

ESSENTIAL



Computing

Basic 9

Facilitator's Guide



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ESSENTIAL

Computing

Basic 9

Facilitator's Guide

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How to use this Teacher's Guide

This Teacher's Guide sets out to provide practical ways to teach tasks required by the Computing curriculum for high schools, closely following the curriculum requirements and outcomes, tied to the strands and sub-strands and the performance indicators. A FREE downloadable resource pack is provided, with activity source files that can be used on a projector in your classroom or printed out. Also included is additional content specifically for you – an e-book providing guidance on integrating ICT in the classroom and printable classroom posters.

At the beginning of each strand, there is an Introduction section, listing the information covered in that strand. These introductions could be used in a variety of ways that might assist in lesson preparation. Each strand ends with a Summary of the content covered and a 'Check your progress' section, which includes questions relating to the whole strand.

The book is packed with activities. The HOW TO? boxes have step-by-step instructions and screenshots from popular computer applications to familiarise learners with practical tasks, even before they log into their computers.

In this Teacher's Guide, you can expect to find an explanation of the purpose of each activity, which links to the performance indicators and core competencies listed in the curriculum. The resources required to teach this concept are listed, including the source files needed to complete the activity.

Clear guidance is provided on what needs to be done and how to assess learners. You can support the learner during the activity or evaluate if the correct steps were covered once the activity is complete.

Links to websites

There are several additional links to websites and YouTube videos to supplement and reinforce the content covered in the Learner's Book. It would be wise to adopt an open mind to mobile phones and electronic devices in the classroom to enhance the learning process.

Low resource schools

The 'Low resource schools' section caters for schools or lessons where electronic devices are not available. Teachers in such situations should prepare in an entirely different way. However, numerous parts of lessons do not require learners to be working on a computer. Teachers might be able to use the following ideas:

- Prepare flashcards with keywords by placing a picture on one card and its definition on another card. Hand one card to each learner randomly and ask learners to find their match.
- Ask learners to explain or describe in their own words their understanding of their keyword.
- Create classroom posters for your display boards. Use these for reference during explanations.
- Create 'fill in the missing words' worksheets.
- Draw information-rich sketches on a writing board, develop a discussion or explanation as the drawing is being developed, and use the Learner's Book as a point of reference.
- Ask learners to do the activities that do not require the use of a computer.

Answers

The Answers section provides possible answers for the activities. These are by no means exhaustive, and you should consider any other reasonable solutions. Learners are encouraged to create their digital resources to prepare our 'digital natives' for their future world of work.

Assessment in the Common Core Programme

Monitoring progress

School Based Assessments (SBA) cover all types of assessment, including Assessment as learning in which learners reflect on their own progress.

Assessment for Learning	Assessment of Learning	Assessment as Learning
Class exercises	Class Assessment Task (CAT)	Portfolio
Quizzes	End of term	Journal entries
Class tests (written, oral, aural and/or practical)	End of year	Project work
Class Assessment Task (CAT)		Checklist
		Questionnaire

The following are samples of relevant records that can be kept on the learner's learning:

- Learner's Progress Record (Cumulative Record)
- Learner's Report Card
- School-Based Assessment Termly Recording Register.

Each strand in this course has plentiful exercises and assignments that can be used to assess the learner's progress in achieving the required indicators. The course encourages the creation of a learning-centred classroom which engages learners in meaningful 'hands-on' activities. At the end of each strand, there are exercises and activities to allow the teacher to assess the learner's abilities.

Reporting School-Based Assessment (SBA) in the Common Core Programme

The Common Core Programme provides levels of proficiency to be attained and descriptors for all grade levels of the programme, as shown in the table below.

Level of Proficiency	Benchmark	Grade Level Descriptor
1: Highly proficient (HP)	80% +	Learner shows high level of proficiency in knowledge, skills and values and can transfer them automatically and flexibly through authentic performance tasks
2: Proficient (P)	68–79%	Learner demonstrates sufficient level of proficient knowledge, skills and core understanding; can transfer them independently through authentic performance tasks

3: Approaching Proficiency (AP)	54–67%	Learner is approaching proficiency in terms of knowledge, skills and values with little guidance and can transfer understanding through authentic performance tasks
4: Developing (D)	40–53%	Learner demonstrates developing level of knowledge, skills and values but needs help throughout the performance of authentic tasks
5: Emerging (E)	39% and below	Learner is emerging with minimal understanding in terms of knowledge, skills and values but needs a lot of help

The grading system presented shows the letter grade system and equivalent grade boundaries. In assigning grades to learners' test results, or any form of evaluation, the above grade boundaries and the descriptors may be applied. The descriptors (Highly Proficient [HP], Proficient [P], Approaching Proficiency [AP], Developing [D], Emerging [E]) indicate the meaning of each grade.

In addition to the school-based assessment (SBA), a national standards assessment test is conducted in Basic 8 to provide national level indicators on learners' achievement.

Strand 1: Introduction to Computing

THIS RESOURCE WILL PROVIDE INFORMATION FOR THE TEACHER SURROUNDING EACH OF THE ACTIVITIES IN THE LEARNER'S BOOK.

Introduction

For each activity, there will be:

- The number of the activity, and whether it is an individual, pair or group activity
- A list of resources
- Links to websites and videos needed for the activity, including the length of each video
- Explanation for the teacher on how the activity could be altered or further developed
- and some notes on how to carry out some of the steps requested of the learners
- Notes about how the activity can be assessed as well as suggestions for a plenary when the activity is complete
- The contents of the activity for the learners
- The answers or expected outcome for the activity.

Sub-strand 1: Components of computers and computer systems

Activity 1.1: Group

Purpose:

Discuss the trends in the next generation of computers.

Identify and analyse different points of view of speaker. Provide feedback in areas of ideas, organisation, voice, word choice and sentence fluency in communication. (Core competencies CC7.5 and CC7.3)

Resources:

- Learner's Book pages 1–2
- The internet, access to a computer or mobile device with access to the internet

Links:

1. Video: 7 amazing technologies we'll see by 2030 (2:52 minutes)
<https://www.youtube.com/watch?v=AuVHftBiDVw>
2. Video: 6G Vision for 2030 (4:59 minutes)
<https://www.youtube.com/watch?v=T6ubRoZCeVw>
3. Video: 5 Futuristic Technologies THAT WILL EXIST BY 2030 (13:55 minutes)
<https://www.youtube.com/watch?v=453ibZYzdGE>

4. Online article: Google and IBM Clash Over Milestone Quantum Computing Experiment
<https://www.quantamagazine.org/google-and-ibm-clash-over-quantum-supremacy-claim-20191023/>

Teacher:

Cover the content provided in the Learner's Book. If possible, let the learners work in groups to watch videos on the future of computers. If there is time, ask them to do their own research to enrich their brainstorming session on what computers will be able to do in the future.

Assessment:

Informal assessment of the learners' knowledge of this topic through short quizzes and the checking of the answers to the activity.

Plenary:

Use a question-and-answer session to check and reinforce the learner knowledge of this section of work. Check the answers to the activity.

LEARNERS

You are going to watch three videos on the future of computers. Write notes as you go and brainstorm your observations and understanding in your groups. Use your notes to draw a pictogram of what you all agree will be present in the next generation of computers. Share your pictogram with the class and add other valid ideas to your work.

ANSWERS

Learners' answers may vary quite widely, especially if they were given time to do more research on the internet. The Learner's Book provides the main features of future computers, which should also be included in their pictograms, namely parallel processing, spintronics and quantum computers.

Activity 1.2: Individual

Purpose:

Discuss the trends in the next generation of computers: Describe Google's quantum computer (Sycamore) and compare its processing power with other supercomputers (focus on processor).

Identify and analyse different points of view of speaker. Provide feedback in areas of ideas, organisation, voice, word choice and sentence fluency in communication. (Core competencies CC7.5 and CC7.3)

Resources:

- Learner's Book pages 2–6
- The internet, access to a computer or mobile device with access to the internet
- Pictures and articles about quantum computers, in particular Sycamore
- Presentation software, such as Microsoft® PowerPoint

Links:

1. Online article: 15 things everyone should know about quantum computing
<https://bernardmarr.com/default.asp?contentID=1193>
2. Video: Quantum Supremacy: a three-minute guide (3:12 minutes)
<https://www.youtube.com/watch?v=vTYp5Kd9nMA>

Teacher:

To understand quantum computing, learners need a good grounding in the differences between a quantum computer and a traditional supercomputer, such as the use of qubits instead of bits and the concept of superposition. For this activity, pair enthusiastic learners with learners who do not show as much interest in the subject.

Assessment:

Informal assessment of the learners' knowledge of this topic through short quizzes and the checking of the answers to the activity.

Plenary:

The Google Sycamore will fascinate learners who are 'into' computers, hi-tech and the future. Ask these learners to present what they have found out to the class, in the hope that their enthusiasm will prove infectious.

LEARNERS

You are going to watch videos and do research on Sycamore, which is Google's quantum computer. As you did in Activity 1.1, write notes as you go. Use your notes and find a suitable image to create a poster that briefly describes what a quantum computer is.

ANSWERS

Learners' posters should include an image of Sycamore or any other actual quantum computer, as well as the main points about quantum computers and how they can be used.

Activity 1.3: Class

Purpose:

Examine the concept of perceptual computing.

Identify and analyse different points of view of speaker. Provide feedback in areas of ideas, organisation, voice, word choice and sentence fluency in communication. (Core competencies CC7.5 and CC7.3)

Resources:

- Learner's Book pages 6–8
- The internet, access to a computer or mobile device with access to the internet
- Articles about perceptual computing, its history and uses

Teacher:

Learners need to do their own research, after reading through the section about perceptual computing in the Learner's Book, in order to make sure that they do not repeat facts that are already in the Learner's Book. This will feed into the class discussion on what the Learner's Book contains and the new facts they have discovered for themselves. Learners should be given free rein to discuss the last point (c), which could include some imaginative insights into what roles they think computers will play in the future.

Assessment:

Assess the learners by asking pertinent questions during the discussions on perceptual computing, for example, the role played by voice recognition software and sensors.

Plenary:

Note which learners actually did find new facts about perceptual computing. Also note which learners engaged in the class discussions and how well they understand the concepts.

LEARNERS

You are going to research perceptual computing to find out new facts about it. Research its uses, its history and what role it might play in the future. The class discussions are there not only to find out what you know, but to learn from each other.

ANSWERS

Learners' answers will vary, depending on what they found out about perceptual computing. The 'new' facts they present could be a use of perceptual computing, how it began (Zadeh's theory of computing with words to assist people) or how experts expect perceptual computing to evolve in years to come.

Activity 1.4: Pairs

Purpose:

Discuss the uses of output devices such as wearable displays, e-paper, e-books, Kindle.

Identify and analyse different points of view of speakers. (Core competency CC7.5)

Resources:

- Learner's Book pages 8–13
- The internet, access to a computer or mobile device with access to the internet
- Presentation software, such as Microsoft® PowerPoint

Teacher:

Learners need to do quite a lot of research for this activity. The following links could be given to learners to reduce the time that this research could take.

- https://en.wikipedia.org/wiki/Electronic_paper
- <https://learn.g2.com/what-is-an-ebook>
- <https://www.google.com/glass/start/>
- <https://www.digitalunite.com/technology-guides/hobbies-interests/reading-learning/what-kindle>

Assessment:

Assess the learners' presentations using this checklist.

Task	Yes	No
1. Does the presentation include accurate information?		
2. Does the information include one of the extra subjects (1. a. to d.)?		
3. Is the presentation logically organised and well structured?		
4. Is the text of the presentation in point form?		
5. Do the images illustrate the text?		
6. Is the presentation attractive in terms of colour and other graphic elements?		
7. Is the presentation easy to understand and follow?		

Plenary:

Give learners printouts of articles on each subject or show suitable videos so that they have a better idea of what the activity requires of them. Learners can also use the checklist to assess one another's work.

LEARNERS

You are going to research wearable display technology as well as one of the following: e-paper, e-books, Google Glass and Kindle. You will then create a clear, simple and professional presentation on wearable displays that would give an audience accurate information that is easy to understand.

ANSWERS

Learners' presentations will vary, depending on how they chose to handle the subject matter, what illustrations they chose and how the presentation is formatted and styled. This is a good opportunity to assess their understanding of the content as well as their ability to organise, illustrate and present technical information.

Activity 1.5: Group

Purpose:

Describe storage systems: network and cloud storage systems, smartcards, holographic storage, storage systems for large computer systems (home servers or media servers).

Demonstrate the ability to find and utilise digital content. Identify and analyse different points of view of speakers. (Core competencies DL5.3 and CC7.5)

Resources:

- Learner's Book pages 13–17
- The internet, access to a computer or mobile device with access to the internet
- Access to a cloud storage site
- Spreadsheet software, such as Microsoft® Excel
- A word processor, such as Microsoft® Word

Links:

1. Online article: 10 advantages and disadvantages of cloud storage
<https://www.promax.com/blog/10-advantages-and-disadvantages-of-cloud-storage>
2. Online article: 6 pros and cons of online storage for business
<https://www.comparethecloud.net/articles/6-pros-and-cons-of-cloud-storage-forbusiness/>

Teacher:

This group activity involves various tasks: discussions, research, creating a graph using a spreadsheet and creating a table in a word processor. It is advisable to hold a class discussion on network and cloud storage systems after learners have done this in their groups. You could then give the learners tasks 2 and 3, and once that is done, let them do tasks 4 and 5.

Assessment:

Each group can assess another group's graph and table and give one another constructive feedback.

Plenary:

If available, show learners how cloud storage works using a service such as Microsoft® OneDrive, Google® Drive or Dropbox. Explain the concept of free storage and storage that is paid for by monthly subscription. Give the learners access to the articles cited in task 4.

LEARNERS

You are going to discuss and research network storage and cloud storage, and then research some common cloud storage services, which offer free storage. You will use this research to create a graph that compares the free storage and the prices of paid storage offered by several cloud storage providers. You will also research the advantages and disadvantages of cloud storage, which you will then record in a table.

ANSWERS

Learners' graphs and tables may vary, depending on their research results and how they interpreted those results. Let each group assess the graph and table compiled by another group and ask them to give constructive feedback.

Remedial activity:

Give the learners the list of features below and ask them to identify whether they apply to a cloud storage system or to network storage:

- Is usually cheaper. (Cloud storage)
- Does not need an internet connection. (Network storage)
- Is accessible from anywhere in the world. (Cloud storage)
- Acts as a backup system. (Cloud storage)
- Can sync your files across all devices. (Cloud storage)

Activity 1.6: Individual

Purpose:

Explore personalisation of the computer.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competency DL5.1)

Resources:

- Learner's Book pages 17–21
- Preferably a desktop computer rather than a laptop or tablet
- Preferably a handheld mouse rather than a touchpad

Teacher:

This activity is individual and informal. Learners are given the opportunity to explore and apply various mouse settings, as well as change the images on two desktop icons. It is advisable to instruct the learners not to change default Windows icons, such as the Recycle Bin and This PC. To prevent a wide range of answers, you could give the learners a fictitious scenario of a left-handed user who cannot see the screen clearly.

Assessment:

Learners can assess one another's mouse settings and the icons chosen, for suitability, identification and ease of use.

Plenary:

Demonstrate how to change mouse settings and explain when each setting would be changed, for example using pointer trails makes watching the mouse pointer as it traverses the screen much easier for people with poor eyesight. Explain that the icons on desktop shortcuts need to be suitable and varied so that they match the programs they launch or the folders they open.

LEARNERS

You are going to explore the Mouse Properties dialog box to find out what aspects can be changed to suit the user's circumstances and preferences. Make a note of what changes you make so that you can undo them if you need to.

You will also be changing the images on two desktop icons. Scroll through the icon library to find icons that match the folders or shortcuts you want to change so that you can still easily identify them on the desktop.

ANSWERS

This activity is informal and results could vary considerably. Consider asking some of the learners to demonstrate what they changed and why.

Sub-strand 2: Technology in the community

Activity 1.7: Pairs

Purpose:

Evaluate problems in the community that can be solved with technology. Propose solutions to the problems identified. Design the solution selected.

Speak clearly and explain ideas. Share a narrative or extended answer while speaking to a group. Understand and use interpersonal skills. Demonstrate the ability to combine information and ideas from several sources to reach a conclusion. Putting forward constructive comments, ideas, explanations and new ways of doing things. (Core competencies CC8.1, CC9.2, CP5.1 and CI5.7)

Resources:

- Learner's Book pages 24–26
- The internet, access to a computer or mobile device with access to the internet
- Microsoft® Excel, Microsoft® Word and Microsoft® PowerPoint

Teacher:

The syllabus specifies this activity as a project based on class discussions, brainstorming and research. The problem statement, a technological solution and its design are to be formally presented.

Assessment:

There is an assessment checklist that pairs of learners can use to assess another pair in the Answers section that follows. Consider choosing one or two presentations that are exemplary to share with the rest of the class.

Plenary:

Hold a class discussion on problems in the local community, taking note of which learners actively engage in the discussion and which do not. For the pairs work, pair the 'engaged' learners with the learners who tended to remain uninvolved.

Make sure that the learners understand that their choice of problem must have a realistic, practical technological solution. For example, suggesting a high-tech security system in a rural area to catch cattle thieves would be too costly and impractical, whereas setting up a neighbourhood watch equipped with low-end mobile phones might well solve the problem.

LEARNERS

You are going to collect as many ideas as you can to identify and solve a problem in your local community. You will then design a realistic, practical and affordable technological solution to the problem. Lastly, you will create a 10-slide presentation briefly outlining the problem and giving details on the solution you designed.

ANSWERS

Assess the learners' presentations using this checklist.

Task	Yes	No
1. Does the presentation include a brief description of the problem?		
2. Does the solution design show insight into the problem on the part of the learners?		
3. Is the design based on technology that is practical, affordable and easy to use?		
4. Is the presentation logically organised and well structured?		
5. Is the text of the presentation in point form?		
6. Are there suitable images that illustrate the content?		
7. Is the presentation attractive in terms of colour and other graphic elements?		
8. Is the presentation easy to understand and follow?		
9. Would the presentation persuade leaders in the community to consider implementing the solution?		

Remedial activity:

If learners struggle to identify a suitable problem, help them identify a problem and its solution.

Sub-strand 3: Health and safety in the use of ICT tools

Activity 1.8: Individual

Purpose:

Evaluate health issues at workstations.

Speak clearly and explain ideas. Share a narrative or extended answer while speaking to a group. (Core competence CC8.1)

Resources:

- Learner's Book pages 27–29
- The internet, access to a computer or mobile device with access to the internet
- Microsoft® Excel and Microsoft® Word

Teacher:

This activity is individual to focus the learners' attention on research as well as their ability to comparatively compare prices so that they can buy the best item at the fairest price. To this end, learners create a spreadsheet of their choices, focusing on ergonomic devices to treat and/or prevent eye strain and wrist pain. They then use this information in a document that explains why they chose the devices they did.

Assessment:

There is a self-assessment checklist that learners can use to assess how well they performed in this activity.

Plenary:

Ideally, learners should research products, such as ergonomic keyboards before finding out where to buy them in Ghana. In this way, they can search for an exact make and model. While some computer stores may not offer online shopping, they usually have a website displaying the products they carry and the prices. Ergonomic devices are not very common, so online stores, such as Jumia, GET4LESS and Zoobashop might not have exactly what learners are looking for, but it is worth a try.

LEARNERS

You are going to decide on ergonomic devices that can prevent headaches and wrist pain. You will then research what makes and models of these devices are available and which are the best. You will then find out where you can purchase them and which stores have the fairest prices. These can be online stores and traditional walk-in computer stores.

ANSWERS

Learners can use this self-assessment checklist to ensure that their research is complete.

Task	Yes	No
1. I decided on an anti-glare screen and an adjustable paper stand to prevent headaches from eye strain.		
2. I decided on a mouse pad with wrist support and an ergonomic mouse to prevent wrist pain.		
3. I researched the best makes and models of the devices I chose.		
4. I researched where I could find each of the devices in Ghana and in online stores.		
5. I found that one or two of the devices I wanted were not available, so replaced those with makes and models that would be good replacements.		
6. I found at least three prices for each device.		
7. I chose the fairest price for each device.		
8. I created a spreadsheet containing my intended purchases.		
9. I compiled a document containing the reasons for my choices and inserted my spreadsheet into my document.		

