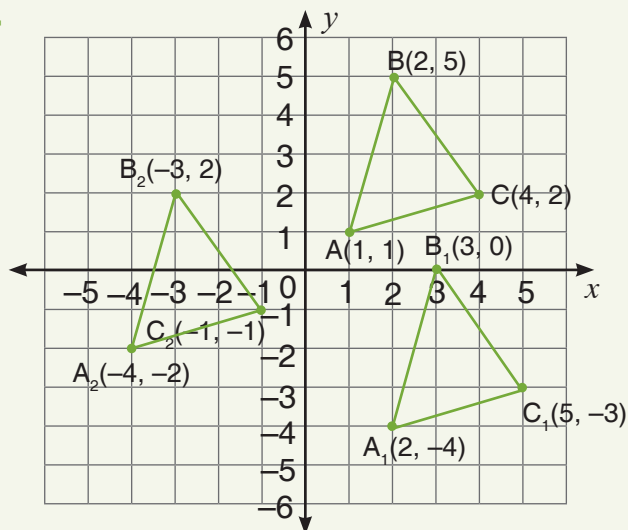
1.



2.



3.



Main Idea 4

(LB page 305)

1. Check learners answers.
2. Check learners answers.
3. A and f are congruent, and B and h are congruent.
4. A, D, G and H

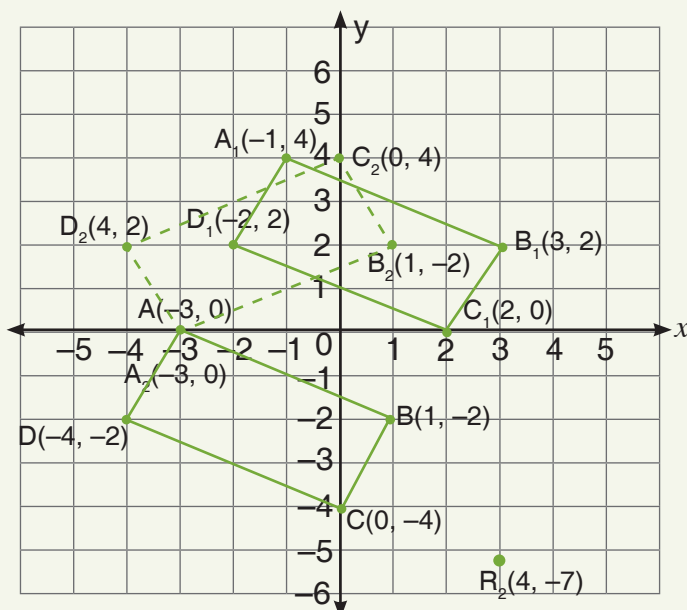
Answers to Revision

10

(LB page 307)

1. a. $P_1(1, 3)$ b. $Q_1(4, 2)$ c. $R_1(5, -4)$ d. $Q_1(-2, -3)$
2. a. Image point (5, 2) b. $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ c. $A(3, -4)$
3. a. Congruent b. Similar c. Congruent
- d. Congruent e. Similar f. Congruent

4.



Sub-strand 1: Data

Module 1

Collecting data

Content standard

B7.4.1.1 Select, justify, and use appropriate methods to collect data (quantitative and qualitative), display and analyse the data (grouped/ungrouped) presented in frequency tables, line graphs, pie graphs, bar graphs or pictographs and use these to solve and/or pose problems.

Indicator

B7.4.1.1.1 Select and justify a method to collect data (quantitative and qualitative) to answer a given question.

B7.4.1.1.2 Design and administer a questionnaire for collecting data to answer questions and record the results.

Learning expectation: In this module, learners will learn how to:

- Identify and discuss some methods for collecting data.
- Discuss some activities for which each data collection method can be used to collect data.

Essentials for learning: Learners can:

- ask their friends questions about their likes and dislikes
- record information given by friends.

Resources: Pencils, notebooks

Keywords: data, questionnaires, experiments, survey

Competencies: Critical thinking and problem-solving, creativity and innovation, communication and collaboration, cultural identity and global citizenship, personal development and leadership and digital literacy

Starter: Refer to the Starter activity on page 309 in the Learner's Book. Ask learners to study the multiple bar chart and discuss the questions that follow. Ask learners to discuss the bar chart in pairs.

Activity 1: Place learners in convenient groups.

Ask learners to write at least four different topics for which they would like to collect information or data. Topics can include their friends, family, teachers, sports, food or technology.

Ask a few groups to present their notes to the class. Where necessary, ask them to justify a particular data choice.

Activity 2: Ask learners to take part in a discussion about some of the methods they can use to collect data from friends and family. Draw learners' attention to some of the methods they talked about in the Basic 6 class.

Write a summary of learners' responses on the board and methods they did not suggest. (Refer to Learner's Book page 310 for the various methods learners can use to collect.