Remedial activity:

Ask learners to work in pairs to revise the principles of best practices for avoiding eye strain and wrist pain when using workstations.

Activity 1.9: Individual

Purpose:

Evaluate safety risk reduction at issues at workstations.

Speak clearly and explain ideas. Share a narrative or extended answer while speaking to a group.
(Core competency CC8.1)

Resources:

- Learner's Book pages 29–32
- The internet, access to a computer or mobile device with access to the internet
- Microsoft® Word

Teacher:

This activity is practical and depends on learners making an honest assessment of their posture when seated at a computer, using the questionnaire in the Learner's Book. They then evaluate lighting, glare and reflections in a short report with recommendations on how to reduce these effects. Before printing the report, they need to calculate the cost of running a printer in Ghana.

Assessment:

Assess each group separately, making notes of aspects they might have missed and the aspects in which they demonstrated competence. Assess the printed reports as well so that you can give general feedback to the class on their accuracy, completeness and clarity.

Plenary:

Start by giving the learners time to complete the questionnaire as well as time to correct what they can in the current circumstances. Ask the learners to use a word processor to compile a short report on how well they can see the screen in front of them, as well as recommendations for improving the situation. Ask them to print their reports and form groups to discuss their findings. Groups can also calculate the cost of running the printer.

LEARNERS

You will be filling in a questionnaire to determine whether your posture is correct when you are seated at a computer. You will then be required to evaluate the ambient lighting, as well as glare and reflections that may make reading the screen difficult or uncomfortable. You will then compile and print a report that includes your recommendations. Lastly, you will discuss your findings in groups and give one another constructive feedback, which you will use to improve your reports. You will also work out how much it costs to run the printer you used.

ANSWERS

Use the notes you took while observing group discussions and the printed reports to compile general feedback to give the entire class. Also ensure that there is time to discuss aspects that the learners might have found difficult.

Check your progress

ANSWERS

1.
 - a. Sycamore
 - b. spintronics
2. Any two: Smartwatches; Google Glass; smart glasses; smart jewellery; fitness trackers; body-mounted sensors; augmented reality headsets
3. device driver
4. holographic storage
5. Plug and Play
6. ergonomic
7. 1,000
8. kilowatt hours (kWh)
9. RAID is a technology that allows data to be stored across several hard drives. This gives an increase in performance.
10. A bit can have only one of two possible values: 1 or 0, true or false, yes or no. A qubit can be 1 and 0 at the same time, or true and false at the same time.
11. Perceptual computing is about the ability of a computer to recognise what is going on in the environment around it. Accept any example such as:
 - Real-time AI will enable people who speak different languages to speak in their own language and understand each other because of the AI real-time transcription.
 - Soon self-driving cars will be able to hear and interpret sounds and directions, just like a human, improving the service they can provide to their human passengers.
 - Doctors will be able to access improved intelligent technology to diagnose what is wrong with a patient.
 - There are endless benefits to humans when AI-enabled assistants are able to hear, see and converse with humans without humans needing to type requests.
12.
 - a. Storage that is located on a server that is connected to the internet and accessed through the internet.
 - b. Accept any two such as:
 - Google® Drive
 - Dropbox
 - Microsoft® OneDrive
13. Ergonomic keyboards are better for a person's health as they allow the person's hands to be held in a natural position when typing on the keyboard. This helps prevent injury when typing for a long time, where injuries to the wrist could take place from working at an unnatural angle.

Strand 2: Productivity Software

THIS RESOURCE WILL PROVIDE INFORMATION FOR THE TEACHER SURROUNDING EACH OF THE ACTIVITIES IN THE LEARNER'S BOOK.

Introduction

For each activity, there will be:

- The number of the activity, and whether it is an individual, pair or group activity
- A list of resources
- Links to websites and videos needed for the activity, including the length of each video
- Explanation for the teacher on how the activity could be altered or further developed and some notes on how to carry out some of the steps requested of the learners
- Notes about how the activity can be assessed as well as suggestions for a plenary when the activity is complete
- The contents of the activity for the learners
- The answers or expected outcome for the activity.

Sub-strand 1: Introduction to word processing

Activity 2.1: Individual

Purpose:

Demonstrate how to add pictures, insert a screenshot and screen clipping, and print screen.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CI5.4 and DL5.1)

Resources:

- Learner's Book pages 36–38
- *Activity 2.1_Use clip art.docx*
- *Map of Ghana.jpg*
- Access to online clip art
- Microsoft® Word

Teacher:

Demonstrate where to find clip art, such as doing a search in the Online Pictures window or searching the internet. Explain that Creative Commons clip art and other images can be used without infringing on copyright. There are other websites that offer royalty-free images, such as Pixabay, Clipart Library and freepik.

Demonstrate how to choose and insert suitable clip art in a document.

Assessment:

Review the learners' documents to assess their skills or set up peer reviews.

Plenary:

Give the class feedback on common mistakes as well as constructive feedback on their progress.

LEARNERS

You are going to find, choose and insert clip art in a document that your teacher will provide. Make sure that the clip art you choose for Task 3 in the activity illustrates the text rather than just decorating the document. Save your work as <your name>_Activity 2.1_Use clip art.docx.

ANSWERS

Use this checklist to assess the learners' documents.

Task	Yes	No
1. Did the learner open the correct document file?		
2. Did the learner insert a map of Ghana and surrounding countries below the <i>Geography</i> heading?		
3. Did the learner find suitable clip art to illustrate the bulleted list?		
4. Is the learner's document easy to read and well laid out?		
5. Did the learner save the document under the correct filename and in the correct place?		

Remedial activity:

Allow learners to improve the document after having reflected on what they could have done differently.

Activity 2.2: Pairs

Purpose:

Demonstrate the use of SmartArt.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CI5.4 and DL5.1)

Resources:

- Learner's Book pages 39–43
- Microsoft® Word

Links:

Video: How to insert and modify SmartArt in Word (10:37 minutes)

<https://www.youtube.com/watch?v=O-AtmfhCbJQ>

Teacher:

Explain that SmartArt is used to create diagrams and charts that look professional and are easy to read and understand. Demonstrate how to insert and edit SmartArt to suit the content of the document. Explain that SmartArt might look decorative, but the fewer colours they use and the simpler the diagram, the more professional it will look.

Assessment:

Use the checklist provided to assess the activity, including the *Challenge yourself!* section. Pairs of learners could use this to review the work of other pairs.

Plenary:

Provide or give the learners access to the video in the *Challenge yourself!* section. You could also show the video to the whole class before they start on the activity. Ask the pairs of learners to read through the activity, explore the SmartArt gallery and decide on which diagrams to use before they start.

LEARNERS

Read through the activity before you start actually doing the activity. Explore and discuss various types of SmartArt and decide on the diagrams you want to use for the entire activity. Choose diagrams that are easy to edit and read. Save your work as <your names>_Activity 2.2_Create SmartArt.docx.

ANSWERS

Use this checklist to assess the learners' SmartArt.

Task	Yes	No
1. The learners created a cycle of the five days in the school week.		
2. Each day in the cycle has a list of subjects studied on that day.		
3. The weekly timetable was saved correctly.		
4. A three-level hierarchical diagram displays the timetable and the name of the school correctly.		
5. The learners could adequately explain why they thought one of the diagrams was clearer than the other.		
6. The learners watched the video and made notes.		
7. They created an accurate and complete process chart on the steps in one of the suggested processes.		
8. The document containing all three diagrams was saved.		

Activity 2.3: Group

Purpose:

Demonstrate how to add multimedia (audios, videos, animations), charts and hyperlinks.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CI5.4 and DL5.1)

Resources:

- Learner's Book pages 43–46
- A smartphone or tablet capable of making audio and video recordings
- Microsoft® Word

Teacher:

Explain how to plan and compile an information sheet on the school. Learners will need to make audio and video recordings to embed in their documents. Demonstrate how to use a smartphone or tablet to make audio and video recordings. Also demonstrate how to rename and save the multimedia files in a new folder and to embed them in a document from there.

Assessment:

Let the groups assess one another's work in terms of suitability, accuracy and completeness. This includes the information on the information sheet, as well as testing that the embedded files are suitable and run correctly.

Plenary:

Note which learners recorded the audio and video files and which learners compiled the document and embedded the multimedia files. Also note which learners engaged in the activities and which learners preferred to be simply observers.

LEARNERS

You are going to plan and compile an information sheet on your school. You are also going to record audio and video that can be embedded in the information sheet. Before you start, read through the activity and decide on who will write the document, who will read the information sheet aloud and who will be recording it, who will take the video, and who will embed the audio and video in the information sheet. Ensure that each person in the group has a task to do. Save your work as *<name of your group>_Activity 2.3_Audio and video.docx*.

ANSWERS

The groups' answers will vary, as will the multimedia they embed in their document. Each group should be assigned another group so that they can assess and test one another's work. Encourage constructive feedback rather than negative criticism.

Activity 2.4: Individual

Purpose:

Demonstrate how to add multimedia (audios, videos, animations), charts and hyperlinks.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CI5.4 and DL5.1)

Resources:

- Learner's Book pages 46–48
- Learners' saved versions of their answers to Activity 2.1
- Access to the internet
- Microsoft® Word

Teacher:

Explain what a GIF is and how one can be inserted into a document. Ensure that learners realise that animations like this only work on screen. When printed, the animation becomes a motionless image. Learners will need access to their Activity 2.1 document as well as access to the internet to research and find a GIF of the Ghana flag. Demonstrate how to insert an animation in a document and how to animate text selections in Word.

Assessment:

Since this is an individual activity, learners can use the self-assessment checklist in the Answers section to assess themselves.

Plenary:

Give learners pointers on where to find animated images (GIFs) online or provide one for the learners to work with.

LEARNERS

You are going to find an animation of the Ghanaian flag to insert in the document about Ghana that you created in Activity 2.1. You are also going to animate the headings in the document. Save your work as *<your name>_Activity 2.4_Animation.docx*.

ANSWERS

Use this self-assessment checklist.

Task	Yes	No
1. I can open and work in an existing document.		
2. I can insert an animated image in a document.		
3. I can test that an embedded animation works.		
4. I can animate text in Microsoft® Word.		
5. I can save an existing document with a different filename.		

Activity 2.5: Individual

Purpose:

Demonstrate how to add multimedia (audios, videos, animations), charts and hyperlinks.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CI5.4 and DL5.1)

Resources:

- Learner's Book pages 48–50
- Microsoft® Word

Links:

Video: Charts (5:12 minutes)

<https://edu.gcfglobal.org/en/word2016/charts/1/>

Teacher:

Explain that Word 'calls' Excel functionality to create a chart in the current document. Therefore, it is not necessary to exit Word and launch Excel in order to export a chart from Excel into Word. This is one of the benefits of working in office suites of programs. Because all the programs in the suite are integrated, their files can be used as is in other programs in the same suite.

Assessment:

Since this is an individual activity, learners can use the self-assessment checklist below to assess themselves.

Plenary:

Before handing out the activity, show the video on creating charts in Microsoft® Word 2016 to the whole class. Then hold a class discussion on why one would want to have a chart in a word-processing document.

LEARNERS

Save your work as <your name>_Activity 2.5_Charts.docx. Use this self-assessment checklist.

Task	Yes	No
1. I can open a new blank document.		
2. I can use the Insert Chart dialog box to select the type of chart I want.		
3. I can enter my own data in the spreadsheet window.		
4. I can label my chart.		
5. I can save the document containing the chart with the filename specified.		

ANSWERS

Learners' charts may vary, depending on the imaginary data they used and the formatting they applied. Ask learners to do the self-assessments and ask for help with any of the tasks they found difficult or confusing.

Activity 2.6: Individual

Purpose:

Demonstrate how to add multimedia (audios, videos, animations), charts and hyperlinks.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CI5.4 and DL5.1)

Resources:

- Learner’s Book pages 50–51
- Microsoft® Word

Teacher:

Allow the learners to experiment with importing a linked chart, changing data in the original chart and checking that the imported chart did in fact update. Explain that this does not work the other way around: If they change the data in the linked chart, the original chart in Excel is not updated. Also explain that both the document and the spreadsheet need to be saved and reopened for the results to be displayed correctly.

Assessment:

This is an informal activity. Walk around the class and check that learners know what to do and are getting the right results.

Plenary:

Make sure that all learners understand the intended outcome of this activity (experiment): To show that a linked chart is updated when the original chart is updated.

LEARNERS

You are going to experiment with importing a linked chart and then changing it.

ANSWERS

Ask learners to do the self-assessments and ask for help with any of the tasks they found difficult or confusing.

Task	Yes	No
1. I can open a new blank document.		
2. I can use the Insert Chart dialog box to select the type of chart I want.		
3. I can enter my own data in the spreadsheet window.		
4. I can label my chart.		
5. I can save the document containing the chart with the filename specified in the activity.		

Activity 2.7: Individual

Purpose:

Demonstrate how to add multimedia (audios, videos, animations), charts and hyperlinks.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges.
Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CI5.4 and DL5.1)

Resources:

- Learner's Book pages 51–53
- Microsoft® Word

Links:

Video: How to insert and edit hyperlinks (2:22 minutes)

<https://www.youtube.com/watch?v=up6nNidyYqM>

Teacher:

Demonstrate how to insert a hyperlink to a website, video or file on the local computer that will open the object it is linked to. Make it very clear that learners must be accurate when specifying the type, name and location of the linked object, otherwise the hyperlink will not work.

Assessment:

Walk around the class and check that learners are specifying the hyperlink correctly and that it opens the video. Ask stronger learners to help learners who are struggling to understand the concept or to create a hyperlink.

Plenary:

Make sure that all learners understand how hyperlinks work before they attempt this activity.

LEARNERS

You are going to insert a hyperlink in a new document to a video on YouTube. When you have done this, double-click the hyperlink to check that the video opens in a media player and runs.

ANSWERS

Save your work as <your name>_Activity 2.7_Hyperlink.docx. Use this self-assessment checklist.

Task	Yes	No
1. I can open a new blank document.		
2. I can type the text of the hyperlink.		
3. I can select the text and use the Links group to open the Insert Hyperlink dialog box.		
4. I can type in the address of the video in the correct place.		
5. When I double-click the hyperlink in my document, the video opens.		

Remedial activity:

The following activity is suitable for learners who need more practice with word processing.

1. Open the *Strand 2 Extra activity 1_Metal* word processing file.
 - a. The text in the image below the text 'Precious Metals' is difficult to read. Format this image so that the text reads correctly from left to right.
 - b. Change the size of the second image (the coins) to exactly 5 cm x 5 cm.

- c. Insert an image from the internet relating to precious metals below the second image (coins). Crop the image to a diamond shape. The image must fit on the first page.
- d. Find the word 'nuggets'. Remove the hyperlink from this text without deleting the text.
- e. Find the table below the heading 'Best-known Precious Metals'.
- f. Find the shaded cells in the table and use the data in these cells to create a chart. Place the chart immediately below the table.
- g. Find the text 'Insert formula' in the table and insert a formula to find the highest number of ounces for a metal.
- h. Find the text 'Insert video below' at the end of the document. Add an appropriate video about precious metal below the text.

ANSWERS

1.
 - a. First image: Rotation: Flip Horizontal
 - b. Second image: Resized: Height: 5 cm; width: 5 cm
 - c. Third image:
 - New image added below the second image
 - Cropped to diamond shape
 - Image resized to fit on page 1
 - d. Hyperlink: removed from text 'nuggets'
 - e. Table
 - f. Data in table to create chart; chart placed below table
 - g. Formula: Max(above)
 - h. Appropriate video inserted

Sub-strand 2: Introduction to presentations

Activity 2.8: Group

Purpose:

Demonstrate how to add pictures and insert screenshots.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CI5.4 and DL5.1)

Resources:

- Learner's Book pages 54–57
- Access to the internet
- *Activity 2.8_Images and screenshots.pptx*
- *Dog pack.jpeg*
- *How to tell which dog is alpha.pdf*
- Microsoft® PowerPoint

Teacher:

Before handing out this activity, ensure that learners know the difference between screenshots and screen clippings. Demonstrate how to insert images on a presentation slide using options in the Images group on the Insert tab. Also demonstrate moving and sizing images.

Assessment:

Let the groups assess one another's work in terms of accuracy and completeness. This can be done using the checklist in the Answers section.

Plenary:

Access the presentation, image and PDF article that the learners will need to complete this activity. Also give the learners time to find an online picture of a litter of puppies using the Online Pictures option.

LEARNERS

You are going to work in groups on a presentation that your teacher will provide. You will insert, move and resize an image, find another image online and crop an image. You will also open a PDF article and take a screenshot that you will then insert and edit on a slide. Save your work as *<your name>_Activity 2.8_Images and screenshots.pptx*.

ANSWERS

Groups can use this checklist to assess another group's presentation.

Task	Yes	No
1. Slide 2: The Dog pack image is next to the bulleted list.		
2. Slide 2: The Dog pack image has been resized to match the size of the text box.		
3. Slide 2: The Dog pack image has been moved to the right-hand side of the list.		
4. Slide 4: An image of a litter of puppies was sourced online and inserted.		
5. Slide 4: The image of a litter of puppies is referenced.		
6. Slide 5: The image of the dog pack has been cropped to show only the leader.		
7. Slide 9: Correct PDF opened and a screenshot taken.		
8. Slide 9: Screenshot inserted on slide and edited to show only the heading and the text below it.		
9. Presentation correctly saved.		

Activity 2.9: Individual

Purpose:

Demonstrate how to animate slides in a presentation.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CI5.4 and DL5.1)

Resources:

- Learner's Book pages 58–61
- *Activity 2.9_Animations and transitions.pptx*
- *Activity 2.9_Animations and transitions.pptx_answer*
- Microsoft® PowerPoint

Teacher:

Before handing out this activity, ensure that learners know the difference between animations and transitions. Demonstrate how to animate objects on a slide and how to insert transitions between slides or apply the same transition to all the slides. Also ensure that learners know how to group individual objects using the Arrange button in the Drawing group on the Home tab.

Assessment:

Since this is an individual activity, learners can use the checklist in the Answers section to assess another learner. It is advisable to pair learners according to their abilities so that weaker learners can benefit from hands-on help.

Plenary:

Access the presentation that the learners will need to complete this activity. Ask learners who are good at geometry to assist other learners with the calculations that need to be done in task 1. b.

LEARNERS

You are going to animate triangles on a slide, solve for each angle on a new slide, and give reasons for your calculations. You will then apply two animations that you choose yourself to any two slides. Lastly, you will create a concluding slide and apply a transition effect of your choice to all the slides in the presentation. Save your work as *<your name>_Activity 2.9_Animations and transitions.pptx*.

ANSWERS

Access *Activity 2.9_Animations and transitions_answer.pptx* for a sample solution.

Learners can use this checklist to assess another learner's presentation.

Task	Yes	No
1. Slide 2: The three internal triangles have been grouped so that they can be copied separately.		
2. Each triangle appears on a separate slide.		
3. The w, v, x, y and z angles are correctly solved and explained.		
4. Two animations applied to two separate slides.		
5. Concluding slide created.		
6. One transition applied to all slides in the presentation.		
7. Presentation correctly saved.		

Remedial activity:

Allow learners to improve the presentation after having reflected on what they could have done differently.

Activity 2.10: Pairs

Purpose:

Demonstrate how to add multimedia (audios, videos etc.), tables and charts.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CI5.4 and DL5.1)

Resources:

- Learner's Book pages 62–67
- Access to the internet
- *Activity 2.10_Multimedia.pptx*
- *Flower Blooming.mov*
- *Piano.mp3*
- *Activity 2.10_Multimedia_answer.pptx*
- Microsoft® PowerPoint

Teacher:

Before handing out this activity, ensure that learners are familiar with inserting tables, charts and multimedia in a presentation, as well as being able to test that the multimedia open and play correctly.

Assessment:

Let the pairs assess one another's work in terms of accuracy and completeness. This can be done using the checklist in the Answers section.

Plenary:

Access the presentation, video and audio clip that the learners will need to complete this activity. Also give the learners time to create the tables and the chart. Specify whether the chart should be linked or embedded.