Activity 3: Ask learners to work in pairs. Assign each pair/of learners two data collecting methods.

Ask learners to write down anything they know about the two methods.

Ask pairs to present their notes in class and ask the whole class to contribute to the presentation.

Wrap up on each presentation by adding the necessary information that learners did not include.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to list at least two different types of information they would like to collect about friends and family.

Ask learners to list at least three data collecting tools or methods they would like to use.

Challenging activity

Ask learners to list at least three different types of information they would like to collect about friends, family and events. They need to give reasons for their choices.

Ask learners to list and explain at least four data collecting methods or tools.

Assessment tasks ----- LB page 311

Learners answer questions about types of data and methods to collect data.

Main idea 2

Designing and administering a data collection tools

LB page 311

Activity 1: Assess what learners remember about methods to data collection. Quickly transition learners into the new lesson by putting them into convenient groups. Preferably, learners can work in the same groups as for the previous lesson.

Ask learners to select a theme (personal information) and write at least six questions they would ask their friends (name, age, class, hometown, best food, best subject, best TV programme etc.)

Activity 2: Ask a few groups to present their notes to the class. Ask learners in the class to take part in each presentation.

Wrap up on each presentation by adding the necessary information that learners did not include.

Activity 3: Ask learners to discuss the features of questionnaires and guidelines for interviewing people when collecting data.

Task some of the groups to use the data/information written to design a questionnaire whiles other groups design an interview guide.

Ask learners to ensure that their sentences are clear and well-punctuated (cross-subjects knowledge transfer).

Allow learners time to present their work to the class.

Lead a class discussion about the differences between questionnaires and interviews.

Refer learners to the Worked examples on pages 311 to 313 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to design a questionnaire and an interview guide with at least four questions each.

Ask learners to explain what an interview is.

Challenging activity

Ask learners to design a questionnaire and an interview guide with at least six questions each.

Ask learners to explain the difference between an interview guide and a questionnaire.

Assessment tasks ----- LB page 314

Learners prepare a table and a questionnaire to use to collect data.

Answers to Assessment tasks

Exercise 1

(LB page 311)

Check learners answers.

Exercise 2

(LB page 314)

Check learners answers.

Sub-strand 1: Handling data

Module 2

Organising data

Content standard

B7.4.1.1 Select, justify, and use appropriate methods to collect data (quantitative and qualitative), display and analyse the data (grouped/ungrouped) presented in frequency tables, line graphs, pie graphs, bar graphs or pictographs and use these to solve and/or pose problems.

Indicator

B7.4.1.1.3 Organise and present data from a survey into a table and/or chart, and analyse it to solve and/or pose problems.

Learning expectation: In this module, learners will learn how to:

- Construct a frequency distribution table for a given data set.
- Draw and interpret bar graphs for a given set of data.
- Draw and interpret pie charts for a given set of data.

Essentials for learning: Learners can:

- collect and record information using questionnaires
- interview guides and draw bar simple bar graphs.

Resources: Pencils and notebooks

Keywords: frequency, distribution, organise, tally

Competencies: Critical thinking and problem-solving, creativity and innovation, communication and collaboration and personal development and leadership

Starter: Refer learners to the Starter activity in the Learner's Book on page 315. Ask learners to work in pairs.

Main idea 1

Frequency distribution table

LB page 316

Activity 1: Place learners in convenient groups.

Present the scenario to each group and task them to organise the data. (The aim of the activity is to find the different ways in which learners can organise the data.)

Inspect learners' work and ask groups with different methods to present their work to the class.

If any group organised the data into a frequency table, encourage the class to discuss about the table and use it to introduce the day's lesson.

Activity 2: Encourage learners to brainstorm the features of frequency distribution tables and ask them to sketch a table that only includes headings.

Give learners examples to discuss. As you go to all the groups, make notes about any mistakes for class discussion.

Alternatively, first demonstrate the whole process and then ask learners to do same in their groups.

Lead a class discussion and ask learners to vote about a few points to ensure learners are on course.

Activity 3: Give learners one more example, for learners to work through on their own.

Move around the class and offer support particularly to any learners who are not sure what they need to do.

Note any more misunderstandings or mistakes and make sure you include them in the final class discussion.

Refer learners to the Worked examples on pages 317 and 318 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to draw a frequency data set that includes at least 20 items.

Challenging activity

Ask learners to draw a frequency data set that includes at least 40 items.

Assessment tasks ----- LB page 319

Learners construct frequency distribution tables.

Main idea 2

Bar graphs

LB page 320

Activity 1: Review previous lesson on frequency distribution tables.

Discuss bar charts with the class.

Place learners in convenient groups (preferably, in the groups from the previous lesson).

Ask learners to use the data in their frequency distribution table from the previous lesson to draw a bar graph.

Activity 2: Allow groups ample time to present their graphs and explain the features and the bars.

Give them another example from the Learner's Book to solve.

Allow learners to work in pairs share their work and discuss difficulties they encountered with classmates.

Activity 3: Discuss the example and ask learners to raise their hands if they would like to know more about an aspect of the work.

Ask learners to work with partners, write their own examples and draw a bar graph for it.

Refer learners to the Worked examples on pages 321 and 322 in the Learner's Book.
Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to draw a bar graph to represent given data.

Challenging activity

Ask learners to produce their own data and draw a bar graph to represent the data.

Assessment tasks ----- LB page 323

Learners answer questions about data, prepare frequency distribution tables and draw bar graphs.

Main idea 3

Interpreting bar charts/graphs

LB page 324

Activity 1: Remind learners how to construct bar charts.

Place learners into convenient groups (preferably, in the same groups as for the previous lesson).

Present each group with a task sheet with a sample bar chart and ask learners to respond to the questions on the chart.

Ask a few groups to discuss their answers with the class.

Discuss learners' work and compliment them on their successes and help them handle any challenges.

Activity 2: During to a whole class discussion explain how to interpret a given bar chart.

Encourage learners to ask questions and seek for clarification.

Ask learners to work in their groups and answer questions from the Learners' Book.

Visit groups to offer help where required.

Allow groups to share their work and discuss their difficulties with other groups.

Activity 3: Working with the whole class again, discuss anything learners do not understand well.

Wrap up the class by asking learners to help you summarise the main ideas in the lesson.

Refer learners to the Worked examples on pages 324 and 325 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to interpret a given pie chart.

Challenging activity

Ask learners to write their own examples (data) and interpret a given bar graph.

Assessment tasks ----- LB page 326

Learners answer questions about bar charts.

Main idea 4

Pie charts

LB page 327

Activity 1: Review the content of the lesson on frequency distribution tables and bar graphs.

Lead the class to discuss and explain what a pie chart is.

Place learners in convenient groups (preferably, in the same groups as in the previous lesson).

Show learners the first example in the Learners' Book.

Take as much time as necessary to explain and guide learners through how to calculate the sector angles.

Activity 2: Ask learners to solve the first example in their groups.

Allow groups ample time to present their charts and discuss about the features.

Give learners another example from the Learners' Book to solve.

Allow learners to work in pairs and discuss their work and any difficulties they encountered with classmates.

Activity 3: Discuss the example and ask learners if there is anything they do not understand well.

Ask learners to work with a partner, write their own examples and draw the pie chart to represent the data.

Refer learners to the Worked examples on pages 327 to 329 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to draw a pie chart for given data.

Challenging activity

Ask learners to write their own examples (data) and draw a pie chart that represents the data.

Assessment tasks ----- LB page 330

Learners draw pie charts.

Main idea 5

Interpreting pie charts

LB page 331

Activity 1: Assess how well learners understand how to construct pie charts.

Place learners in convenient groups (preferably, in the same groups as for the previous lesson)

Present each group with a task sheet with a sample pie chart and ask learners to respond to the questions on the chart.

Ask a few groups to discuss their work with the class.

Discuss learners' work and compliment them on their successes help them handle any challenges.

Activity 2: Working with the whole class explain to learners how to interpret a given pie chart.

Encourage learners to ask questions and seek for clarification.

Ask learners to work in their groups again. Give them questions from the Learners' Book to solve.

Visit groups to offer help where required.

Ask groups to discuss their work and any difficulties with other groups.

Activity 3: Working with the whole class again, discuss anything learners do not understand well.

Wrap up the class by asking learners to help summarise the main ideas in the lesson.

Refer learners to the Worked examples on pages 331 to 334 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated Assessment

Remedial activity

Ask learners to interpret a given pie chart.

Challenging activity

Ask learners to write their own examples (data) and interpret a given pie chart.

Assessment tasks ----- LB page 335

Learners answer questions about pie charts.

Answers to Assessment tasks

Main Idea 1

1.

Favourite fruit	Tally	Frequency
Apple		7
Banana		2
Mango		3
Orange		8
Pear		3
Pineapple		6
Watermelon		1

3.

Scores	Tally	Frequency
1		2
2		10
3		7
4		13
5		8

2.

(LB page 319)

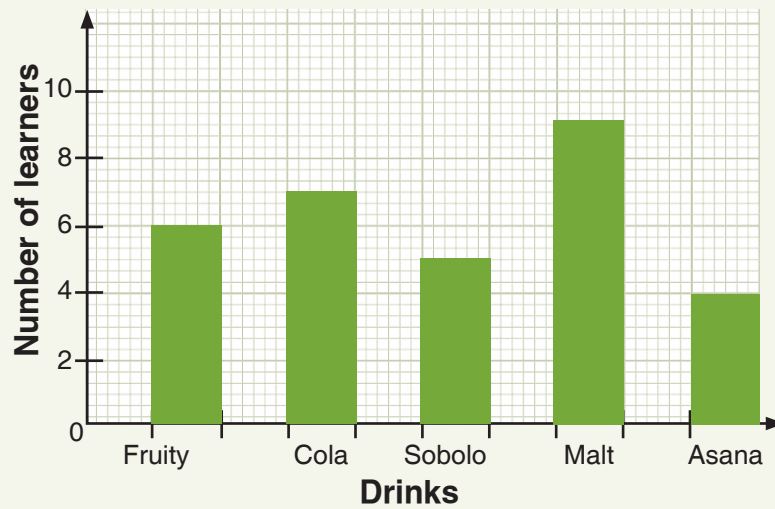
Marks	Tally	Frequency
1		3
2		1
3		2
4		7
5		9
6		12
7		9
8		3
9		2
10		2