LEARNERS

You are going to work in pairs on a presentation that your teacher will provide. You will insert a video and an audio clip on specific slides. You will then insert a table and format it so that it looks professional and is easy to read. Lastly, you will use the data provided in the activity to create a column chart in the presentation. Save your work as <your name>_Activity 2.10_Multimedia.pptx.

ANSWERS

Pairs can use this checklist to assess another pair's presentation.

Task	Yes	No
1. Slide 2: The <i>Flower Blooming</i> video can be opened and run.		
2. Slide 6: The <i>Piano</i> audio clip is below the text and the picture and can be opened and played.		
3. Slide 12: The table has the correct headings and data.		
4. Slide 12: The table formatting is attractive and aids reading.		
5. Slide 13: The spreadsheet content is correct and complete.		
6. Slide 13: The chart is the correct type.		
7. Slide 13: The chart formatting is attractive and aids reading.		
8. Presentation correctly saved.		

Sub-strand 3: Introduction to desktop publishing

Activity 2.11: Pairs

Purpose:

Create and present a desktop published document (flyer, advertisement, invitation cards, business cards).

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Demonstrate the ability to work with all group members to complete a task successfully. (Core competencies CI5.4, DL5.1 and CC9.6)

Resources:

- Learner's Book pages 68–71
- Access to the internet
- Microsoft® Publisher

Teacher:

This group activity requires a great deal of collaboration between learners, most especially when doing online research, recommending types of publications that can be used in given scenarios and the use of design features in a given publication. It is advisable to collect as many hardcopy versions of the publications as possible, to give learners an idea of the various types and their uses.

Assessment:

Let the pairs assess one another's work in terms of accuracy, completeness, creativity and knowledge of the subject.

Plenary:

Give the learners ample time to explore the various categories of publications in the Microsoft® Publisher as well as the features on the Page Design tab, such as layouts, schemes and page backgrounds. Much of this activity is conceptual and scenario-based, so the more familiar they are with the application, the more they will be able to engage with the tasks.

LEARNERS

You are going to explore the templates in Publisher, as well as the features on the Page Design tab so that you can make informed decisions when choosing a publication type in a particular scenario. As you go through the tasks in the activity, work as a team to find out what you need to know and decide on your answers. Save your work as <your names> Activity2.11_Design a publication.pub

ANSWERS

2.

Publication type	Possible features used
Leaflet	Text, image, template, orientation, capitalisation, typography
Flyer	Text, image, template, orientation, capitalisation, typography
Advertisement	Border, text, image, template, orientation, capitalisation, typography
Greetings card	Image, text, template, border, capitalisation, typography
Business card	Image, text, template, border, capitalisation, typography
Letterhead	Header or footer, text, template, page number
Newsletter	Overflow, research, text, image, template, page numbers, border
Booklet	Overflow, research, text, image, template, page numbers

3. a. Answers will vary; accept any reasonable answers. Possible answers: letterhead, business cards, flyers, leaflets, advertisements
- b. Answers will vary; accept any reasonable answers. Possible answers: green and earthy colours to represent the earth's greenness and the brown of the soil
4. a. When using a suitable template, the design and layout are already in place. Therefore, it is a simple matter of inserting suitable text and images.
- b. Borders around the images or on each page of a greetings card can add artistic flair.
- c. Images, solid colours, gradients and other textures can be used as backgrounds to make very professional-looking greetings cards.
- d. Some commercial cards are left blank so that people can write their own messages. When text is included, it should be short and concise in a font that is 'fancy' but easy to read. Text can also be placed in text boxes that are placed over artwork in a decorative way.
- e. Picture placeholders can be filled with images, decoratively framed and formatted to create an attractive display, most particularly on the front of the card.

Activity 2.12: Group

Purpose:

Create and present a desktop published document (flyer, advertisement, invitation cards, business cards).

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Demonstrate the ability to work with all group members to complete a task successfully. (Core competencies CI5.4, DL5.1 and CC9.6)

Resources:

- Learner's Book pages 72–75
- Access to the internet
- Microsoft® Publisher

Teacher:

It is advisable to collect as many hardcopy versions of advertisements as possible, to give learners a broader knowledge base. This group activity requires teamwork when listing items that can improve advertisements.

Learners can do the sketches of the items on their own or as a group. The table giving the purpose of the suggested items for all three scenarios should be completed as a group.

Assessment:

Let the groups assess one another’s work in terms of completeness and informed decisions based on knowledge and own experience of group members.

Plenary:

Give the learners time to study the hardcopy advertisements and online advertisements before they start this activity.

LEARNERS

You are going to study advertisements and decide what works and what does not work, and how each of the three advertisements could be improved by the inclusion of the items you identified as being effective. Then you will do sketches of those items, labelling them with the fonts, backgrounds and colour schemes you suggest. Lastly, you will complete a table that explains why you chose each item.

ANSWERS

3.

Advertisement	Item/object	Explain the purpose of the item/object
A new fast-food drive-through is due to open near you and the manager has asked you to create an advertisement to advertise the opening.	text	To provide details of opening event.
	image	Showing opening event’s special offers, discounts and promotions.
	shape	To provide eye-catching shapes with promotional offers in the shapes that can be rotated and positioned anywhere on the advertisement.
	background	To use colours and images to help with the branding for the new company.
	WordArt	To highlight the type of event.
A long-awaited movie is due to be released at the local cinema in a few weeks’ time and the cinema owner has asked you to create an advertisement for this premiere event.	text	To display the name of the movie.
	image	To display pictures from the movie’s trailer.
	shape	To highlight the date and time of the movie showing.
	background	To help with the branding of the cinema where the movie will premiere.
	WordArt	To display ticket prices.
A popular store is closing, and the owner has asked you to create an advertisement for its closing-down sale in a week’s time.	image	To display the cinema’s logo and slogan.
	text	To highlight the discounts available.
	image	To show images of the goods for sale.
	shape	To display the name of the event.
	background	To show the company’s house style and colours.
	WordArt	To highlight the date of the closing-down sale.

Activity 2.13: Individual

Purpose:

Create and present a desktop published document (flyer, advertisement, invitation cards, business cards).

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Demonstrate the ability to work with all group members to complete a task successfully. (Core competencies CI5.4, DL5.1 and CC9.6)

Resources:

- Learner's Book pages 76–82
- Microsoft® Publisher

Teacher:

Show the class some of the decorative shapes and fonts in Publisher that would be good examples in terms of text being legible and shapes not taking up too much space. Hardcopies of the logos and slogans of local businesses and learning institutions would give learners an idea of what works and what does not. For example, simple logos with short slogans are usually best.

Assessment:

Although this is an individual activity, it can also be done in pairs if some learners have more artistic talent than others. Learners can use the checklist in the Answers section to assess their own work.

Plenary:

This is a creative task, which might be daunting for some learners. Read the activity to the class, explaining what each task entails to ensure that all learners understand what they need to do. Examples of shapes are stars, banners, block arrows and callouts. Decorative fonts that are easy to read include Bodoni, Copperplate, Garamond and Ink Free.

LEARNERS

You are going to use shapes and fonts to create a logo and a slogan for a local travel agency. You will need to suggest three fonts and the reasons you would choose each of them. Then you will create a shape made of two or more shapes that contains the name of the business and is coloured with four shades of the same colour. You will also need to rotate the logo and curve the text of the slogan. Save your work as *<your name>_Activity 2.13_Fonts and shapes.pub*.

ANSWERS

Learners can use this checklist to assess their work.

Task	Yes	No
1. I can view fonts and find three decorative but readable fonts for a logo.		
2. I can say why I chose those three fonts.		
3. I can insert and combine shapes.		

4. I can rotate a group of shapes.		
5. I can use four shades of one colour effectively.		
6. I can use text or WordArt in a logo.		
7. I can capitalise all the letters in a slogan.		
8. I can make the first word in the slogan a drop capital.		
9. I can curve the text of a slogan.		
10. I can save a publication correctly.		

Remedial activity:

Allow learners to improve the logo and slogan after having reflected on what they could have done differently.

Activity 2.14: Individual

Purpose:

Evaluate a desktop published document.

Demonstrate the ability to work with all group members to complete a task successfully. Demonstrate the ability to combine information and ideas from several sources to reach a conclusion. (Core competencies CP5.1 and CC9.6)

Resources:

- Learner's Book pages 82–84
- Microsoft® Publisher

Teacher:

Explain that this activity does not involve the detailed text in the poster. They are to concentrate on headings, layout and use of colour and white space. Learners can redesign the layout of the poster either on paper or in Publisher.

Assessment:

Although this is an individual activity, it can also be done in pairs if some learners have more artistic talent than others.

Plenary:

Read the activity to the class, explaining what each task entails to ensure that all learners understand what they need to do.

LEARNERS

You are going to evaluate a poster published by a school to encourage people to enrol in their Computer Science course. Look carefully at the colours, images, white space and headings and work out how you could improve on the poster. Save your work as *<your name>_Activity 2.14_Layout.pub*

ANSWERS

1. The school's logo, slogan, contact details and general information about the school.
2. **Home:** Greetings cards and invitations; posters for local events, such as a fete or bazaar.
School: Quarterly newsletters about past events and upcoming events; flyers about open days at the school or graduation events; programmes for school concerts; advertisements about the school; letterheads for official correspondence to parents and the public; business cards for members of staff.
3. Use this checklist to assess the learners' improved layout of the poster. Note that some layouts may be quite different but equally effective. Accept any clear and complete layouts.

Task	Yes	No
1. The name of the school is at the top of the poster.		
2. The school's logo appears close to its name.		
3. A large, clear heading below the school's name and logo saying what the poster is about, such as <i>Computer Studies Course</i> .		
4. Clear headings for the objectives of Computer Science, congratulating the learner of the month, the future of computing and the school's contact details (at the bottom of the poster).		
5. Attractive images to illustrate the content, such as learners in the computer lab, the learner of the month, the school or any other image that suits the content.		
6. Good use of white space to avoid the poster looking cramped, but not so much that the objects on the poster seem to float in space.		
7. General attractiveness, good use of colour and images, and an overall professional look and feel.		

Activity 2.15: Individual

Purpose:

Evaluate a desktop published document.

Demonstrate the ability to work with all group members to complete a task successfully. Demonstrate the ability to combine information and ideas from several sources to reach a conclusion. (Core competencies CP5.1 and CC9.6)

Resources:

- Learner's Book pages 85–89
- *Activity 2.15_Critique.docx*
- *Activity 2.15_Critique_answer.pub*
- Microsoft® Publisher

Teacher:

Demonstrate how to use the spelling and grammar feature in Publisher to correct errors automatically detected and flagged in written content. Also demonstrate how to access and use the research feature in Publisher. Supply learners with the activity document. Show them how to copy and paste it into Publisher. From there they can use the spelling and grammar feature and the research feature.

Assessment:

Although this is an individual activity, it can also be done in pairs.

Plenary:

LEARNERS

You are going to finalise a publication by checking and correcting spelling and grammar errors. You will also use the research feature to verify particular facts. Note that not all facts can be verified using this feature because it does not do internet searches.

ANSWERS

Refer to *Activity 2.15_Critique_answer.pub* for a sample solution. Learners can use this checklist to assess their work.

Task	Yes	No
1. I corrected the spelling of all words underlined in red.		
2. I reviewed all grammar suggestions underlined in blue and accepted the suggestions that I thought were correct.		
3. I researched massive open online courses, but could not verify the facts in the document. This would need to be done with an internet search.		
4. I highlighted all my changes.		
5. I copied the changed text into a new document.		
6. I wrote a short critique of the mechanics and content accuracy.		
7. I saved the document correctly.		

Sub-strand 4: Introduction to electronic spreadsheets

Activity 2.16: Individual

Purpose:

Perform data filtering, sorting and validation.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Demonstrate the ability to work with all group members to complete a task successfully. Demonstrate the ability to combine information and ideas from several sources to reach a conclusion. (Core competencies DL5.1, CP5.1 and CC9.6)

Resources:

- Learner’s Book pages 90–93
- *Activity 2.16_Formulas.xlsx*
- *Activity 2.16_Formulas_answer.xlsx*
- Microsoft® Excel

Teacher:

Ensure that learners know the difference between a structured and an unstructured table, and know how to create a structured table that uses a structured reference. The formula starts with an equals sign immediately followed by the heading being used as a structured reference. Show learners how to populate a table with fictitious records so that they can work with data.

Assessment:

Although this is an individual activity, it can also be done in pairs if some learners are more skilled in Excel than others.

Plenary:

Give learners access to the Excel spreadsheet that has been partially populated for this activity.

LEARNERS

You are going to work with the formulas in a structured table. The formula for the Price column has already been done. You need to write the formulas for the Sales Tax, Total Price and Balance To Pay columns. You then need to create dummy records containing random data. Display the formulas and take a screenshot.

ANSWERS

J	K	L	M	N
Price	Sales Tax	Total Price	Amount Paid	Balance to Pay
=[@Quantity]*[@Unit Price]	=5/100*[@Price]	=[@Price]+[@Sales Tax]	100	=[@Total Price]-[@Amount Paid]
=[@Quantity]*[@Unit Price]	=5/100*[@Price]	=[@Price]+[@Sales Tax]		=[@Total Price]-[@Amount Paid]
=[@Quantity]*[@Unit Price]	=5/100*[@Price]	=[@Price]+[@Sales Tax]		=[@Total Price]-[@Amount Paid]
=[@Quantity]*[@Unit Price]	=5/100*[@Price]	=[@Price]+[@Sales Tax]		=[@Total Price]-[@Amount Paid]
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=[@Quantity]*[@Unit Price]	=5/100*[@Price]	=[@Price]+[@Sales Tax]		=[@Total Price]-[@Amount Paid]
=[@Quantity]*[@Unit Price]	=5/100*[@Price]	=[@Price]+[@Sales Tax]		=[@Total Price]-[@Amount Paid]
=[@Quantity]*[@Unit Price]	=5/100*[@Price]	=[@Price]+[@Sales Tax]		=[@Total Price]-[@Amount Paid]
=[@Quantity]*[@Unit Price]	=5/100*[@Price]	=[@Price]+[@Sales Tax]		=[@Total Price]-[@Amount Paid]

Activity 2.17: Individual

Purpose:

Perform data filtering, sorting and validation.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Demonstrate the ability to work with all group members to complete a task successfully. Demonstrate the ability to combine information and ideas from several sources to reach a conclusion. (Core competencies DL5.1, CP5.1 and CC9.6)

Resources:

- Learner's Book pages 93–95
- Learners' saved answers from Activity 2.16
- *Activity 2.17_Validation_answer.xlsx*

- *Activity 2.17_Validation Rule.tiff*
- *Activity 2.17_Validation Error.tiff*
- Microsoft® Excel

Teacher:

Explain why data validation is important and that one way of doing this in Excel is to create validation rules in the form of a drop-down list on columns that require data in a particular format. Demonstrate how to create such a drop-down list using the Data Tools group on the Data tab.

Assessment:

Learners can do the activity on their own or in pairs. However, pair learners to check that one another's drop-down menus work, complete with an input message and an error alert that is triggered by a user action.

Plenary:

Ask learners to open the spreadsheet they worked on in Activity 2.16. Pair weaker learners with a learner who will be able to help them through all the tasks in the activity.

LEARNERS

You are going to open your Activity 2.16 spreadsheet and create a drop-down table that forces users to choose an option rather than type in the cells of the column. Include an appropriate input message and an error alert that is triggered by a user action.

ANSWERS

Refer to *Activity 2.17_Validation_answer.xlsx* for a sample solution. Sample screenshots have also been supplied (*Activity 2.17_Validation Rule.tiff* and *Activity 2.17_Validation Error.tiff*). Pairs can use this checklist to assess another pair's validation rule.

Task	Yes	No
1. Correct spreadsheet opened.		
2. Validation rule set up as a list.		
3. Correct source chosen.		
4. Appropriate input message created.		
5. Appropriate error alert created.		
6. Validate rule successfully tested.		
7. Screenshot taken.		
8. Spreadsheet correctly saved.		

Activity 2.18: Individual

Purpose:

Demonstrate how to use styles, themes, templates and macros.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Demonstrate the ability to work with all group members to complete a task successfully. (Core competencies CI5.4, DL5.1 and CC9.6)

Resources:

- Learner's Book pages 96–104
- *Activity 2.18_Templates and themes.xlsx*
- *Activity 2.18_Templates and themes_answer.xlsx*
- Microsoft® Excel

Teacher:

Show learners how to explore various templates using the More templates link in the File window as well as various themes in the Themes group on the Page Layout tab. If there is time, ask them to choose a template, enter fake data and change the theme. Ensure that learners know how to change field formatting before they attempt task 4.

Assessment:

The answer spreadsheet is given in the Answers section. This can be checked by learners themselves, pairs of learners or as a class.

Plenary:

Ask learners to open the spreadsheet for Activity 2.18 and customise the template and apply a theme. Pair weaker learners with a learner who will be able to help them through all the tasks in the activity, including data formatting.

LEARNERS

You are going to work in a spreadsheet that your teacher will give you. Fill in the template fields with fake data and apply a theme that suits the template. Look at the numerical content of the cells and format each one as a date or currency.

ANSWERS

Please note that the date on the statement will automatically update to today's date.

Emoji Fried Chicken

34 Asiedu Street
Pillar Two
Accra

Phone: 675 987342
Fax: 675 987343
E-mail: office@emojifc.com

Statement

Statement #: 002987EFC
Date: 21 July 2021
Customer ID: REF76142

Bill To: Mr Kwasi Gyamfi
Accra Football Stadium
47 Liberia Road
Pillar 1
Accra

Date	Type	Invoice #	Description	Amount	Payment	Balance
2021/01/25	Frozen chicken pieces	247	20 Packets of frozen chicken	GHC 335.00	GHC 200.00	GHC 135.00
2021/01/26	Cooking Oil	248	25 l	GHC 49.99	GHC 20.00	GHC 29.99
					Total	GHC 164.99

Reminder: Please include the statement number on your cheque.

Terms: Balance due in 30 days.

REMITTANCE	
Customer Name:	Mr Kwasi Gyamfi
Customer ID:	REF76142
Statement #:	002987EFC
Date:	21 July 2021
Amount Due:	GHC 164.99
Amount Enclosed:	

Billing statement

Sheet1



Activity 2.19: Individual/Group

Purpose:

Demonstrate how to use styles, themes, templates and macros.

Demonstrate the ability to visualise alternatives, see possibilities and identify problems and challenges. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Demonstrate the ability to work with all group members to complete a task successfully. (Core competencies CI5.4, DL5.1 and CC9.6)

Resources:

- Learner's Book pages 104–106
- Activity 2.19_Macros.xlsx
- Activity 2.19_Macro Code.tiff
- Activity 2.19_Macro Signature.tiff
- Activity 2.19_Macro Result.tiff
- Microsoft® Excel

Teacher:

Explain that macros are used to group sequences of user commands so that they can be executed using one command. This is most often done when users find themselves repeating the same sequence of steps over and over. Macros save users a great deal of time. Demonstrate how to record a macro, give it a unique name and execute it successfully. Also demonstrate how, in the case of a signature, the user would fill in the person's details in the Signature dialog box to create an individualised signature line.

Assessment:

Pair learners so that they can work together to create a macro and test it. They can base their assessments on the checklist in the Answers section.

Plenary:

Ask learners to open the spreadsheet for Activity 2.19. Give guidance on how to create a macro that will insert the image of their signature when the Insert Signature button is clicked. Ask them to view the macro code and take a screenshot of it.

LEARNERS

You are going to work in a spreadsheet that your teacher will give you. Use a smartphone to take a picture of your signature. Then create a macro in the spreadsheet that will insert your signature when the Insert Signature button is clicked.

ANSWERS

Sample screenshots of the code, signature dialog box and result have been supplied:
Activity 2.19_Macro Code.tiff, *Activity 2.19_Macro Signature.tiff* and *Activity 2.19_Macro Result.tiff*.

Pairs can use this checklist to assess another pair's macro.