Main Idea 2

(LB page 323)

1.

Favourite soft drink



a. Malt

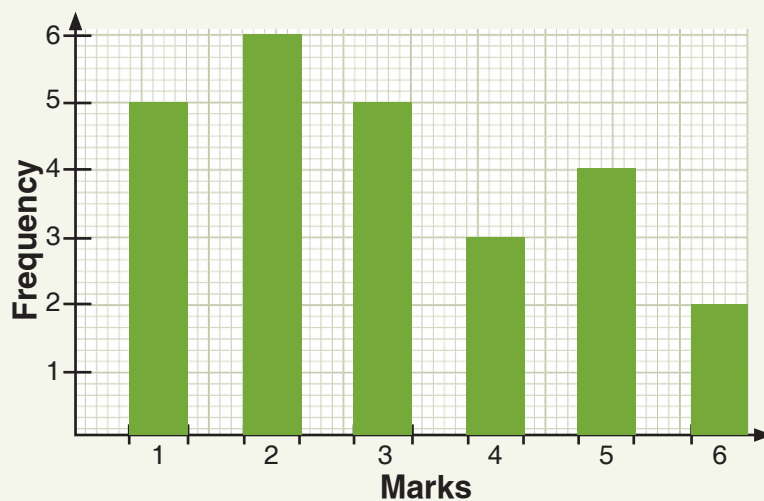
b. Asana

c. 31 learners

2.

Scores	Tally	Frequency
1		3
2		2
3		3
4		7
5		9
6		12
7		9
8		5

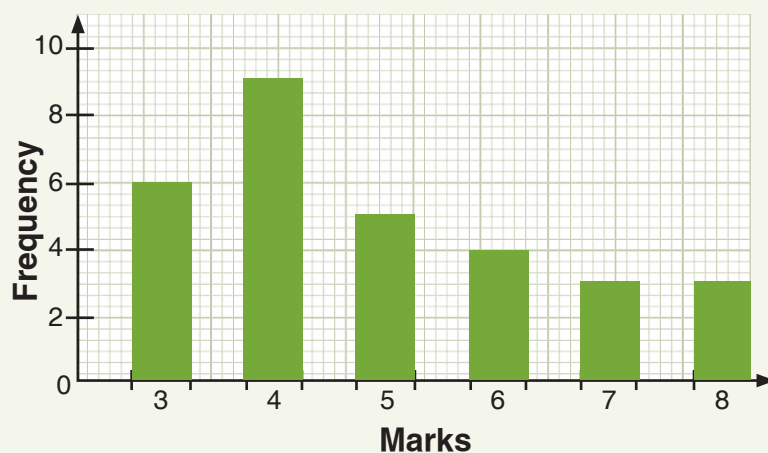
3. Bar chart showing the distribution of marks of learners in a class test.



4. a.

Marks	Tally	Frequency
3		6
4		9
5		5
6		4
7		3
8		3

b. Bar chart showing the distribution of marks of some learners in Maths test.



Main Idea 3

(LB page 326)

1. a.

Marks	2	3	4	5	6	7	8	9	10
Frequency	3	2	1	4	5	4	1	2	3

b. 25 learners

c. 5 failed

2. a. 4 members

b. 4 members

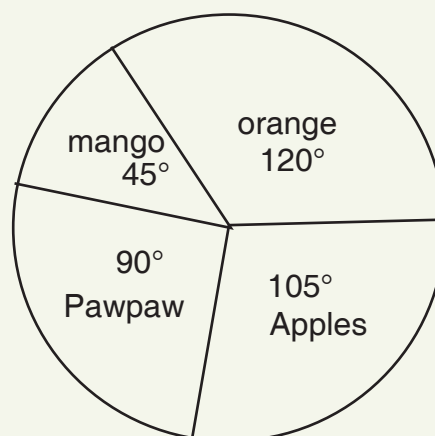
c. 4 members

Main Idea 4

(LB page 330)

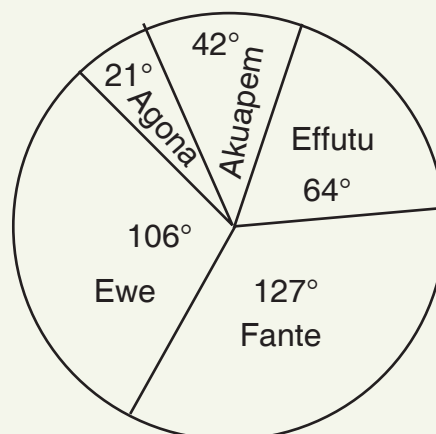
1.