Task	Yes	No
1. Took and saved an image of a signature.		
2. Opened correct spreadsheet file.		
3. Recorded a macro to insert the signature where specified.		
4. Saved the macro.		
5. Successfully tested the macro.		
6. Viewed macro code.		
7. Screenshot taken of macro code.		
8. Spreadsheet correctly saved.		

Activity 2.20: Pairs

Purpose:

Demonstrate the use of data tables, pivot tables, charts and pivot charts.

Demonstrate the ability to work with all group members to complete a task successfully. Demonstrate the ability to combine information and ideas from several sources to reach a conclusion. (Core competencies CC9.6 and CP5.1)

Resources:

- Learner's Book pages 107–112
- Microsoft® Excel

Teacher:

Explain that pivot tables and charts are used to display data extracted from large volumes of data. They are much more powerful than the sort and filter features used in a spreadsheet. Pivot tables help to summarise, analyse and compare the extracted data sets.

Assessment:

This activity looks fairly simple because it asks learners to interpret a pivot table and a chart based on the same information. However, pair learners who have shown competence with pivot tables and charts with learners who are struggling.

Plenary:

Explain exactly what is required for each task in this activity. Then monitor the learners so that you can spot learners who are struggling early on and can pair them with stronger learners.

LEARNERS

You are going to study the pivot table and chart on page 112 of the Learner's Book so that you can say which fields are being displayed and how they are being displayed. Then you will discuss how pivot tables and charts could be used in three scenarios. Lastly, you will list the steps you would follow to create a pivot table and a chart.

ANSWERS

1. This pivot table and chart display a summary of each product's unit price and the name of the salesperson selling each product.
2. Answers will vary. Accept any valid answers.
 - a. Possible answers: Staff can compare their sales performance with their colleagues and make decisions about improving their own performances.
 - b. Possible answers: The pivot tables can be used to display a summary of the best- and worst-selling products and show the position for each salesperson in relation to other salespersons or the products they are selling.
 - c. Possible answers: It can be seen that even though some salespersons are selling higher numbers of their products, they aren't necessarily bringing in the most revenue.

3. **Step 1:** Open the data set you wish to explore and place your cursor anywhere in the data set.
- Step 2:** Select the Pivot Table option in the Tables group on the Insert tab.
- Step 3:** Select a table or range.
- Step 4:** Specify where you want to place the pivot table.
- Step 5:** Select the Add this to the Data Model checkbox.
- Step 6:** Click OK.

Remedial activity:

Reinforce learners' understanding by asking them to match the following descriptions with these key concepts: macro, data validation, pivot table.

- Allows you to control the type of data in a cell. (data validation)
- Allows you to summarise large quantities of data. (pivot table)
- Allows you to automate repetitive tasks. (macro)

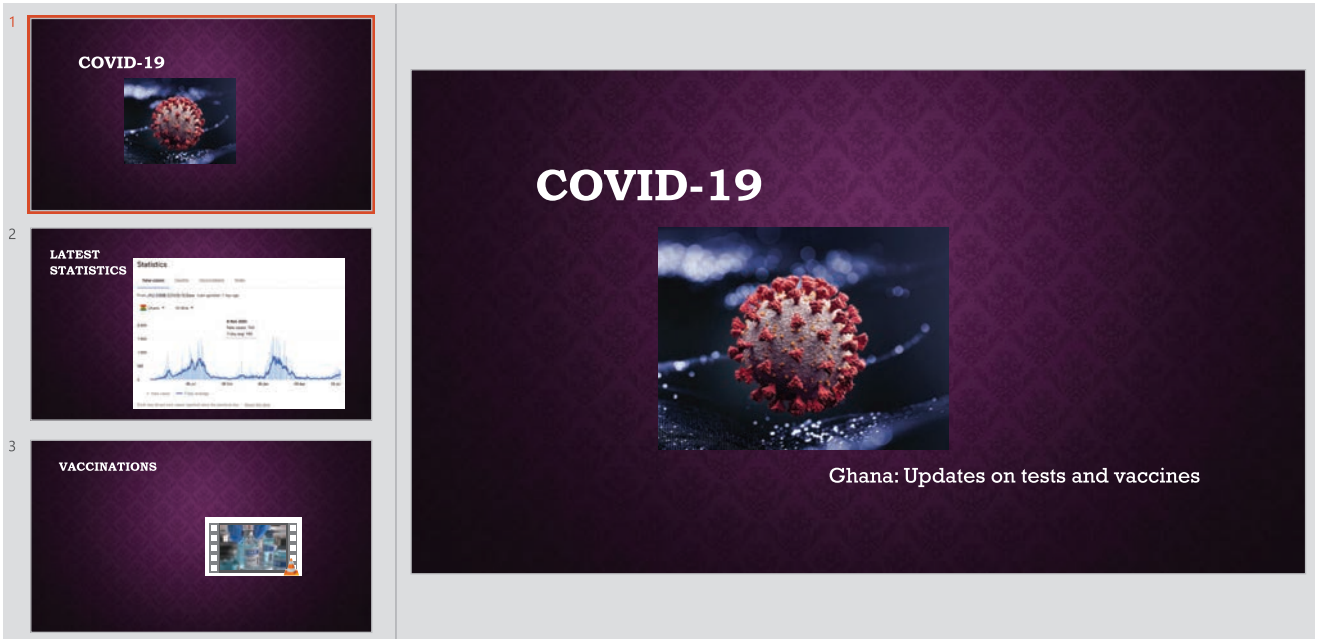
Check your progress

ANSWERS

- 1. Productivity software consists of all the applications that people use to do their work. The applications in an office suite are typical examples of this and include the following applications: word processing, electronic spreadsheets, desktop publishing, presentation, database, and cloud computing and storage.
- 2. The interfaces are very similar, so it's easier to learn a new application in the same suite. The files produced in one of the applications can be used as is in another application without having to be converted to a different format. Linked files, such as an Excel chart in a Word document, are automatically updated when the original file is updated.
- 3. Use this checklist to assess learners' documents.

Task	Yes	No
1. Blank document opened.		
2. Title correctly entered and formatted.		
3. Screenshot taken of the Ghana Wildlife Society home page.		
4. Screenshot inserted below title.		
5. Bulleted list of five valid facts inserted below screenshot.		
6. Link to the correct YouTube video inserted below screenshot.		
7. YouTube link works.		
8. Document saved correctly.		

- 4. Use this example to assess learners' presentations.



Note: Learners' formatting and placement of objects will vary. The important aspects to note are:

Task	Yes	No
1. Is the text legible in terms of the font chosen and the size of headings and content?		
2. Is the layout of each slide balanced and attractive?		
3. Do the slides look like they belong to the same presentation?		
4. Are the images inserted on the correct slides?		
5. Was the correct screenshot taken?		
6. Are the animations so varied that they are a distraction?		
7. Does the slide transition apply to all slides and is it appropriate for the seriousness of the topic?		

5. Use this checklist to assess the learners' publications.

Task	Yes	No
1. Is the choice of template suitable, such as a flyer or poster?		
2. Does the publication contain all five items of information?		
3. Are the images and shapes appropriate and illustrative?		
4. Was a music audio file sourced on the internet? Is the audio appropriate?		
5. Was the publication saved correctly?		

6. A pivot table is used to summarise, analyse and compare data in large data sets. They are used to select specific data for reports. Banks and other large organisations, such as hospitals and educational institutions, who store large volumes of client data frequently use pivot tables.
7. Keyboard shortcuts are macros because they execute at least two user actions. These user actions are mouse movements that have to be precise, so take time. For example, Ctrl+C involves selecting the object to be copied, selecting the Home tab, finding the Clipboard group and clicking the Copy button.
8. Use this checklist to assess the learners' spreadsheets.

Task	Yes	No
1. Was the <i>Personal monthly budget</i> template used?		
2. Has the currency data type been adjusted to display cedi?		
3. Are the lists of income and expenses realistic?		
4. Have all unwanted placeholders been deleted?		
5. Has the theme been changed to Atlas?		
6. Was the spreadsheet saved correctly?		

9. Spreadsheet:

- a. Cell D4: =COUNTA(G9:G58)
- b. Cell D5: =COUNTA(G9:G58)
- c. Cell D6: =COUNTIF(B9:B58, "earrings")
- d. AutoFill cells A9:A10 to the rest of the cells in column A
- e. Column D: Conditional formatting:
 - Criteria: "22 carat"
 - Format
 - Border: Red
 - Shading: yellow
 - Pattern style: 12.5% gray
- f. Cell I9: =E9*F9
- g. Cell J9:
 - =I9*1.1 or =I9+(I9*0.1)
 - Formula copied down to other cells
- h. PivotTable:
 - Columns: Quality Level
 - Rows: Jewellery Type and Precious Metal
 - Values: Count of Quality Level
- i. Filter:
 - Jewellery Type: Ring
 - Precious Metal: Platinum
 - Stone Type: Diamonds or ruby
- j. Sort:
 - 1st Level: Precious Metal: Smallest to largest
 - 2nd Level: Grams: Largest to smallest

Strand 3: Communication Networks

THIS RESOURCE WILL PROVIDE INFORMATION FOR THE TEACHER SURROUNDING EACH OF THE ACTIVITIES IN THE LEARNER'S BOOK.

Introduction

For each activity, there will be:

- The number of the activity, and whether it is an individual, pair or group activity
- A list of resources
- Links to websites and videos needed for the activity, including the length of each video
- Explanation for the teacher on how the activity could be altered or further developed
- and some notes on how to carry out some of the steps requested of the learners
- Notes about how the activity can be assessed as well as suggestions for a plenary when the activity is complete
- The contents of the activity for the learners
- The answers or expected outcome for the activity.

Sub-strand 1: Computer networks

Activity 3.1: Individual

Purpose:

Discuss types of e-commerce and the cashless society (Bitcoin, transaction cards, quick response code (QR) payment system).

Demonstrate the ability to find and utilise digital content. Vary the level of detail and the language used when presenting to make it appropriate to the audience. (Core competencies DL5.3 and CC8.5)

Resources:

- Learner's Book pages 116–120
- The internet and a computer or mobile device with access to the internet
- Electronic or printed examples of QR codes
- A smartphone with a QR scanner app installed

Teacher:

Cover the content provided in the Learner's Book. If possible, let the learners work in groups to explore a variety of e-commerce sites, such as online shops. Demonstrate a QR code being used with a smartphone app. The QR code does not have to be linked to a payment but can just be one that takes you to a website.

Assessment:

Informally assess the learners' knowledge of this topic through short quizzes and checking the answers to the activity.

Plenary:

Use a question-and-answer session to check and reinforce the learners' knowledge of this section of work. Check the answers to the activity.

LEARNERS

You are going to give definitions and show your understanding of mobile money and online shopping. Read the questions in the Learner's Book. Ask your teacher to explain anything that is unclear. Answer the questions on your own to help you remember the content of this section. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1.
 - a. E-commerce involves the buying and selling of products on the internet.
 - b. A QR Code, or quick response code, is a two-dimensional image made up of a pattern of little blocks; it can hold more information than a normal barcode.
2. Accept any three of the following:
 - Money can be sent directly to your mobile money account without having to go through a bank account at a bank.
 - It is easy to use, and it is quick to perform transactions.
 - It is secure.
 - It is inexpensive as the transaction fees are usually low.
 - It is convenient as it is on your phone and available to use at any time, as long as you have cellular reception.
3. The money is kept with the mobile phone company.
4. Accept any three of the following:
 - You can shop at any time of the day or night.
 - You are not limited by your geographical location (unless you live in a very remote area where it is difficult or too far to make deliveries). You can shop on international sites with ease, but should keep possible import duties in mind.
 - As a business, you can have global exposure for your business.
 - Many sites allow you to compare products and prices so that you can find the best deal.
 - If you use reputable online shops, returns are easy if you do not like the product or something does not fit.
 - You do not have to travel to crowded shopping malls and markets and can shop from the comfort of your home. This saves on fuel and transport costs and avoids having to sit in frustrating traffic in a city environment.
 - For a business, the money from an online sale is deposited into your account immediately and carries less risk than having physical cash on your business premises.

Activity 3.2: Individual

Purpose:

Justify eLearning potentials.

Speak clearly and explain ideas. Share a narrative or extended answer while speaking to a group. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CC8.1 and DL5.1)

Resources:

- Learner's Book pages 121–122
- A computer with access to the internet
- A data projector or screen-sharing software
- eLearning sites, such as Google® Classroom, Moodle, Khan Academy and PHET simulations

Teacher:

Cover the content in the Learner's Book, taking care to explain all the new concepts clearly. If possible, use a computer with an internet connection to demonstrate some of the eLearning opportunities, such as any e-book example of a school textbook, VLE such as Google® Classroom or Moodle, sites such as Kahn Academy (www.khanacademy.org) or the PHET simulations website (phet.colorado.edu).

Assessment:

Informally assess the learners' knowledge of this topic, through short quizzes and checking the answers to the activity.

Plenary:

Use a question-and-answer session to check and reinforce the learners' knowledge of this section of work. Check the answers to the activity.

LEARNERS

Work on your own to answer questions about eLearning. Read the questions in the Learner's Book. Ask your teacher to explain anything that is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. Some e-books are enhanced by interactive content and embedded video clips. Many also allow the learner to make notes and to highlight important concepts.
2. Google® Classroom and Moodle (Accept any other valid examples.)
3. Any three:
 - Work can be accessed anywhere and at any time.
 - The lessons can be customised to individual learning needs.
 - Learners can work at their own pace.
 - It promotes learner-centred activities that lead to greater retention of what has been learnt.
 - Work can be revisited in the learner's own time, as often as needed.
 - Content is easily updated compared to printed books and course material.
 - Learners can spend more time actively learning because they do not have to travel to get to a classroom.
4. Any two:
 - It can be expensive.
 - The learner needs access to a computer and the internet.
 - It requires willpower, self-motivation and excellent time management to work on your own.
 - Feedback on work done can be limited or delayed.
 - You can feel isolated when you work on your own.
 - It can be difficult to control the integrity of online tests and to ensure that no cheating takes place.
 - Good computer literacy is required to be able to operate effectively in an online environment.

Activity 3.3: Group

Purpose:

Justify eLearning potentials.

Speak clearly and explain ideas. Share a narrative or extended answer while speaking to a group. Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competencies CC8.1 and DL5.1)

Resources:

- Learner's Book pages 123–127
- A computer with access to the internet per group, but preferably per learner
- A data projector, if possible (to demonstrate online collaboration to the whole class)

Teacher:

Cover the content in the Learner's Book, taking care to explain all the new concepts clearly. This lesson can be done as a demonstration only, but ideally every learner needs to experience this for themselves. Demonstrate how to share a document using a cloud service before letting them do the activity. You can choose a learner to share the document with and then have them demonstrate to the class what they can see and do with the document.

LOW RESOURCE SCHOOLS

1. Discuss the benefits of saving documents to the cloud.
2. How are collaborations done on documents stored in the cloud?

ANSWERS

1. You can share a document, or a folder with documents, with other people so that you can all collaborate (or work together) on the documents. You can set permissions for a shared document so that the 'owner' of the document can control who can view it, comment on the document, or make changes to it. Another advantage of storing documents in the cloud is that your documents will still be safe and accessible if your computer is damaged or stolen. You will still be able to access the documents from another computer.
2. Open File Explorer and find the file or folder that you want to share. Right-click on the file or folder. Choose the **Share** option from the menu that pops up. Choose the sharing options and enter the username of the person on the network, or their email address.

Assessment:

You can assess this activity informally. Move around the class and ensure that each learner in the group is actively involved. Ask informal questions as you move around to ensure that every learner understands the concepts. Provide assistance to anyone who is struggling to work in this unfamiliar environment, creating the account if necessary.

Plenary:

Ask the learners to describe their experiences when creating a document and then sharing it. Let them express what they enjoyed about this activity and what opportunities they see in terms of their schoolwork in general.

LEARNERS

You are going to work in a group to create and share online documents. Read the questions in the Learner's Book. Ask your teacher to explain anything that is unclear.

ANSWERS

Answers will vary. All learners should be able to create and share an online document.

Remedial activity:

Provide learners with further opportunities to practise sharing online documents.

Sub-strand 2: Internet and social media

Activity 3.4: Individual

Purpose:

Identify the advantages and risks in the use of social media platforms.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competency DL5.1)

Resources:

- Learner's Book pages 128–130
- The internet and a computer or mobile device with access to the internet

Teacher:

This is a straightforward section of work. Cover the content in the Learner's Book, taking care to explain all the new concepts clearly.

Assessment:

Informally assess the learners' knowledge of this topic through short quizzes and checking the answers to the activity.

Plenary:

Use a question-and-answer session to check and reinforce the learners' knowledge of this section of work. Check the answers to the activity.

LEARNERS

You are going to work on your own to answer questions about the benefits and risks of social media. Read the questions in the Learner's Book. Ask your teacher to explain anything that is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. Any three:

- Social media is free to use.
- It provides a way for family and friends who are far apart to share in each other's important life events.
- Social media gives everyone the ability to be heard and make their opinions publicly known. This is especially useful for making the public aware of causes such as climate change concerns, anti-abuse campaigns, human rights and animal anti-cruelty.
- Social media can be a source of entertainment.

2. Accept any three reasonable answers, such as:

- Businesses can use social media to reach existing and new clients. Social media platforms provide a massive audience and potentially wide exposure to a business. In this way, social media can be used for advertising purposes, building a brand or for keeping in touch with loyal customers and keeping them interested in your product.
- A business can use social media to promote their website and their online store.
- Social media provides a business with instant feedback on how well they are doing, whether people are happy with their product or service, and where improvement is needed.

3. Any four:

- Social media platforms are public, so you need to be very careful what you post on social media. You can limit your exposure by checking your privacy settings and ensure that they are high. This will limit the number of people who can see your posts, comment on them and share them.
- The internet and social media platforms provide a great deal of anonymity. Anyone can create a fake online profile and pretend to be someone else. You have no idea whether a stranger is who they say they are, or whether the pictures you see are genuine. Fake profiles can be used to lure people into dangerous situations where kidnapping or other abuses are possible. It is therefore essential to take care when you communicate with strangers on social media.
- It is very important not to post personal details, such as your address or phone number, on social media. Providing personal contact details could leave you open to becoming a victim of cybercrimes, such as identity theft and cyberstalking. It is a good idea if young users of social media do not use their real names in their social media profiles. This will help them to protect their privacy.
- Be careful that what you post is factually correct and does not harm anyone else. You could get into legal trouble for spreading fake news or for damaging someone's reputation. Even if you delete a post, someone may already have shared it or taken a screenshot of it. Once something has been published on the web, it can exist forever and is out of your control. Check your facts before posting, especially anything sensational.
- Be careful what you post, as it can cause problems for you later in life. Potential employers look at the social media profiles of job applicants and they may decide that the things you post do not fit in with what the company or organisation stands for. The same could happen when you apply to university or college or for study bursaries.
- Posting negative comments on social media about work colleagues or the company you work for could lead to disciplinary action. If a job requires you to have a work-related social media presence, consider having different profiles for your work and your private life on these platforms.
- Cyberbullying happens where bullying takes place on social media. Report the bully to a trusted adult and block them on the platform.

- By posting to social media platforms, you give them the rights to any images and video clips that you post. In other words, they can use those in any way that they want to. This means that they can use your social media and other online activity for marketing purposes. Make sure that you are happy with the possibility that the content you post might be used by the platform.
- Social media can become addictive. If you spend too many hours a day on social media, you could end up neglecting your studies, work or loved ones. Keep an eye on how much time you spend on social media and scale down if necessary.

Activity 3.5: Pairs

Purpose:

Identify the advantages and risks in the use of social media platforms.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competency DL5.1)

Resources:

- Learner's Book pages 130–131
- The internet and a computer or mobile device with access to the internet
- A data projector is helpful to display the example to the whole class if this activity is done as a demonstration
- An email account per learner, provided either by the school or by setting up individual webmail accounts

Teacher:

If there are no devices with internet access available, this activity could be done as a demonstration. It is preferable that each learner has an opportunity to experience the various email functions for themselves, as this is a skill often required in the modern world.

Let the learners follow the steps as set out in the activity.

LOW RESOURCE SCHOOLS

Amenyo is a learner who has received an assignment from his teacher via email. When he finishes the assignment, he is expected to send it to his teacher by replying to the email he received. Outline the steps to guide him how to reply to the email.