Fruit	Number requested	Angle of sector
Orange	200	$\frac{200}{600} \times 360^\circ = 120^\circ$
Mango	75	$\frac{75}{600} \times 360^\circ = 45^\circ$
Pawpaw	150	$\frac{150}{600} \times 360^\circ = 90^\circ$
Apples	175	$\frac{175}{600} \times 360^\circ = 105^\circ$



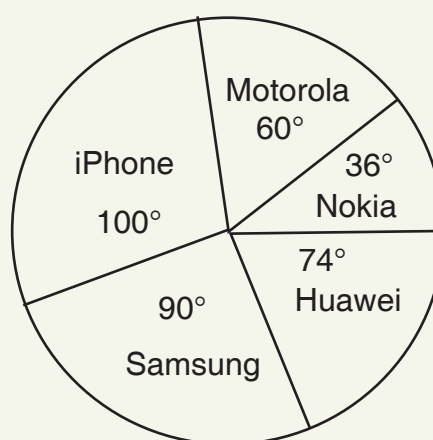
2.

Ghanaian language	Number of learners	Angle of sector
Effutu	15	$\frac{15}{85} \times 360^\circ = 63.53^\circ$
Akuapem	10	$\frac{10}{85} \times 360^\circ = 42.35^\circ$
Agona	5	$\frac{5}{85} \times 360^\circ = 21.18^\circ$
Ewe	25	$\frac{25}{85} \times 360^\circ = 105.88^\circ$
Fante	30	$\frac{30}{85} \times 360^\circ = 127.06^\circ$



3.

Brand of mobile phone	Number of learners	Angle of sector
Nokia	90	$\frac{90}{900} \times 360^\circ = 36^\circ$
Motorola	150	$\frac{150}{900} \times 360^\circ = 60^\circ$
iPhone	250	$\frac{250}{900} \times 360^\circ = 100^\circ$
Samsung	225	$\frac{225}{900} \times 360^\circ = 90^\circ$
Huawei	185	$\frac{185}{900} \times 360^\circ = 74^\circ$



Exercise 5

(LB page 335)

1. a. 120°

b. 48.61 hectares

c. $\frac{1}{4}$ or 0.25

2. a. 1 bathroom

b. 40 people

c. Probability = $\frac{4}{9}$

Sub-strand 1: Handling data**Module 3****Mean, median and mode****Content standard**

B7.4.1.1 Select, justify, and use appropriate methods to collect data (quantitative and qualitative), display and analyse the data (grouped/ungrouped) presented in frequency tables, line graphs, pie graphs, bar graphs or pictographs and use these to solve and/or pose problems.

Indicator

B7.4.1.2.1 Calculate the mean for a given ungrouped data and use it to solve problems.

B7.4.1.2.2 Calculate the median for a given ungrouped data and use it to solve problems.

Learning expectation: In this module, learners will learn how to:

- Calculate the mean of ungrouped data.
- Calculate the median and mode of ungrouped data.
- Solve problems involving mean, median and mode.

Essentials for learning: Learners can:

- Organise data into frequency tables.
- Draw bar simple bar graphs and pie charts.

Resources: Pencils, notebooks, counters or bottle tops

Keywords: mean, median, mode, data

Competencies: Critical thinking and problem-solving, creativity and innovation, communication and collaboration and personal development and leadership

Starter: Refer learners to the Starter activity on page 336. in the Learner's Book. Ask learners to discuss the questions in pairs.

Main idea 1

Determining the mean, median and mode of a set of raw unorganised data

LB page 336

Activity 1: Place learners in convenient groups.

Ask them to take out their counters.

Ask learners to count the different brands of bottle tops.

Allow each group to present their results to the class and indicate the mode.

Lead a whole class discussion on the meaning of the concept of mode.

Activity 2: Ask learners to solve the examples in the Learner's Book.

Visit groups, offer help and address any challenges.

Ask high-ability learners to create their own examples and solve them.

Activity 3: Give learners some numbers and ask them to arrange the numbers in both ascending and descending order of magnitude.

Lead a whole class discussion on the meaning of the concept of median.

Allow learners to determine the median of the given numbers (ensure the total count of the numbers is odd, for easy identification of the median).

Draw learners' attention to the fact that either ascending or descending order of the arrangement will give the same results.

Ask learners to solve the examples in the Learner's Book.

Give learners an even number of numbers and ask them to find the median.

Discuss with the class how to determine the the median of an even set of numbers.

Activity 4: Lead a whole class discussion about the meaning of the concept of mean.