ANSWERS

Click the **Reply** button to reply to the sender of the message. Type your message in the message pane. If the assignment is a separate document, attach it to the email. When the message is ready, click the **Send** button.

Assessment:

This activity can be assessed informally. Ask informal questions in class to assess each learner's knowledge and understanding of the use of the **Reply**, **Reply all** and **Forward** functions. When the learners are working

in pairs, move around the class and provide assistance and reinforcement if learners are struggling with any aspect of the process. Ensure that each learner can perform the actions as set out in the Learner's Book.

Plenary:

Hold an informal question-and-answer session to consolidate the use of **Reply**, **Reply all** and **Forward**.

LEARNERS

You are going to work with a classmate to send, reply to and forward an email. Read the questions in the Learner's Book. Ask your teacher to explain anything that is unclear. If you struggle with sending, replying to or forwarding an email, ask your teacher to help you or to give you more time. If you have email available at home, try sending emails to friends and family members.

ANSWERS

The teacher should receive an email message from each of the learners in the class.

Remedial activity:

If necessary, allow the learners more practice with sending emails.

Sub-strand 3: Information security

Activity 3.6: Group

Purpose:

Discuss cyberbullying, cyberstalking, digital footprint and digital shadow on the internet.

Understand the sociological and emotional aspects of cyberspace. Demonstrate the ability to identify important and appropriate criteria and use them to evaluate available alternatives. Vary the level of detail and the language used when presenting to make it appropriate for the audience. (Core competencies DL6.1, CP6.4 and CC8.5)

Resources:

- Learner's Book pages 132–134
- A computer or mobile device with access to the internet
- A data projector and a set of computer speakers (if the video clip is being shown to the class as a whole)
- The link below

Link:

Video: Top 10 forms of cyberbullying (3:30 minutes)

<https://www.youtube.com/watch?v=0Xo8N9qJtk>

Teacher:

Either divide the class into groups to watch the video clip in their groups or show the video to the whole class. Then answer any questions.

Assessment:

Assessment can take place through discussion of the video and the questions asked during the plenary.

Plenary:

Discuss any questions that the learners may have about the concepts mentioned in the video clip.

LEARNERS

You are going to watch a video clip on cyberbullying and cyberstalking to help improve your understanding of these concepts. Watch the video in your group. Ask your teacher to explain anything that is unclear. After watching the video, have a group discussion about what you have seen and what lessons you have learnt.

ANSWERS

The class discussion should demonstrate that the learners understand the nature and dangers of cyberbullying and cyberstalking.

Activity 3.7: Group

Purpose:

Discuss cyberbullying, cyberstalking, digital footprint and digital shadow on the internet.

Understand the sociological and emotional aspects of cyberspace. Demonstrate the ability to identify important and appropriate criteria and use them to evaluate available alternatives. Vary the level of detail and the language used when presenting to make it appropriate for the audience. (Core competencies DL6.1, CP6.4 and CC8.5)

Resources:

- Learner's Book pages 134–135
- The internet and a computer or mobile device with access to the internet
- A data projector and a set of computer speakers (if the video clip is being shown to the class as a whole)
- The link below

Link:

Video: Four reasons to care about your digital footprint (8:01 minutes)

https://www.youtube.com/watch?v=Ro_LIRg8rGg

Teacher:

Either divide the class into groups to watch the video clip as a group, or show the video to the whole class. Then answer any questions.

Assessment:

Assessment can take place through discussion of the video and the questions asked during the plenary.

Plenary:

Discuss any questions that the learners may have about the concepts mentioned in the video clip.

LEARNERS

You are going to work in a group and watch a video on digital footprints. When you are watching the video, ask your teacher to explain anything that is unclear. In your group, discuss what you have seen in the video and give three examples that illustrate why it is important to have a positive digital footprint.

ANSWERS

Discussions should demonstrate that the learners understand the nature of a digital footprint and the importance of having a positive digital footprint.

Activity 3.8: Individual

Purpose:

Discuss cyberbullying, cyberstalking, digital footprint and digital shadow on the internet.

Understand the sociological and emotional aspects of cyberspace. Demonstrate the ability to identify important and appropriate criteria and use them to evaluate available alternatives. Vary the level of detail and the language used when presenting to make it appropriate for the audience. (Core competencies DL6.1, CP6.4 and CC8.5)

Resources:

- Learner's Book pages 134–135

Teacher:

Read aloud the content in the Learner's Book dealing with cyberbullying, cyberstalking, digital footprint and digital shadow. Explain any new or confusing concepts. You can also refer to the video they watched in Activity 3.7. Allow for discussion and questions from the learners.

Assessment:

Assessment can take place through discussion during the plenary.

Plenary:

Ensure that every learner has the correct answers to the activity.

LEARNERS

You are going to work on your own to answer questions. Read the questions in the Learner's Book. Ask your teacher to explain anything that is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. Bullying that takes place using electronic media, usually online.
2. Accept any two of the following:
 - All forms of bullying should be reported to a responsible adult, such as a trusted teacher or your parents, who can help you deal with it.
 - If the cyberbullying is happening in a group, such as a WhatsApp group, it is the responsibility of the owner of the group to put a stop to it by warning and/or removing the bully from the group. If this does not happen, then you should leave the group.
 - If the bullying is happening on social media platforms such as Facebook or Instagram, you should report the person to the platform's administrators, then block the person.
3. Accept any two of the following:
 - Cyberstalking can take the form of someone harassing a person online with inappropriate messages and demands.
 - It can take the form of continual harassment, with threats aimed at frightening someone or making unfounded statements about the person on online platforms.
 - Cyberstalking can also be used to gather personal information from online platforms over time, in order to commit identity theft.
4. It is the digital record of all your online activity.
5. Answers will vary. Accept any suitable ideas, such as:
Prospective employers or educational institutions may check your digital footprint to see if you fit the image and ethos of their organisation. It might even affect your credit rating. If you show risky behaviour in your digital footprint, a bank may think twice about financing a new car or giving you a housing loan.

Activity 3.9: Group

Purpose:

Explain ten information hacking techniques on the internet environment.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competency DL5.1)

Resources:

- Learner's Book page 136
- The internet and a computer or mobile device with access to the internet

Teacher:

This activity is intended to generate interest in the topic of hacking techniques as a precursor to the actual content in the book. If possible, allow the learners to search for options on the internet.

Assessment:

Assessment can take place through discussion during the plenary.

Plenary:

List the suggestions from the group on the board and let the class discuss them to gain further insight.

LEARNERS

You are going to work in groups and brainstorm hacking techniques. Follow the instruction in the Learner's Book and ask your teacher to explain anything that is unclear. Discuss as many hacking techniques as possible and try to be inventive with your suggestions.

ANSWERS

The answers will vary according to the ideas listed by the learners.

Activity 3.10: Group

Purpose:

Explain ten information hacking techniques on the internet environment.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. (Core competency DL5.1)

Resources:

- Learner's Book pages 136–142
- The internet and a computer or mobile device with access to the internet

Teacher:

Cover the relevant content in the Learner's Book. Allow time for discussion and questions from the learners.

Assessment:

Assessment can take place through discussion during the plenary.

Plenary:

Ensure that every learner has the correct answers to the activity.

LEARNERS

You are going to work in your group to prepare a presentation on hacking techniques. Make sure that you understand the different techniques before you start to work on your presentation. Ask your teacher to explain anything that is unclear. Follow the instructions in the Learner's Book.

ANSWERS

The answers will vary according to the ideas listed by the learners.

- Phishing: This is a technique where email is used to lure a person to click on a link that will take them to a fake website.
- Smishing: A form of phishing that uses text messaging instead of email.
- Keyloggers: A form of malware that records the keystrokes you make when typing on the computer keyboard.

- Denial of service attack (DoS attack): These attacks are used to overload a system with traffic until it fails.
- Eavesdropping: Eavesdropping on data transfers can happen in different ways. Malware called a sniffer can 'listen' to the traffic on a network and capture valuable data, such as usernames and passwords. Wireless communications are easily intercepted, as the data transmission happens in three dimensions through space.
- Trojan: This is a type of malware that looks like a useful piece of software but, when installed, it carries a hidden piece of malware.
- DNS spoofing: If your computer has been infected by the spoofing malware, an incorrect IP address could have been stored in the web cache. You will then be redirected to a malicious website that could deliver other malware to your computer. If the domain name server has been infected, then the IP address of the malicious website would be sent to your browser instead of the IP address of the real website.
- Pharming: This is a malware infection that causes your web browser to redirect you to a fake website.
- Rootkit: A rootkit is a collection of hacking tools that are designed to get access to a computer or computer system at the highest level.
- Brute force attack: In a brute force attack, the hacker guesses passwords or encryption algorithms multiple times until they find one that works.
- Fake wireless access points: Hackers can set up a mobile phone as a fake, free wireless access point in a public space, such as a busy airport building, a busy shopping mall or in the vicinity of a coffee shop. The hacker uses the connection to spy on what people are doing online and to collect data on what they are doing. They could be collecting usernames, passwords and credit card details or information that could be used for blackmail.

Remedial activity:

List some of the techniques (e.g. Trojans, phishing, keyloggers, denial of service attacks and eavesdropping) and ask learners to match the technique with its description.

Sub-strand 4: Web technologies

Activity 3.11: Pairs

Purpose:

Examine the importance of creating blogs.

Be open-minded, adapting and modifying ideas to achieve creative results. Demonstrate the ability to find and utilise digital content. (Core competencies CI6.6 and DL5.3)

Resources:

- Learner's Book pages 143–144
- The internet and a computer or mobile device with access to the internet

Teacher:

The learners will investigate the importance of creating blogs. Let the learners work in pairs so that they can share ideas with each other. Let them do the activity first and then consolidate with the points from the Learner's Book.

Assessment:

Assessment can take place through discussion during the plenary and an informal evaluation of the ideas provided by the learners.

Plenary:

Have a class discussion. Ask the learners what, in their opinion, are the reasons for using blogs. Also ask them to say which features of the blogs appealed to them. Discuss the different reasons and choice of features, then list the most popular ones on the board.

LEARNERS

You are going to work in pairs to investigate some existing blogs. Follow the instructions in the Learner's Book. You can use a search engine such as Google® to find blogs. Pay attention to the layout and other features of the blogs.

ANSWERS

The learners will give a variety of reasons why blogs are important. Here are some suggestions.

- It provides an easy platform to meet people who like the same things as you do and who agree with your viewpoints on a topic.
- Having a blog gives you a public platform to showcase your writing skills. Your blog could be used as part of your portfolio if you are interested in becoming a writer or journalist.
- Linked to the previous point, a blog can help you build confidence as you grow more knowledgeable on the topic and your blogging skills improve. You do not need to communicate with a wide audience before you build your confidence.
- If your blog is really good and attracts a large number of readers, you can make money from advertising on your blog. Successful bloggers can be very influential, and people look to them to determine new trends and value their opinions on a wide range of topics.
- A blog can be used together with other social media platforms to market a new or existing business. You can share information about upcoming events, special offers and new products being launched.

Activity 3.12: Pairs

Purpose:

Develop a blog for the school or a social club.

Use digital tools to create novel things. (Core competency DL6.3)

Resources:

- Learner's Book pages 145–150
- The internet and a computer or mobile device with access to the internet
- A data projector to demonstrate the creation of a blog

Teacher:

Depending on the platform chosen to create the blog, the interface could be quite confusing for the learners. Lead the learners through the process step by step, and then give them an opportunity explore and discover what they can do.

LOW RESOURCES SCHOOLS

1. In pairs, discuss factors to consider when creating a blog.
2. Discuss the main features of a blog.
3. Outline the benefits of blogs to the blogger.
4. Present your responses to the class.

ANSWERS

1. The learners' discussions will vary. They could mention factors such as readability, attractiveness, ease of navigation, providing useful information, the use of keywords so that search engines can find the blogs, and the regular and relevant posts.
2. A blog should include the following:
 - header or title
 - left-hand sidebar with links to older posts, the blogger's profile and social media account(s), and other sites (if applicable)
 - main area with posts
 - right-hand sidebar for additional information
 - a footer with additional links.
3. Answers may vary, but they should include the following points.
 - A blog provides an easy platform to meet like-minded people who share your interests or agree with your viewpoints on a topic.
 - Having a blog gives you a public platform to showcase your writing skills. Your blog could be used as part of your portfolio if you are interested in becoming a writer or journalist.
 - A blog can help you build confidence as you grow more knowledgeable on your topic and improve your blogging skills. You do not need to communicate with a wide audience when you start out if you do not feel confident yet.
 - If your blog is really good and attracts a large number of readers, you can make money from advertising on your blog site. Successful bloggers can be very influential, and people look to them to determine new trends and value their opinions on a wide range of topics.
 - A blog can be used together with other social media platforms to market a new or existing business. You could publish information about upcoming events, special offers or new products being launched.

Assessment:

Informal assessment will take place when the learners demonstrate their blogs to the class.

Plenary:

Use a class discussion to give constructive feedback about each blog.

LEARNERS

You are going to work with a classmate to create a blog for your school, a social club or a sports club. Read the instructions in the HOW TO? box on pages 146–149 of the Learner's Book. Ask your teacher if there is anything you do not understand. Follow the instructions for the activity in the Learner's Book.

ANSWERS

You can use the following checklist to check that the learners have completed the activity.

Task	Yes	No
1. Blog created.		
2. Topic has to do with a school, a social club or a sports club.		
3. Theme chosen for blog.		
4. Default images replaced.		
5. Page added for posts.		
6. Suitable layout chosen for page.		
7. Posts created.		
8. Pictures have been added.		

Remedial activity:

Give the learners the opportunity to improve their blog.

Activity 3.13: Pairs

Purpose:

Explore the steps in publishing a blog.

Use digital tools to create novel things. (Core competencies DL6.3)

Resources:

- Learner's Book pages 150–151
- The internet and a computer or mobile device with access to the internet
- A data projector

Teacher:

Depending on the platform chosen to create the blog, the interface could be quite confusing for the learners. Lead them through the process step by step and then let the learners explore and discover.

LOW RESOURCE SCHOOLS

1. Discuss the importance of previewing a blog before it is published.
2. Brainstorm the relevance of password protection when a blog is first launched.

ANSWERS

1. The learners' discussions will vary, but should include the following points:
 - It is important to preview your blog before publishing it so that you can double-check its appearance and correct any mistakes.
 - If your blog contains typing errors, spelling or grammatical mistakes, it will create a poor impression for anyone reading the blog for the first time.

2. The learners' ideas will vary, but should include the following points:
- The blog will be visible only to people who have the password.
 - A password is a good option if you want a few people to check the site before it goes live to the public.
 - It is also a good option when you are trying out blogging for the first time and you want to practise and grow in confidence with a limited audience.

Assessment:

Informal assessment will take place when the learners demonstrate their blogs to the class.

Plenary:

Use a class discussion to give positive feedback about each blog.

LEARNERS

You are going to work with a classmate to publish a blog to the web. Read the HOW TO? box on pages 150–151. Ask your teacher if anything is unclear. Follow the steps to publish your own blog to the web.

ANSWERS

You can use the following checklist to check that the learners have completed the activity.

Task	Yes	No
1. Blog published.		
2. Topic has to do with a school, a social club or a sports club.		
3. At least two posts created.		
4. Images have been added.		
5. Address shared with class.		
6. Class have commented on blog.		

Check your progress

ANSWERS

1.
 - a. A mobile money account service is often provided by the mobile phone company itself. Funds are kept in an electronic bank account that can be accessed by a mobile phone app.
 - b. When purchasing an item, it could already have a QR code that you scan with an app on your mobile phone to pay for it. If you are buying several items, the point-of-sale system can generate a QR code that you then scan to pay. The app on your phone is linked to your bank card and payment is immediate.
 - c. Bitcoin is an example of virtual money. This means that it is a purely electronic currency. Another name for this type of currency is cryptocurrency. Bitcoin is kept in an electronic wallet. You can send and receive money using this electronic wallet. It can also be used to pay for purchases, but many shops still do not accept bitcoin. Bitcoins can be bought online using normal currency.
2. Any two: Zoom, Google® Meet, Microsoft® Teams
3.
 - a. Any three:
 - Work can be accessed anywhere and at any time.
 - The lessons can be customised to individual learning needs.
 - Learners can work at their own pace.
 - It promotes learner-centred activities that lead to greater retention of what has been learnt.
 - Work can be revisited in the learner's own time, as many times as needed.
 - Content is easily updated compared to printed books and course material.
 - Learners can spend more time actively learning because they do not have to travel to get to a classroom.
 - b. The answers will vary according to circumstances, but could include:
 - Not everyone has a computer at home.
 - The cost of data/internet connectivity can be high.
 - You need electricity.
 - c. The answers will vary according to circumstances, but could include:
 - Teachers could focus on services that have been zero-rated by the service providers.
 - Mobile devices such as mobile phones could be used instead of computers.
4.
 - a. It is online storage service that is accessed through a web browser.
 - b. Two or more people work together on a shared document that has been stored in the cloud.
 - c. Google® Docs, Microsoft® OneDrive, Dropbox®
5.
 - a. Any two, or similar points:
 - Social media is free to use.
 - It provides a way for family and friends who are far apart to share in each other's important life events.
 - Social media gives everyone the ability to be heard and make their opinions known publicly.
 - Social media can be a source of entertainment.
 - b. Any two:
 - Social media platforms are public, so you need to be very careful what you post on social media. You can limit your exposure by checking your privacy settings and ensure that they are high. This will limit the number of people who can see your posts, comment on them and share them.
 - The internet and social media platforms provide a great deal of anonymity. Anyone can create a fake online profile and pretend to be someone else. You have no idea whether a stranger is who they say they are, or whether the pictures you see are genuine. Fake profiles can be used to lure people into dangerous situations where kidnapping or other abuses are possible. It is

therefore essential to take care when you communicate with strangers on social media.

- It is very important not to post personal details, such as your address or phone number, on social media. Providing personal contact details could leave you open to becoming a victim of cybercrimes, such as identity theft and cyberstalking. It is a good idea if young users of social media do not use their real names in their social media profiles. This will help them to protect their privacy.
 - Be careful that what you post is factually correct and does not harm anyone else. You could get into legal trouble for spreading fake news or for damaging someone's reputation. Even if you delete a post, someone may already have shared it or taken a screenshot of it. Once something has been published on the web, it can exist forever and is out of your control. Check your facts before posting, especially anything sensational.
 - Be careful what you post, as it can cause problems for you later in life. Potential employers look at the social media profiles of job applicants and they may decide that the things you post do not fit in with what the company or organisation stands for. The same could happen when you apply to university or college or for study bursaries.
 - Posting negative comments on social media about work colleagues or the company you work for could lead to disciplinary action. If a job requires you to have a work-related social media presence, consider having different profiles for your work and your private life on these platforms.
 - Cyberbullying happens where bullying takes place on social media. Report the bully to a trusted adult and block them on the platform.
 - By posting to social media platforms, you give them the rights to any images and video clips that you post. In other words, they can use those in any way that they want to. This means that they can use your social media and other online activity for marketing purposes. Make sure that you are happy with the possibility that the content you post might be used by the platform.
 - Social media can become addictive. If you spend too many hours a day on social media, you could end up neglecting your studies, work or loved ones. Keep an eye on how much time you spend on social media and scale down if necessary.
6. a. hacker: a person who gains unauthorised access to a computer system by getting past the security measures
b. cybercriminal: a criminal who uses ICT to commit their criminal activities
c. cyberbullying: bullying that takes place using electronic media, usually online
7. a. online harassment or a form of electronic surveillance used to gather personal information
b. Any two:
 - Keep personal details to a minimum on social media.
 - Set your privacy settings to the highest level.
 - Report any online harassment to the police, as any form of harassment is a criminal act.
 - Block the person if this is happening on your social media account or via email.
 - Report the harassment to the social media platform that it is occurring on so that the person's account can be disabled.
8. The field of law requires individuals to have an excellent reputation. Prospective law firms or educational institutions where you might like to study may check your digital footprint to see if you fit the image and ethos of their organisation. It is thus important to have a positive digital footprint. A negative digital footprint might also cost you possible study bursaries and study loans.

- 9.
 - a. The aim of a denial of service attack (DoS attack) is to overload a system with traffic until it fails. When the computer system is brought to a halt, it can mean big financial losses for a business especially if it is an online business. As a result of the attack, clients may not be able to access the service, resulting in a loss of trade. It also damages the reputation of the business, which could lead to further loss of business.
 - b. A rootkit is a collection of hacking tools that are designed to get access to a computer or computer system at the highest level. The hacker then has access as an administrator and can remotely access everything on the system without anyone knowing about their access.
 - c. email attachments, file downloads, visiting infected websites
- 10.
 - a. A website on which an individual or group regularly posts items of interest.
 - b. Enable the comment section in which members of the public can interact with one another and the owner of the blog.
 - c. Creating a blog means designing the blog and adding content to it, whereas publishing a blog means making it available to the public on the internet, also known as launching a blog.

Strand 4: Computational Thinking

THIS RESOURCE WILL PROVIDE INFORMATION FOR THE TEACHER SURROUNDING EACH OF THE ACTIVITIES IN THE LEARNER'S BOOK.

Introduction

For each activity, there will be:

- The number of the activity, and whether it is an individual, pair or group activity
- A list of resources
- Links to websites and videos needed for the activity, including the length of each video
- Explanation for the teacher on how the activity could be altered or further developed
- and some notes on how to carry out some of the steps requested of the learners
- Notes about how the activity can be assessed as well as suggestions for a plenary when the activity is complete
- The contents of the activity for the learners
- The answers or expected outcome for the activity.

Sub-strand 1: Introduction to programming

Activity 4.1: Individual

Purpose:

Describe the conversion of decimal into binary data type for a computer to recognise the meaning, process and store.

Effectively evaluate the success of solutions used in an attempt to solve a complex problem. (Core competency CP5.5)

Resources:

- Learner's Book pages 154–158
- A calculator

Teacher:

It is important that the learners master an understanding of the different number systems and how to convert from binary and hexadecimal to decimal numbers. Work through the examples given in the Learner's Book before letting the learners complete the activity.

Assessment:

Write the correct answers on the board and ask the learners to mark their own work. Give the learners a chance to correct any wrong answers. Walk around the class and provide guidance where needed.

Plenary:

Ask learners who gave wrong answers how they arrived at those answers. Identify the type of errors they have made. Explain where they made mistakes and how those errors can be avoided.

LEARNERS

You are going to convert binary numbers and hexadecimal numbers to decimal numbers. Before you start, make sure that you understand the definition of each type of number. Read the questions in the Learner's Book. Ask your teacher to explain anything that is unclear. Use the content from the book and your own mathematical knowledge to complete this activity. Show all the steps that you followed to arrive at your answer. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. a. 1001_2
 $= 1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
 $= 1 \times 8 + 0 \times 4 + 0 \times 2 + 1 \times 1$
 $= 9$
- b. 11_2
 $= 1 \times 2^1 + 1 \times 2^0$
 $= 1 \times 2 + 1 \times 1$
 $= 3$
- c. 10101_2
 $= 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
 $= 1 \times 16 + 0 \times 8 + 1 \times 4 + 0 \times 2 + 1 \times 1$
 $= 21$
- d. 11001100_2
 $= 1 \times 2^7 + 1 \times 2^6 + 0 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$
 $= 1 \times 128 + 1 \times 64 + 0 \times 32 + 0 \times 16 + 1 \times 8 + 1 \times 4 + 0 \times 2 + 0 \times 1$
 $= 128 + 64 + 8 + 4$
 $= 204$
- e. 100_2
 $= 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$
 $= 1 \times 4 + 0 \times 2 + 1 \times 1$
 $= 4$
2. a. 11_{16}
 $= 1 \times 16^1 + 1 \times 16^0$
 $= 1 \times 16 + 1 \times 1$
 $= 16 + 1$
 $= 17$

b. AE_{16}
 $= 10 \times 16^1 + 14 \times 16^0$
 $= 10 \times 16 + 14 \times 1$
 $= 160 + 14$
 $= 174$

c. $2F0_{16}$
 $= 2 \times 16^2 + 15 \times 16^1 + 0 \times 16^0$
 $= 2 \times 256 + 15 \times 16 + 0 \times 1$
 $= 512 + 240 + 0$
 $= 752$

d. $B2A_{16}$
 $= 11 \times 16^2 + 2 \times 16^1 + 10 \times 16^0$
 $= 11 \times 256 + 2 \times 16 + 10 \times 1$
 $= 2\,816 + 32 + 10$
 $= 2\,858$

e. $1FF_{16}$
 $= 1 \times 16^2 + 15 \times 16^1 + 15 \times 16^0$
 $= 1 \times 256 + 15 \times 16 + 15 \times 1$
 $= 256 + 240 + 15$
 $= 511$

Remedial activity:

Give learners further simple examples of conversion where they only need to work with the binary place values 8, 4, 2 and 1 to consolidate their understanding of the concept.

Activity 4.2: Individual

Purpose:

Describe the conversion of decimal into binary data type for a computer to recognise the meaning, process and store.

Effectively evaluate the success of solutions used in an attempt to solve a complex problem. (Core competency CP5.5)

Resources:

- Learner's Book pages 158–159
- A calculator

Teacher:

It is important that the learners master an understanding of the different number systems and how to convert from binary and hexadecimal to decimal numbers. Work through the examples given in the Learner's Book before letting the learners complete the activity.

Assessment:

You can assess this activity by taking the learners' answers in to mark.

Plenary:

As you mark the answers to the questions, ask a few learners to write their answers on the board. Ask them to explain the reasoning behind each step of the calculation.

LEARNERS

You are going to work on your own and convert decimal numbers to binary numbers. Read the questions in the Learner's Book. Ask your teacher to explain anything that is unclear. Use the content from the book and your own mathematical knowledge to complete this activity. Show all the steps you used to arrive at your answer. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

- 1.
- | | |
|-------------------|-------------|
| $100 \div 2 = 50$ | Remainder 0 |
| $50 \div 2 = 25$ | Remainder 0 |
| $25 \div 2 = 12$ | Remainder 1 |
| $12 \div 2 = 6$ | Remainder 0 |
| $6 \div 2 = 3$ | Remainder 0 |
| $3 \div 2 = 1$ | Remainder 1 |
| $1 \div 2 = 0$ | Remainder 1 |
- The answer is 1100100_2 .
- Write down the remainders from the last to the first.
- 2.
- | | |
|------------------|-------------|
| $55 \div 2 = 27$ | Remainder 1 |
| $27 \div 2 = 13$ | Remainder 1 |
| $13 \div 2 = 6$ | Remainder 1 |
| $6 \div 2 = 3$ | Remainder 0 |
| $3 \div 2 = 1$ | Remainder 1 |
| $1 \div 2 = 0$ | Remainder 1 |
- The answer is 110111_2 .
- 3.
- | | |
|--------------------|-------------|
| $255 \div 2 = 127$ | Remainder 1 |
| $127 \div 2 = 63$ | Remainder 1 |
| $63 \div 2 = 31$ | Remainder 1 |
| $31 \div 2 = 15$ | Remainder 1 |
| $15 \div 2 = 7$ | Remainder 1 |
| $7 \div 2 = 3$ | Remainder 1 |
| $3 \div 2 = 1$ | Remainder 1 |
| $1 \div 2 = 0$ | Remainder 1 |
- The answer is 11111111_2 .

4. $97 \div 2 = 48$ Remainder 1
 $48 \div 2 = 24$ Remainder 0
 $24 \div 2 = 12$ Remainder 0
 $12 \div 2 = 6$ Remainder 0
 $6 \div 2 = 3$ Remainder 0
 $3 \div 2 = 1$ Remainder 1
 $1 \div 2 = 0$ Remainder 1
The answer is 1100001_2 .

5. $25 \div 2 = 12$ Remainder 1
 $12 \div 2 = 6$ Remainder 0
 $6 \div 2 = 3$ Remainder 0
 $3 \div 2 = 1$ Remainder 1
 $1 \div 2 = 0$ Remainder 1
The answer is 11001_2 .

Activity 4.3: Individual

Purpose:

Describe the conversion of decimal into binary data type for a computer to recognise the meaning, process and store.

Effectively evaluate the success of solutions used in an attempt to solve a complex problem.
(Core competency CP5.5)

Resources:

- Learner's Book pages 159–160
- A calculator

Teacher:

It is important that the learners master an understanding of the different number systems and how to convert from binary and hexadecimal to decimal numbers. Work through the examples given in the Learner's Book before letting the learners complete the activity.

Assessment:

Ask the learners to hand in their answers for marking.

Plenary:

As you mark the answers to the questions, ask the learners to take turns to write their solutions on the board.

LEARNERS

Use the content from the book and your own mathematical knowledge to complete this activity.
Show all the steps you followed to arrive at your answer.

ANSWERS

1.

$$\begin{array}{ll} 29 \div 16 = 1 & \text{Remainder } 13 \\ 1 \div 16 = 0 & \text{Remainder } 1 \end{array}$$

Write down the remainders from the last to the first.

The answer is $1D_{16}$.

2. $180 \div 16 = 11$ Remainder 4
 $11 \div 16 = 0$ Remainder 11

The answer is $B4_{16}$.

3. $255 \div 16 = 15$ Remainder 15
 $15 \div 16 = 0$ Remainder 15

The answer is FF_{16} .

4. $2\,073 \div 16 = 129$ Remainder 9
 $129 \div 16 = 8$ Remainder 1
 $8 \div 16 = 0$ Remainder 8

The answer is 819_{16} .

5. $1\,250 \div 16 = 78$ Remainder 2
 $78 \div 16 = 4$ Remainder 14
 $4 \div 16 = 0$ Remainder 4

The answer is $4E2_{16}$.

Activity 4.4: Individual

Purpose:

Identify the different tools that are accessible in the integrated development environment (IDE) to aid the development of codes.

Demonstrate the ability to try new alternatives and different approaches. Be prepared to recognise and explain results after implementation of plans. (Core competencies CI5.5 and CP6.6)

Resources:

- Learner's Book pages 160–165
- A computer with the Scratch or similar IDE installed per learner, if possible
- A data projector
- *Average5Numbers.sb3*
- *MarkAverage.sb3*
- *NumberTotal.sb3*
- *DiceRoll.sb3*

Links:

<https://scratch.mit.edu/download>

Teacher:

It is important that the learners master the ability to code programs for themselves. Demonstrate the use of the IDE and how to code simple programs before allowing the learners to code their solutions to these activities. Move around the class while the learners code the solutions and assist any individual who may be struggling. Let the learners who complete the tasks more quickly help those who are struggling, as there may be many questions and uncertainty when the learners are first introduced to programming.

Assessment:

Assess the activity by checking the learners' codes against the model solutions provided.

Plenary:

Use the model answers to explain the solution or code the solutions as you explain the steps. Be prepared to answer learner questions and initiate a class discussion when needed. Ask the learners to explain any alternative solutions they may have.

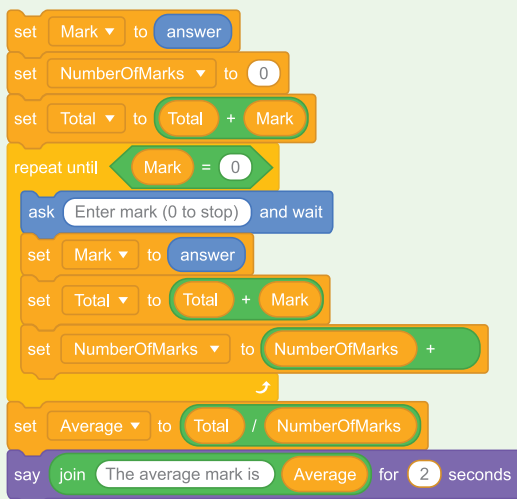
LEARNERS

You are going to work on your own to use Scratch or a similar IDE to code programs. Read the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

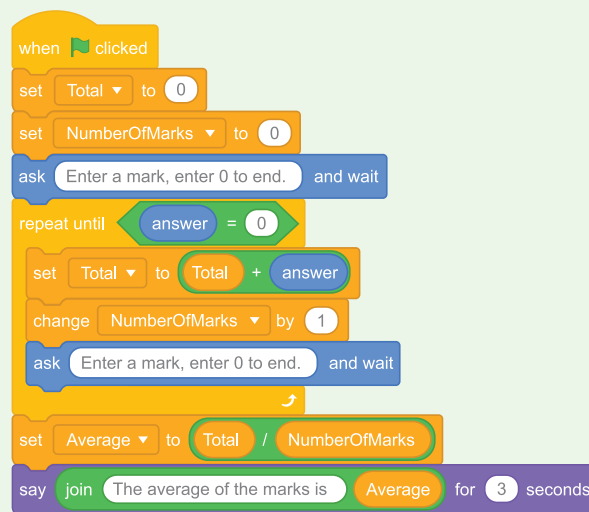
ANSWERS

The model answer files are shown below and are provided as resources.

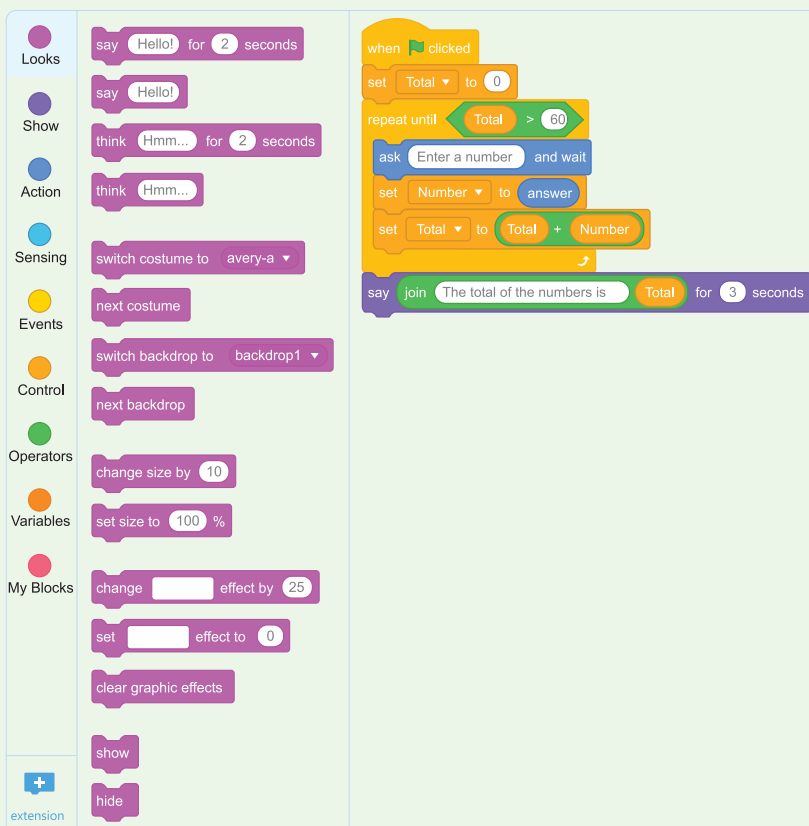
1.



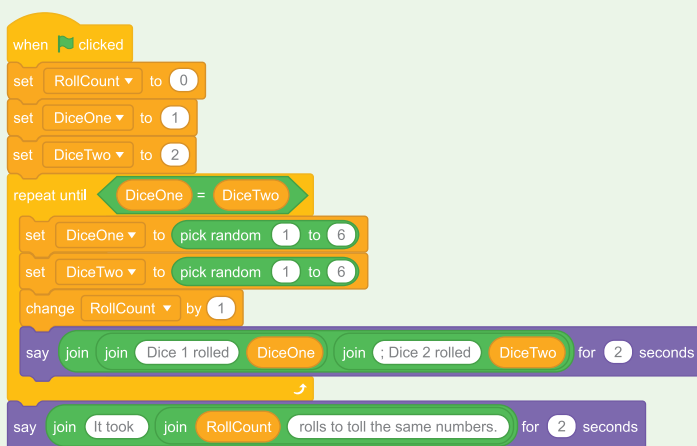
2.



3.



4.



Activity 4.5: Pairs or group

Purpose:

Identify the different tools that are accessible in the integrated development environment (IDE) to aid the development of codes.

Demonstrate the ability to try new alternatives and different approaches. Be prepared to recognise and explain results after implementation of plans. (Core competencies CI5.5 and CP6.6)

Resources:

- Learner's Book pages 166–169
- The internet and a computer or mobile device with access to the internet
- A data projector to demonstrate the creation of a website

Teacher:

Depending on the platform chosen to create the website, the interface could be quite confusing for the learners. Lead them through the process step by step and then let the learners explore and discover what they can do.

LOW RESOURCE SCHOOLS

1. In your group, discuss the similarities and differences between a blog and a standard website. Tabulate your responses on a manila card for easy reading.
2. Present your responses on the manila card to the class.

ANSWERS

Blogs

- A blog is a type of website.
- It is almost like a diary of thoughts about events, progress at school or work, and so on.
- New entries are added regularly and are displayed in reverse-chronological order.
- Blogs can be shared with others, who can comment if they wish.
- Blogs can include photos, sound files and videos.

Standard websites

- The content is usually static; in other words, it does not change often. The main purpose of a website is to supply information about an organisation and its products or services. It is updated only when the information changes or when the organisation itself undergoes changes.
- The information is presented on several interlinked pages and is organised according to category or function.
- A business website is usually relatively formal or business-like. (This depends on the type of business and the market or audience it is aimed at.)
- Most business websites are not interactive and do not make provisions for comments from viewers.

Similarities

- Both provide information.
- Both can contain photos, audio files and videos.
- Both are searchable with search engines.

Assessment:

Informal assessment will take place when the learners demonstrate their websites to the class.

Plenary:

Use a class discussion to give constructive feedback about each website.

LEARNERS

You are going to work with a partner or in a group to create a website. You can choose your own topic for your website or select one from the suggestions given in the Learner's Book. Ask your teacher for guidance if you struggle with anything.

ANSWERS

You can use the following checklist to check that the learners have completed the activity.

Task	Yes	No
1. Website has been created.		
2. Topic of website is clearly evident.		
3. Theme chosen for website from those provided.		
4. Default images have been replaced.		
5. Suitable layout has been chosen for website.		
6. Original content has been added.		
7. Images have been added.		
8. Images add value to website.		

Sub-strand 2: Algorithms

Activity 4.6: Individual

Purpose:

Write a program using flowchart and pseudocode algorithms that include sequence, selection and iteration choices in problem-solving.

Exhibit strong memory, intuitive thinking; and respond appropriately. Show the ability to identify important and appropriate criteria and use them to evaluate available alternatives. (Core competencies CI6.1 and CP6.4)

Resources:

- Learner's Book pages 170–179

Teacher:

It is important that the learners master an understanding of the constructs used in writing pseudocode and flowcharts. Work through the examples given in the Learner's Book before letting the learners complete the activity. Make sure that the learners understand each step of each algorithm.

Assessment:

You can assess the activity by marking the learners' answers. Alternatively, you can ask the learners to swap their answers with a classmate and mark each other's work.

Plenary:

As you mark the answers to the questions, ask a few learners to write their pseudocode and draw their flowcharts on the board. Allow for any class discussion that may arise around the answers given by the learners. Ensure that each learner has the correct answers and understands the reason for each answer.

LEARNERS

You are going to work on your own to create algorithms and draw flowcharts. Read the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1-2. The learners may have more detail in their algorithms. Discuss the merits of including their ideas and make changes if necessary.

```
Go to tap or basin
Turn on tap
Place hands under tap
Wet hands
Pick up soap
Rub soap on hands
Put down soap
REPEAT UNTIL 20 seconds have passed
    Rub palms of hands together
    Rub space between fingers
    Rub all around the thumbs
    Rub tops of hands
    Rub the outside sides of hands
END REPEAT
Rinse hands
Turn off tap
Dry hands
```

3.



Remedial activity:

Give learners the opportunity to improve their algorithms and flow charts where necessary.

Activity 4.7: Individual

Purpose:

Translate a flowchart algorithm to pseudocode format and vice versa.