Ask learners to give examples of situations where we can apply the mean.

Ask learners to solve the examples in the Learner's Book.

Visit groups to offer help and address any challenges.

Ask high-ability learners to create their own examples and solve their problems.

Activity 5: Give learners more examples of mode, median and mean from the Learner's Book and ask learners to work on their own to work out the answers.

Walk around in the classroom and offer support especially to the low-ability learners.

Make a note of any misunderstandings or mistakes and make sure that they are covered in the final class discussion.

Refer learners to the Worked examples on pages 337 to 340 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated Assessment

Remedial activity

Ask learners to determine the mode with at least 20 items in the data.

Ask learners to determine the median with at least 20 items in the data.

Ask learners to determine the mean with at least 10 items in the data.

Challenging activity

Ask learners to determine the mode with at least 40 items in the data.

Ask learners to determine the median with at least 40 items in the data.

Ask learners to determine the mean with at least 20 items in the data.

Assessment tasks ----- LB page 340

Learners calculate the mean, median and mode of sets of data.

Main idea 2

Determining the Determine the mode and median from organised data **LB page 341**

Activity 1: Assess how well learners remember how to determine the mode, mean and median for raw or unorganised data.

Also, assess how well learners remember how to organise data into frequency tables.

Activity 2: Place learners in convenient groups. Learners can also work in the groups in which they worked previously.

Present each group with some raw data to organise into a frequency table.

Ask learners to use their knowledge on the concept of mode and median to determine the mode and median for the data in the table.

Explain to learners that the mode is not the highest frequency, but that it is the score, mark or item with the highest frequency.

Activity 3: To determine the median, tell learners to divide the total frequency by two and use the frequency to find the position of the median and identify the median.

Explain to learners that when the total frequency is an even number (say 10), after you divide by 2, you take the fifth and sixth positions. However, if the total frequency is an odd number (say 9) add 1 to make the number even (10), divide by 2 and only look at the fifth position.

Ask learners to solve an example of median from the Learner's Book. Ask learners to each work on their own to identify the median.

Walk around the class and offer support especially to low-ability learners.

Note anything learners do not understand well or any/mistakes and include it in final class discussion.

Activity 4: Ask learners to arrange data in a frequency distribution table.

Show to determine the values for the fx column.

Ask learners work out the totals for the fx and the frequency (f) columns.

Show learners how to divide to obtain the mean.

Activity 5: Ask learners to solve some more examples from the Learner's Book.

Walk around the class and to help learners who need help and address any challenges.

Ask high-ability learners to create their own examples and solve.

Refer learners to the Worked examples on pages 341 to 346 in the Learner's Book. Discuss the examples with learners.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to determine the median with at least 20 items in the data.

Challenging activity

Ask learners to determine the median with at least 40 items in the data.

Assessment tasks ----- LB page 347

Learners find the mean, median and mode in data sets.

Revision 11

Handling data ----- (LB page 348)

Learners answer the revision questions as a class test.

Answers to Assessment tasks

Main Idea 1

(LB page 340)

1. Mode = 2; Median = 3; Mean = 3
2. Mode = 8; Median = 8.5; Mean = 9
3. Mode = 3; Median = 3; Mean = 2.67 (to two decimal places)

Main Idea 2

(LB page 347)

1.

Marks	Tally	Frequency
1	I	6
2		5
3		9
4		5
5		5

Mode = 3

Median = 3

Mean = 2.93 (to two decimal places)

2.

Marks	Tally	Frequency
1		3
2		4
3		3
4		3
5		4
6		2
7		8
8		3

Mode = 7

Median = 5

Mean = 4.8

3.

Marks	Tally	Frequency
0		2
1		3
2		4
3		3
4		1
5		4
6		2
7		8
8		3

Mode = 7

Median = 5

Mean = 4.53(to two decimal places)

Answers to Revision

11

(LB page 348)

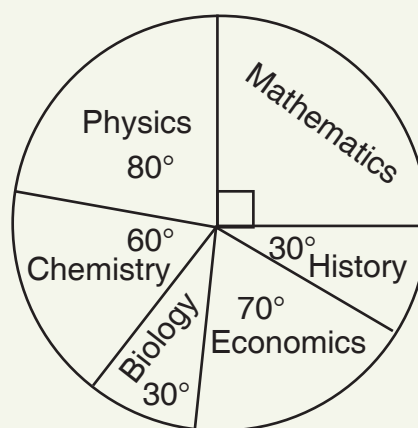
1. a. GH¢4,000.00

b. 45°

c. GH¢100.00

2.