Demonstrate the ability to visualise alternatives, see possibilities, and identify problems and challenges.
(Core competency CI5.4)

Resources:

- Learner's Book pages 170–180

Teacher:

It is important that the learners master an understanding of the constructs used in writing pseudocode and flowcharts. Work through the examples given in the Learner's Book before letting the learners complete the activity. Make sure that the learners understand each step of each algorithm.

Assessment:

Walk around the class while the learners are doing the activity. Check their progress and give guidance where needed.

Plenary:

Ask a few learners to share their answers to the first two questions with the class. If the answers are not correct, ask the rest of the class to comment and help them to arrive at the correct answers. Write the answer to Question 3 on the board and ask the learners to mark their own answers and to make the necessary corrections.

LEARNERS

You are going to work on your own to examine the flowchart given in the Learner's Book. Read the questions in the Learner's Book. Ask your teacher to explain anything that is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. Adding together and then displaying the sum of the numbers.
2. For loop, as there are a known number of repetitions. (Could also be interpreted as a while loop.)
3.

```
Sum ← 0
Counter ← 1
FOR counter = 1 to 10 DO
    Number ← get number
    Sum ← Sum + Number
END FOR
Display: Sum
```

Activity 4.8: Individual

Purpose:

Translate a flowchart algorithm to pseudocode format and vice versa.

Demonstrate the ability to visualise alternatives, see possibilities, and identify problems and challenges. (Core competency CI5.4)

Resources:

- Learner's Book pages 170–181

Teacher:

It is important that the learners master an understanding of the constructs used in writing pseudocode and flowcharts. Work through the examples given in the Learner's Book before letting the learners complete the activity. Make sure that the learners understand every step of each algorithm.

Assessment:

Walk around the class and check the learners' answers while they are working. Give guidance where necessary.

Plenary:

When the learners have completed the activity, ask a few learners to draw their flowcharts on the board. Ask the rest of the class if the answers are correct. If the answers are wrong, ask the learners if they can identify where mistakes were made and how to correct them. Ensure that each learner has the correct answers and understands the reason for each answer.

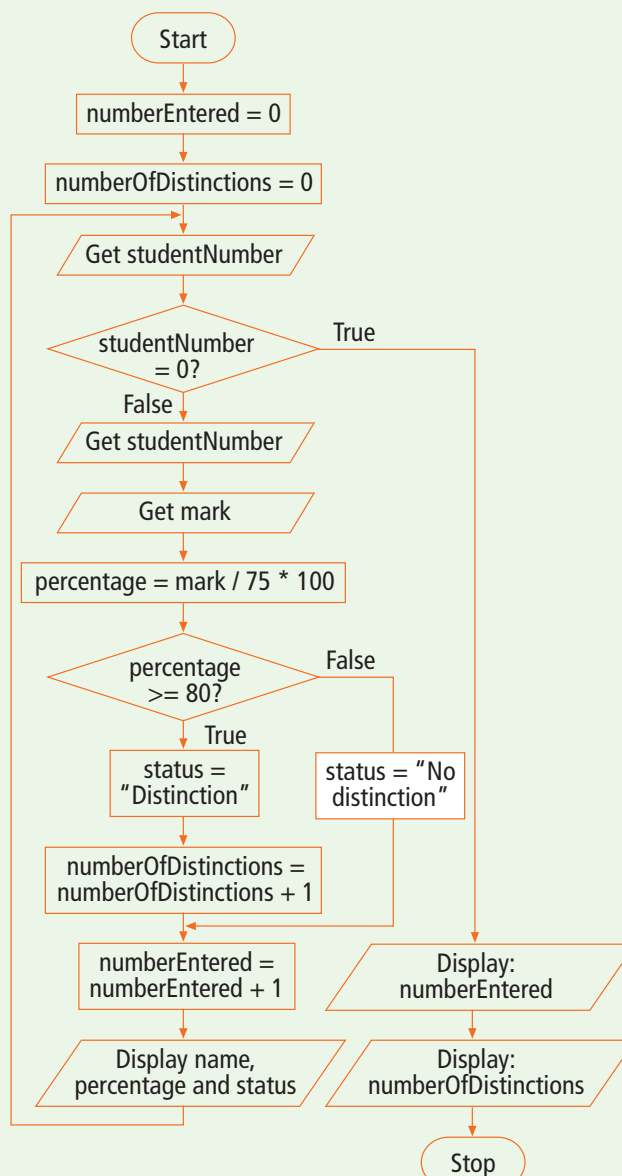
LEARNERS

You are going to work on your own to examine the pseudocode given in the Learner's Book. Read the questions in the Learner's Book. Ask your teacher to explain anything that is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. The algorithm is allowing the entry of a test mark out of 75, then determining whether the mark is a distinction and keeping count of the distinction. It will display whether or not the student has achieved a distinction. It will keep on accepting entries until 0 is entered as a student number. It will then display the total number of marks entered and the number of distinctions achieved.

2.



3. Instead of only being able to work with a mark out of 75, it could allow the user to enter a different maximum at the start of the program to make it more universal.

Activity 4.9: Individual

Purpose:

Write a program using flowchart and pseudocode algorithms that include sequence, selection and iteration choices in problem-solving. Translate a flowchart algorithm to pseudocode format and vice versa.

Exhibit strong memory, intuitive thinking; and respond appropriately. Demonstrate the ability to identify important and appropriate criteria and use them to evaluate available alternatives. Demonstrate the ability to visualise alternatives, see possibilities, and identify problems and challenges. (Core competencies CI6.1 and CP6.4)

Resources:

- Learner's Book pages 170–182

Teacher:

It is important that the learners master an understanding of the constructs used in writing pseudocode and flowcharts. Work through the examples given in the Learner's Book before letting the learners complete the activity. Make sure that the learners understand each step of each algorithm.

Assessment:

You can assess the activity by marking the learners' answers. Alternatively, you can ask the learners to swap their answers with a classmate and mark each other's work.

Plenary:

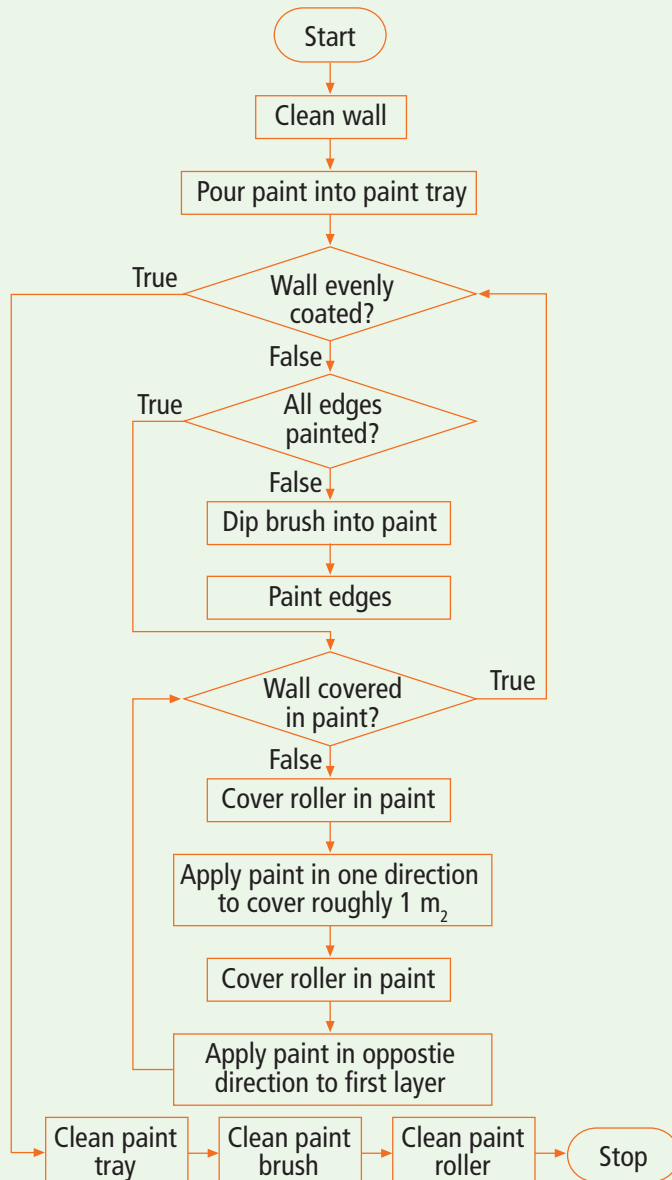
As you mark the answers to the questions, ask the learners to provide their answers in turns. They could draw their flowcharts on the board. Allow for any class discussion that may arise around the answers given by the learners. Ensure that each learner has the correct answers and understands the reason for each answer.

LEARNERS

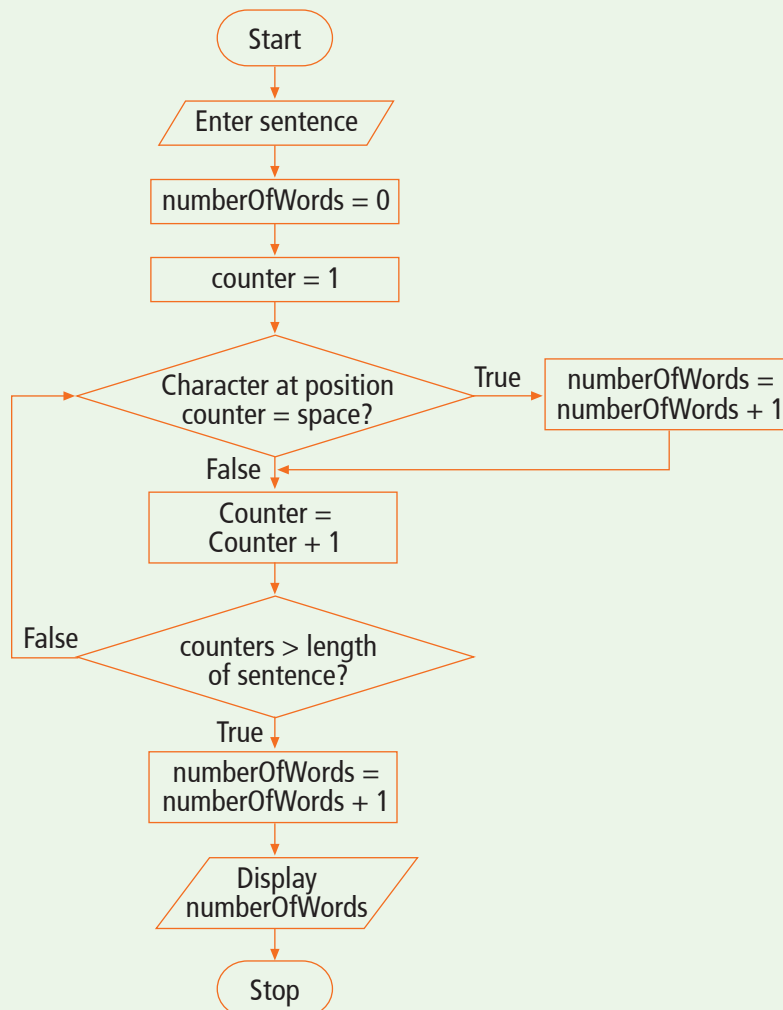
You are going to work on your own and apply the knowledge you have gained from the previous activities to write pseudocode and draw a flowchart. Ask your teacher to explain anything that is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. a. Wipe the wall clean
 Pour paint into a paint tray
 REPEAT UNTIL wall completely covered in even layer of colour
 REPEAT UNTIL all edges painted
 Dip brush into paint
 Paint edges of wall
 END REPEAT
 REPEAT UNTIL whole wall covered in paint
 Cover paint roller in paint
 Apply paint in one direction to cover roughly 1 m²
 Cover paint roller in paint
 Apply paint in opposite direction to first layer
 END REPEAT
 END REPEAT
 Clean paint tray
 Clean paint brush
 Clean paint roller



b. Enter sentence
 numberOfWords \leftarrow 0
 FOR first character to last character of sentence DO
 IF character = space
 numberOfWords \leftarrow + 1
 END IF
 Move to next character
 END FOR
 numberOfWords \leftarrow numberOfWords + 1 (as there is one less space than there are words)
 Display numberOfWords

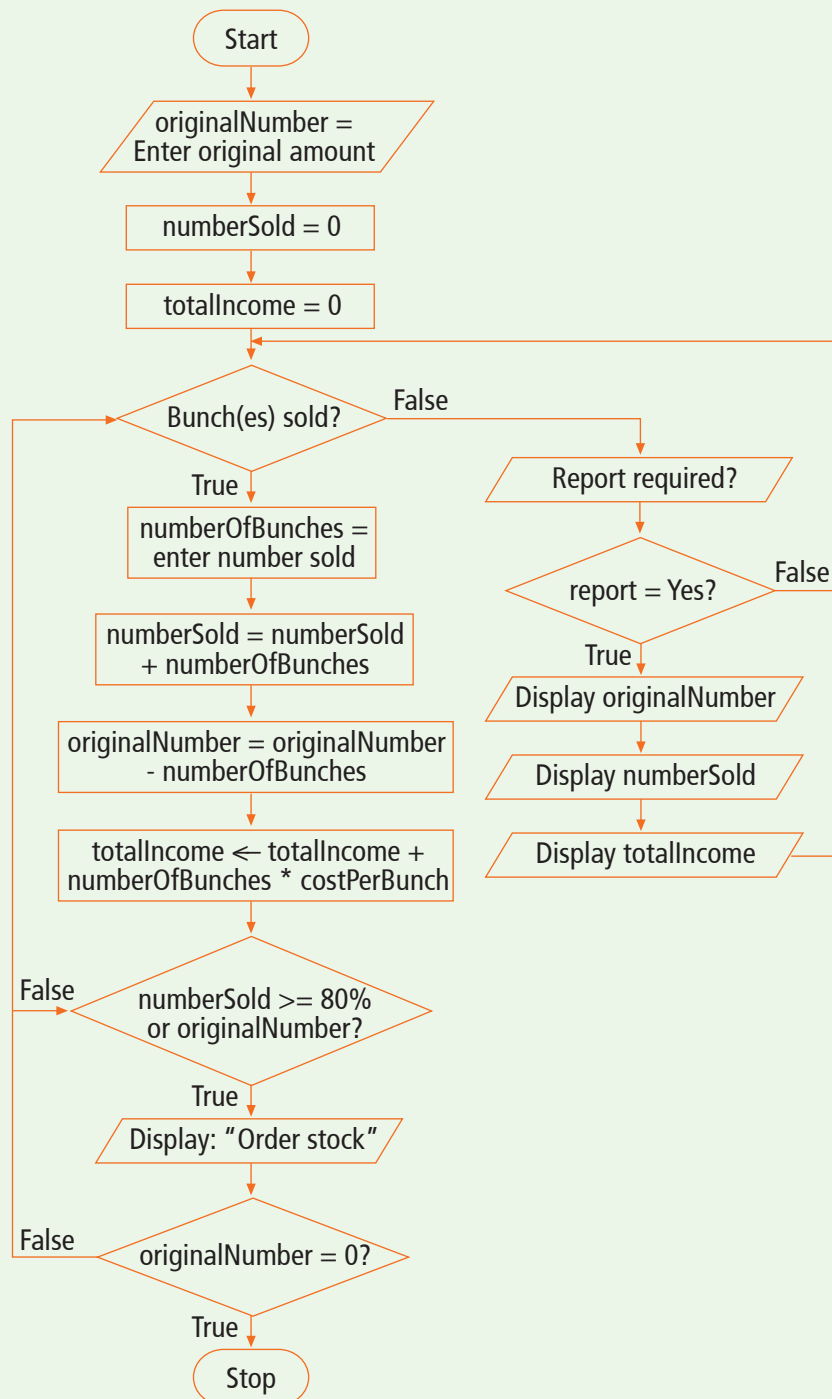


2. originalNumber \leftarrow enter original number of flowers
 numberSold \leftarrow 0
 totalIncome \leftarrow 0
 REPEAT UNTIL originalNumber = 0
 IF bunch(es) sold
 numberOfBunches \leftarrow enter number sold
 numberSold \leftarrow numberSold + numberOfBunches
 originalNumber \leftarrow originalNumber - numberOfBunches
 totalIncome \leftarrow totalIncome + numberOfBunches * cost-
 PerBunch
 END IF

```

Ask if report required
IF report required
    Display originalNumber
    Display numberSold
    Display totalIncome
END IF
IF numberSold >= 80% of originalNumber
    Display "Order stock"
END IF
END REPEAT

```



Sub-strand 3: Robotics

Activity 4.10: Group

Purpose:

Construct a robot artefact using available lab components and tools or emulator/simulator software pack.
Demonstrate the ability to select the most effective creative tools for work and give reasons for the choice.
Generate hypothesis to help answer complex problems. (Core competencies CI6.3 and CP5.4)

Resources:

- Learner's Book pages 183–184

Teacher:

Present the content on Asimov's science fiction laws. Allow time for discussions, as the learners' interest is bound to be aroused by this topic.

Assessment:

Check the learners' answers to the questions in the activity.

Plenary:

Hold a class discussion and ask the learners to share their thoughts on this interesting topic.

LEARNERS

You are going to work in groups to answer the questions in the Learner's Book. There are no specific answers to the questions, so you must think about the topic and share your own opinion. If possible, read the book *I, robot* or watch the movie.

ANSWERS

1. The answers will vary according to the learners' interpretation of the three laws.
 - First Law: A robot may not injure a human being or allow a human being to come to harm.
 - Second Law: A robot must obey the orders given to it by human beings, except where such orders would conflict with the First Law.
 - Third Law: A robot must protect its own existence, as long as such protection does not conflict with the First or Second Laws.
2. Listen to the learners' opinions. To stimulate the discussion, make this point: The development of artificial intelligence and machine learning implies that robots must be able to think for themselves; this could be a contradiction to the second law.

Activity 4.11: Group

Purpose:

Construct a robot artefact using available lab components and tools or emulator/simulator software pack.
Demonstrate the ability to select the most effective creative tools for work and give reasons for the choice.
Generate hypothesis to help answer complex problems. (Core competencies CI6.3 and CP5.4)

Resources:

- Learner's Book pages 184–186
- The internet and a computer or mobile device with access to the internet
- Robotic kits
- *mBot-instruction.pdf*
- *mBot-V1.1_Blue_STD_Instruction_EN_D1.2.1_7.40.4100_Print.pdf*
- The links below

Links:

1. 3D animation showing how to assemble the mBot robot
<https://www.makeblock.com/steam-kits/mbot>
2. Video: How to assemble mBot step by step (1:55 minutes)
<https://www.youtube.com/watch?v=B7rg-vkENSI>
3. Video: Makeblock mBot assembly guide (20:54 minutes)
<https://www.youtube.com/watch?v=liCpEwCvpAc&list=TLPQMjYxMjIwMjDkKWfh67T7Fw&index=2>

Teacher:

The Learner's Book uses the mBot robot as an example, but any robotics kit can be used. The way in which this section is taught will depend on what the school has available:

- Sufficient robotic kits are available: Let the learners work in their groups to assemble a robot. Walk around and ensure that each group is comfortable following the instructions for their particular robot.
- A single kit is available: Do this activity as a demonstration. A document camera or visualiser connected to a data projector will be a very useful tool for demonstration to the whole class.
- No kits are available: Use the animation and one or more of the suggested video clips to show the assembly of a robot to the learners. This will require a data projector.

Start the lesson with one of the video clips or the animation, irrespective of what resources you have available. It will give the learners a good overall idea of what needs to be done. If the mBot robot is not being used, a relevant video clip should be sourced.

Allow time for discussions, as the learners' interest is bound to be aroused by this topic.

Assessment:

Informally assess each learner's knowledge of the assembly of a robotic kit. Where the learners are working in groups, move around the class and provide assistance and reinforcement where learners are struggling with any aspect of the activity.

Plenary:

Hold a class discussion to discuss the main parts of a robot and the order in which they are generally assembled.

LEARNERS

You are going to work in your groups to assemble a robot or watch a demonstration or one of the video clips provided. If you have access to an actual robot, you will need to put the robot together first, using the instructions provided in the construction manual. If you do not have access to an actual robot, watch one of the video clips on assembling an mBot.

ANSWERS

Learners' robots should be correctly assembled. If the learners do not have access to a robot, they should be able to explain what they saw in the video.