Subject	Number of learners	Angle of sector
Mathematics	45	$\frac{45}{180} \times 360^\circ = 90^\circ$
Physics	40	$\frac{40}{180} \times 360^\circ = 80^\circ$
Chemistry	30	$\frac{30}{180} \times 360^\circ = 60^\circ$
Biology	15	$\frac{15}{180} \times 360^\circ = 30^\circ$
Economics	35	$\frac{35}{180} \times 360^\circ = 70^\circ$
History	15	$\frac{15}{180} \times 360^\circ = 30^\circ$

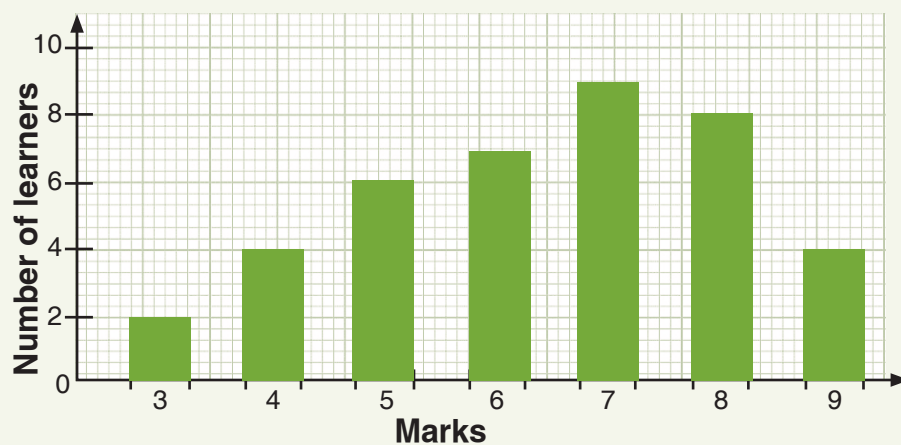


3. $x = 2$

3. a.

Marks	Tally	Frequency
3		2
4		4
5		6
6		7
7		9
8		8
9		4

b. Bar chart showing the distribution of marks.



4 a. Mode = 4

b. Median = 4.5

c. Mean = 4.9 (to one decimal place)

Sub-strand 2: Chance or probability

Module 1

Probability

Content standard

B7.4.2.1 Identify the sample space for a probability experiment involving single events and express the probabilities of given events as fractions, decimals, percentages and/or ratios to solve problems.

Indicator

B7.4.2.1.1 Demonstrate understanding of likelihood of a single outcome occurring by providing examples of events that are impossible, possible, or certain from personal contexts.

B7.4.2.1.2 Classify the likelihood of a single outcome occurring in a probability experiment as impossible, possible, or certain.

B7.4.2.1.3 Calculate the probability of the event and express the probability as fractions, decimals, percentages and/or ratios.

Learning expectation: In this module, learners will learn how to:

- Identify events that can be considered impossible, possible, or certain.
- Classify the likelihood of a single outcome occurring in a probability experiment as impossible, possible, or certain.
- Calculate the probability of the event.
- Express the probability of an even as fractions, decimals, percentages and/or ratios.

Essentials for learning: Learners can:

- predict certain events that occur around them
- identify and justify why it is impossible that some events can occur
- be familiar with the dice and coin.

Resources: Pencils, notebooks, coins, dice

Keywords: probability, outcome, likelihood, event

Competencies: Critical thinking and problem-solving, communication and collaboration and personal development and leadership

Starter: Refer learners to Learner's Book page 349. Ask learners to study the magic square. Give them ample time to try it out. The aim of the activity is to encourage critical thinking. Learners can work in pairs and discuss and check the solution to the magic square.

Main idea 1

The likelihood of a single outcome occurring

LB page 350

Activity 1: Write some activities on strips of paper. Ensure that some of the activities are possible, some are impossible and some are also certain to occur.

Ask a few learners to take turns to pick a strip and ask them to decide whether the activity is possible, impossible or certain to occur.

Discuss with learners that there are certain activities or events that are possible, impossible or certain to occur.

Activity 2: Place learners in convenient groups.

Ask them to write some activities that are possible to occur, impossible to occur and certain to occur.

Allow groups to present their work with the entire class. Encourage the class to contribute to the discussion.

Ask learner to solve some examples in the Learner's Book.

Visit the groups to offer help especially to groups that do not understand the instruction well.

Activity 3: Give learners one more example from the Learner's Book to answer. Ask learners to work on their own.

Walk around the class and offer support especially to learners who do not know what to do.

Note anything learners do not understand well and mistakes they make to include in the final class discussion.

Refer learners to the Worked examples on page 350 in the Learner's Book. Discuss these examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to write at least two activities each for events that are possible, impossible and certain to occur.

Challenging activity

Ask learners to write at least five activities each for events that are possible, impossible and certain to occur.

Assessment tasks ----- LB page 351

Learners discuss the possible outcomes of events.

Activity 1: Review previous lesson on the likelihood of a single outcome occurring.

Place learners in groups. Give each group with coins and dice.

Ask the groups to perform some experiments such as tossing a coin and rolling a dice.