Activity 4.12: Group

Purpose:

Construct a robot artefact using available lab components and tools or emulator/simulator software pack.

Demonstrate the ability to select the most effective creative tools for work and give reasons for the choice. Generate hypothesis to help answer complex problems. (Core competencies CI6.3 and CP5.4)

Resources:

- Learner's Book pages 187–191
- A computer with access to the internet, with the relevant robotic software pack installed
- A smartphone with the Lightbot app installed (preferably one per group)
- *Keyboard Control.mblock*
- Online coding resources and project examples on the links provided below
- A data projector to demonstrate the programming environment for a robot
- The links below

Links:

1. Webots open-source robot simulator
<https://cyberbotics.com/>
2. The Hour of Code website
<https://hourofcode.com/>
3. Tutorials on programming the mBot robot
<https://www.mblock.cc/example/introduction/>

Teacher:

Present the content on programming a robot, as set out in the Learner's Book. Whether programming an actual robot or using a virtual environment such as Webots or Lightbot, you will need to demonstrate how to use the software. This will be an unfamiliar environment for most learners, so they will need a step-by-step introduction. Move around the class. Keep an eye on the learners' progress and give assistance and advice where needed.

The Hour of Code website (see link above) has a number of simulations or games that will teach the learners how to control virtual figures. They can click on the Activities link to try out some of the challenges, for example Dance Party.

Assessment:

Informally assess each learner's knowledge of the use of a robotic software pack. Where the learners are working in groups, move around the classroom and give assistance and reinforcement to learners who are struggling with any aspect of the activity.

Plenary:

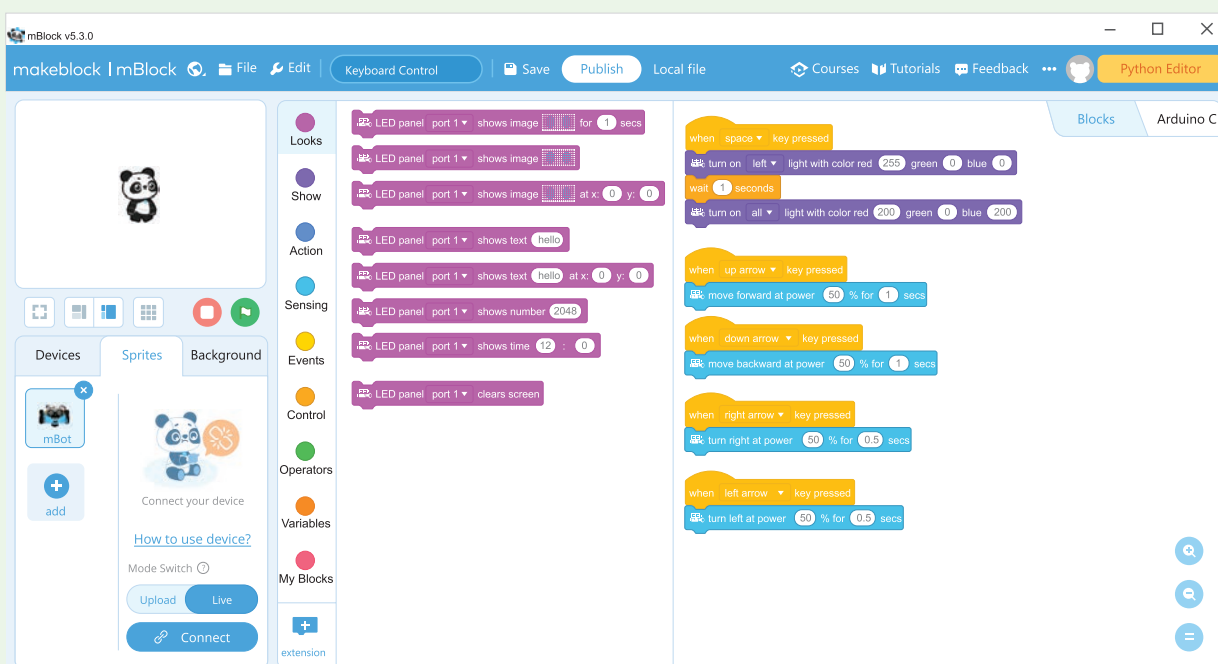
Hold a class discussion to discuss the use of a robotic software kit. Discuss the fact that any changes to the program need to be uploaded to the robot's controller every time.

LEARNERS

You are going to work with your group members to program a robot. Read the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear. Remember that every member of the group must take an active part in the tasks.

ANSWERS

The sample code has been provided in the file *Keyboard Control.mblock*.



Activity 4.13: Group

Purpose:

Construct a robot artefact using available lab components and tools or emulator/simulator software pack.

Demonstrate the ability to select the most effective creative tools for work and give reasons for the choice. Generate hypothesis to help answer complex problems. (Core competencies CI6.3 and CP5.4)

Resources:

- Learner's Book page 191
- A computer with access to the internet
- A smartphone with the Lightbot app installed (preferably one per group)
- Online coding resources and project examples at the websites listed below
- A data projector
- The links below

Links:

1. Webots open-source robot simulator
<https://cyberbotics.com/>
2. The Hour of Code website
<https://hourofcode.com/>

Teacher:

This activity can be done as enrichment or as an alternative to the previous activity. Present the content of programming a robot, as given in the Learner's Book. Whether programming an actual robot or using a virtual environment such as Webots or Lightbot, you will need to demonstrate how to use the software. This will be an unfamiliar environment for most learners and so they will need a step-by-step introduction. Move around the class keeping an eye on the learners' progress and lending assistance and giving advice as needed.

The Hour of Code website (see link above) has a number of simulations or games that will teach the learners how to control virtual figures. They can click on the Activities link to try out some of the challenges, for example Dance Party.

Assessment:

Informally assess each learner's knowledge of the use of a robotic software pack. Where the learners are working in groups, move around the class and provide assistance and reinforcement where learners are struggling with any aspect of the activity.

Plenary:

Hold a class discussion to discuss the use of a robotic software kit. Discuss the fact that any changes to the program need to be uploaded to the robot's controller every time.

LEARNERS

You are going to work with your group members to work through the challenges to program the virtual robot correctly. Read the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear. Remember that every member of the group must take an active part in the tasks.

ANSWERS

Answers will vary but should meet all the criteria in the following checklist.

Task	Yes	No
1. Lightbot installed correctly.		
2. Learner worked out how to use Lightbot.		
3. Successfully accessed activities (challenges) on Hour of Code website.		
4. Chose a suitable challenge according to level of difficulty.		
5. Worked through the online activity tutorial.		
6. Collaborated on programming the virtual robot.		
7. Successfully programmed the virtual robot.		

Activity 4.14: Group

Purpose:

Construct a robot artefact using available lab components and tools or emulator/simulator software pack.

Demonstrate the ability to select the most effective creative tools for work and give reasons for the choice.

Generate hypothesis to help answer complex problems. (Core competencies CI6.3 and CP5.4)

Resources:

- Learner's Book page 192
- A computer with access to the internet, with the relevant robotic software pack installed
- A data projector to demonstrate the programming environment for a robot
- *Line Follower.mblock*

Links:

1. Tutorials on programming the mBot robot
<https://www.mblock.cc/example/introduction/>
2. Information on port settings and what they mean
<https://www.mblock.cc/example/primary-line-patrolling-program/>

Teacher:

Demonstrate how to use the software kit to program the robot. This will be an unfamiliar environment for most learners and so they will need a step-by-step introduction. Move around the class keeping an eye on the learners' progress and lending assistance and giving advice as needed.

Assessment:

Informally assess each learner's knowledge of the use of a robotic software pack. Where the learners are working in groups, move around the class and provide assistance and reinforcement where learners are struggling with any aspect of the activity.

Plenary:

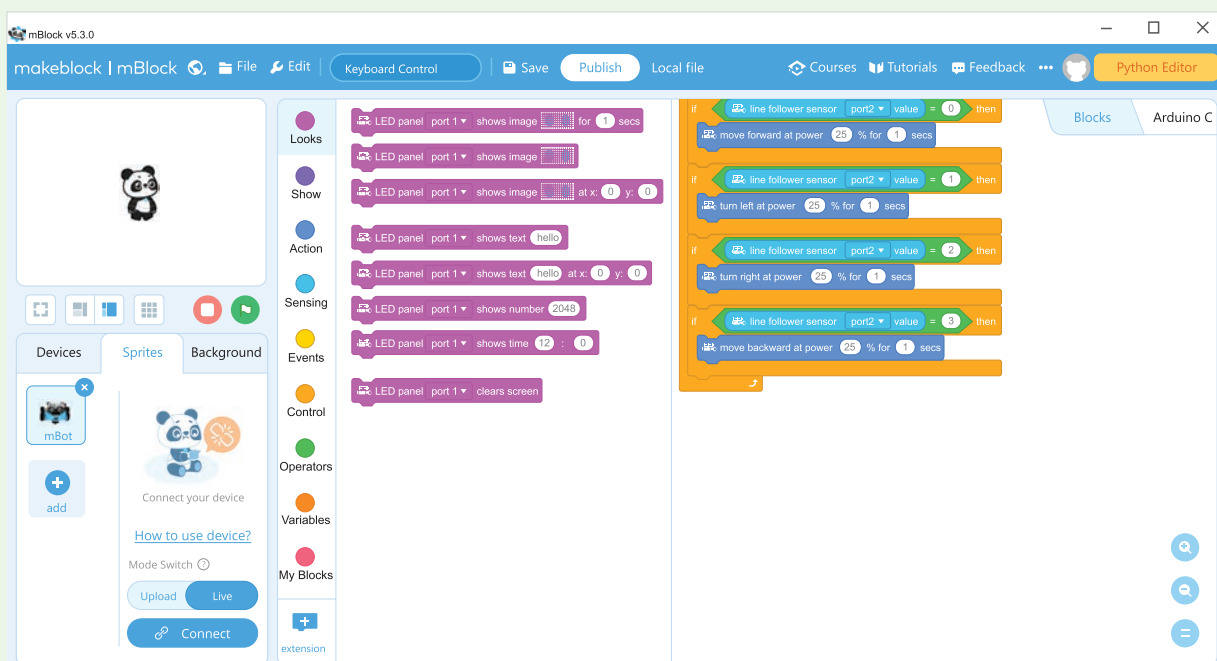
Hold a class discussion to discuss the use of a robotic software kit. Discuss the fact that any changes to the program need to be uploaded to the robot's controller every time.

LEARNERS

You are going to work with your group members to program a robot. Read the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear. Remember that every member of the group must take an active part in the tasks.

ANSWERS

The sample code has been provided in the *Line Follower.mblock* file.



Remedial activity:

Allow learners more opportunities to practise the skills covered in this section.

Sub-strand 4: Artificial intelligence

Activity 4.15: Group

Purpose:

Describe the knowledge-based systems (expert systems) as the classical artificial intelligence.

Explain ideas in a clear order with relevant detail, using correct construction and structure of speech.

Be prepared to recognise and explain results after implementation of plans. (Core competencies CC8.2 and CP6.6)

Resources:

- Learner's Book pages 193–195

Teacher:

Present the content on this topic. Allow for discussions to take place as the learners' interest is bound to be aroused by this topic.

Assessment:

Informally assess each learner's knowledge of artificial intelligence and expert systems. Where the learners are working in groups, move around the class and provide assistance and reinforcement where learners are struggling with any aspect of the activity.

Plenary:

Check the answers to the activity. Discuss any questions and observations that the learners might have about artificial intelligence and expert systems.

LEARNERS

You are going to work in a group to write possible IF-THEN rules for an imaginary expert system. Read the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear.

ANSWERS

The learners may give different answers to these. Allow discussion of the answers given and accept any logical answers.

1. IF the weather is sunny AND the wind is not too strong AND it is a hot day THEN a day at the beach is a good idea.
2. IF the total cost of the holiday is not greater than the savings available THEN the holiday is affordable.
3. IF a person's BMI is between 18.5 and 24.9 THEN the person probably has a healthy weight.
4. IF the average temperature is between 18 °C and 27 °C during the day AND the area is frost-free THEN the conditions are ideal for growing maize.

Remedial activity:

Give learners further scenarios for which they can generate IF-THEN rules, such as: 'User is under 18. Only certain websites are to be shown.'

Activity 4.16: Pairs

Purpose:

Describe the knowledge-based systems (expert systems) as the classical artificial intelligence.

Explain ideas in a clear order with relevant detail, using correct construction and structure of speech. Be prepared to recognise and explain results after implementation of plans. (Core competencies CC8.2 and CP6.6)

Resources:

- Learner's Book pages 196–197
- A computer with access to the internet
- The links below

Links:

Examples of free online encyclopaedias/knowledge bases:

1. Encyclopaedia Britannica Online (Note that it is free to use for seven days only.)
www.britannica.com
2. Wikipedia
www.wikipedia.org
3. Encyclopedia.com
www.encyclopedia.com

Teacher:

Present the content on this topic. Allow for discussions to take place as the learners' interest is bound to be aroused by this topic. If time and resources allow, let them search for and share other free online encyclopaedias.

Assessment:

Check the learners' answers to the encyclopaedia searches indicated in the instructions.

Plenary:

Check the answers to the activity. Discuss any questions and observations that the learners might have around the results. Write down a list of the most interesting facts on the board for the learners.

LEARNERS

You are going to work in your groups to query the online expert systems. Use an online knowledge base, such as Wikipedia or Encyclopedia.com, to look for information. Write down one interesting fact that you have discovered about each topic.

ANSWERS

The interesting facts obtained by the learners will vary but should be accurate and supported by online sources.

Activity 4.17: Pairs

Purpose:

Describe the knowledge-based systems (expert systems) as the classical artificial intelligence.

Explain ideas in a clear order with relevant detail, using correct construction and structure of speech. Be prepared to recognise and explain results after implementation of plans. (Core competencies CC8.2 and CP6.6)

Resources:

- Learner's Book pages 197–200
- A computer or mobile device with a web camera and/or microphone
- The video on Teachable Machine at the link provided below
- A data projector and a set of speakers (if showing the two-minute video clip to the whole class)
- The links below

Links:

1. Teachable Machine
<https://teachablemachine.withgoogle.com>
2. Video: Teachable Machine 2.0: Making AI easier for everyone (2:08 minutes)
https://www.youtube.com/watch?v=T2qQGqZxkD0&feature=emb_logo

Teacher:

Present the content on this topic. Allow for discussions to take place as the learners' interest is bound to be aroused by this topic. Demonstrate how to use the Teachable Machine. Let the learners watch the video clip (see link above) before attempting the activity.

Assessment:

Informally assess each learner's ability to work with Teachable Machine.

Plenary:

Let a variety of learners demonstrate what they taught the Teachable Machine to do for them. Allow the learners to discuss and suggest other ideas to each other.

LEARNERS

You are going to work in pairs to do a Teachable Machine project. Follow the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear.

ANSWERS

Use this checklist to assess the learners' ability to train the Teachable Machine to distinguish between two photographs or two sounds.

Task	Yes	No
1. Successfully accessed the Teachable Machine website.		
2. Chose an image or sound project.		
3. Uploaded two images or two sounds into the online model.		
4. Initiated the training procedure and waited until the model was trained.		
5. Previewed the model to determine successful training.		
6. Saved the project.		
7. Tested that the model can be exported.		

Check your progress

ANSWERS

1. a. 101011_2

$$\begin{aligned}
 &= 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 \\
 &= 1 \times 32 + 0 \times 16 + 1 \times 8 + 0 \times 4 + 1 \times 2 + 1 \times 1 \\
 &= 32 + 0 + 8 + 0 + 2 + 1 \\
 &= 43
 \end{aligned}$$

b.

$221 \div 2 = 110$	Remainder 1
$110 \div 2 = 55$	Remainder 0
$55 \div 2 = 27$	Remainder 1
$27 \div 2 = 13$	Remainder 1
$13 \div 2 = 6$	Remainder 1
$6 \div 2 = 3$	Remainder 0
$3 \div 2 = 1$	Remainder 1
$1 \div 2 = 0$	Remainder 1

Write down the remainders from the last to the first.

The answer is 11011101_2

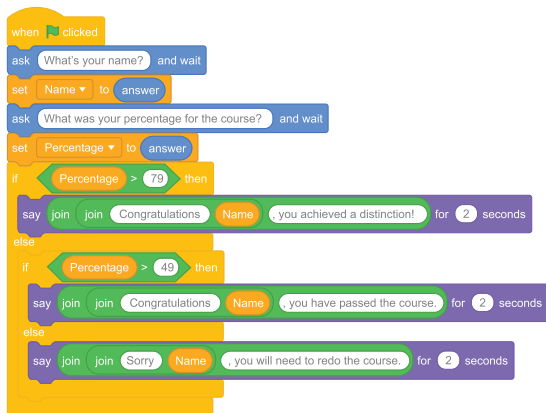
c. $21B_{16}$

$$\begin{aligned}
 &= 2 \times 16^2 + 1 \times 16^1 + 11 \times 16^0 \\
 &= 2 \times 256 + 1 \times 16 + 11 \times 1 \\
 &= 512 + 16 + 11 \\
 &= 539
 \end{aligned}$$

d. $422 \div 16 = 26$ Remainder 6
 $26 \div 16 = 1$ Remainder 10
 $1 \div 16 = 0$ Remainder 1

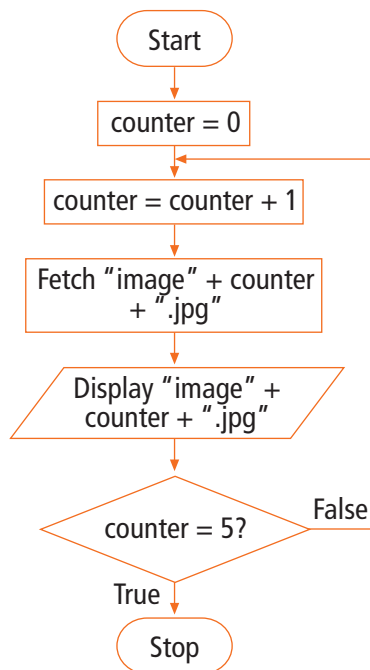
The answer is $1A6_{16}$.

- A computer's logic circuits are essentially a series of switches that can be turned on or off. This links to the binary number system that uses only two symbols, a 0 and a 1. The 0 represents the off state and the 1 represents the on state. Computers also store data using a digital system that utilises 0s and 1s.
- An integrated development environment or IDE is an environment used to write computer programs. An IDE is linked to a specific programming language and allows the programmer to code programs using commands that resemble ordinary English words.
- Accept any two relevant ones such as Python, Java, C++, etc.
- The model solution has been provided in a file named *CourseResult.sb3*.



6. The answers provided will vary but must contain sufficient detail.
- Collect a bucket and cloth
 - Fill the bucket halfway with water
 - Add a little bit of soap to the water
 - Dip a cloth into the soapy water
 - Wring it out so that the cloth is not too wet
 - Start at the top of the window
 - Wash window using the wet cloth until you reach the bottom of the window
 - Rinse the window with clean water
 - Dry the window with a soft cloth

7.



8. Isaac Asimov was a science fiction writer who created the three Laws of Robotics.
- First Law: A robot may not injure a human being or, through inaction, allow a human being to come to harm.
 - Second Law: A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
 - Third Law: A robot must protect its own existence, as long as such protection does not conflict with the First or Second Law.
9. a. mBot, Lego EV3, Arduino robot kit (accept any one or any other verifiable name)
b. Scratch, mBlock, Blockly (accept any one or any other verifiable option)
c. Webots, Lightbot (accept any one or any other verifiable option)
10. a. Knowledge-based systems, also known as expert systems, consist of huge databases that have been input by humans, and programming that is able to query or ask questions of that system and get answers or predictions.
b. Expert systems rely on a knowledge base that is created by human experts and can only respond based on what has been programmed into them.
c. Machine learning happens where a computer system can learn and improve based on experience without being specifically reprogrammed.

- d. Doctors can input a patient's symptoms into a medical expert system and receive possible diagnoses and treatments for the patients.
- e. IF the camera lens is not clear THEN advise user to clean lens.

ESSENTIAL Computing Basic 9

Facilitator's Guide

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