Activity 2: Ask the various groups to solve the examples in the Learner's Book using their knowledge from their experiments. (Learners will realise from their experiments that it is impossible to obtain the number 8 when you roll a single dice once.)

Encourage learners to question or criticise some of the activities if they believe an outcome should be different. Ensure that learners give reasons for statements they make.

Activity 3: Ask learners to solve one more example from the Learner's Book. Ask learners to work on their own to solve this problem.

Walk around the class offer support particularly to learners who are not sure what to do.

Note anything learners do not understand well and include these concepts in the final class discussion.

Refer learners to the Worked examples on pages 351 and 352 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to describe the outcome of an experiment as possible, impossible or certain.

Challenging activity

Ask learners to perform an experiment and describe the outcome of an experiment as possible, impossible or certain.

Assessment tasks ----- LB page 352

Learners discuss the outcomes of experiments.

Activity 1: Review previous lesson about the likelihood of a single outcome occurring and discuss probability experiments.

Put about five items in a box. Ensure that there is a combination of two different items (for example, pencils and pens).

Ask one learners to go to the front of the class, dip a hand into the box and pick one item and show it to the class.

After all the items have been picked, ask the learners to discuss the events in order to understand meaning of probability.

Activity 2: Ask learners to work in groups and solve a probability question.

Ask a few groups to present their solution to the class. If they make a mistake, ask the other learners to help address the mistake.

End each presentation with further explanations and clarification if necessary.

Activity 3: Task pairs or learners working on their own to solve more examples from the Learner's Book.

Walk around the class and help learners who are not sure what to do.

Note any more concepts learners do not understand well so that you can explain these concepts to the class again.

Refer learners to the Worked examples on pages 353 to 355 in the Learner's Book. Discuss the examples with the class.

Review exercise

Differentiated assessment

Remedial activity

Ask learners to calculate the probability of given events.

Challenging activity

Ask learners to create their own problems on probability and solve the problems.

Assessment tasks ----- LB page 356

Learners answer questions about probability.

Revision 12

(Chance or probability) ----- (LB page 357)

Learners answer the revision questions as a class test.

Answers to Assessment tasks

Main Idea 1

(LB page 351)

- | | | |
|------------------|---------------|-------------|
| 1. a. Impossible | b. Possible | c. Certain |
| d. Possible | e. Impossible | |
| 2. a. Possible | b. Impossible | c. Possible |
| d. Impossible | e. Possible | f. Possible |

Main Idea 2

(LB page 352)

1. Possible 2. Possible 3. Impossible
4. Possible 5. Impossible 6. Impossible

Main Idea 3

(LB page 356)

1. $\frac{6}{20} = \frac{3}{10}$ 2. $\frac{24}{42} = \frac{4}{7}$ 3. $\frac{21}{30} = \frac{7}{10}$ 4. $\frac{76}{400} = \frac{19}{100}$

5.

The probability of rolling	Event	Fractions	Decimals	Percentages	Ratios
1. multiples of 3	3, 6	$\frac{1}{3}$	0.33	33.33	1 : 3
2. a factor of 6	1, 2, 3, 6	$\frac{2}{3}$	0.67	66.67	2 : 3
3. factors of 60	1, 2, 3, 4, 5, 6	1	1	100	1 : 1
4. divisors of 8	1, 2, 4	$\frac{1}{2}$	0.5	50	1 : 2
5. a 2 or greater	2, 3, 4, 5, 6	$\frac{5}{6}$	0.83	83.33	5 : 6
6. factors of 8	1, 2, 4	$\frac{1}{2}$	0.5	50	1 : 2
7. a 6 or less	1, 2, 3, 5, 6	1	1	100	1 : 1
8. divisors of 30	1, 2, 3, 4, 5, 6	$\frac{5}{6}$	0.83	83.33	5 : 6
9. a prime number	2, 3, 5	$\frac{1}{2}$	0.5	50	1 : 2
10. an odd number	1, 3, 5	$\frac{1}{2}$	0.5	50	1 : 2

1. a. $\frac{1}{2}$ b. $\frac{1}{2}$ c. $\frac{2}{3}$

2. $\frac{2}{3}$

3. a. $\frac{7}{10}$ b. $\frac{3}{10}$

4. a. 0.5 b. 1 c. 0 d. 1 e. 0.5

5. a. $\frac{1}{3}$; 33.33% b. $\frac{1}{4}$ c. Green balls and white balls

6. a. $\frac{2}{11}$ b. $\frac{1}{11}$ c. 0 d. $\frac{4}{11}$ e. $\frac{4}{11}$

7. a. $\frac{1}{3}$ b. $\frac{2}{3}$ c. $\frac{1}{2}$ d. $\frac{2}{3}$ e. $\frac{1}{3}$ f. $\frac{1}{3}$

ESSENTIAL

Mathematics

Basic 7

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- regular assessments and review sections to monitor learners progress and reinforce learning
- answers to assessments in the Learner's Book

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