

ESSENTIAL



Computing

Basic 8

Facilitator's Guide



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FREE
DIGITAL CODE
INSIDE



ESSENTIAL

Computing

Basic 8

Facilitator's Guide

Silas Hibbert • Hamidu Kwame Seidu • Brian Dill
Shani Nunkumar • Victoria Wright



CAMBRIDGE
UNIVERSITY PRESS



NNF Esquire Limited
P.O. Box AN 8644, Accra - North, Ghana.

CAMBRIDGE UNIVERSITY PRESS

Shaftesbury Road, Cambridge CB2 8EA, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore 238467

Old Warehouse Building, Black River Park, 2 Fir Street, Observatory, Cape Town, 7925, South Africa

Cambridge University Press & Assessment is part of the University of Cambridge.

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www.cambridge.org

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First published 2023

Second edition 2024

20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Printed in

ISBN 978-9-988-94236-6 Paperback

Authors: Brian Dill, Hamidu Kwame Seidu, Shani Nunkumar, Silas Hibbert, Victoria Wright

Editor: Janine Versfeld

Typesetter: The Icon Agency

Illustrators: Claudia Eckard

Cover artwork: pagadesign, Getty Images

Acknowledgements

The publisher and authors would like to thank the following individuals and organisations for permission to use their material in either the original or adapted form:

Photographs

Activities 2.5, 2.6 and 2.7: Slide 2: Gord Ruffh/500 pix; Slide 4: Suzanne Moses / EyeEm; Slide 5: Stefonlinton; **Activity 2.5 Photo album:** Slide 2: GK Hart/Vikki Hart; Slide 3: Karen Moskowitz; Slide 4: Jonathan Knowles; Slide 5: MIXA; Slide 6: Chris Stein; Slide 7: Mario Forcherio / EyeEm; Slide 8: Chad Latta; Slide 9: Anda Stavri Photography; Slide 10: Chiara Benelli; **Strand 2 Assessment Rainfall Types:** Slide 3: **ClassicStock**; **Strand 2 Assessment Rivers Album:** Slide 2: Peter Adams; Slide 3: Thomas Barwick; Slide 4: Suttipong Sutiratanachai; Slide 5: Paul Souders; Slide 6: Mlenny; Slide 7: Jules Kulcsar / EyeEm; Slide 8: Xavi Talleda · Photo collection; Slide 9: lupengyu; Slide 10: Baac3nes; Slide 11: Bernd Schunack

Youtube: Anadolu Agency; Vimeo, Instagram & Pinterest: SOPA Images; Tiktok & Snapchat: Future Publishing; Periscope: Lionel Bonaventure; Facebook: Chesnot

Apps/Programs

Scratch scratch.mit.edu

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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 the teacher – 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, providing information covered in that strand. These introductions can 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 that can be set for individual learners, as group activities or as homework tasks. The HOW TO boxes have step-by-step instructions on how to complete practical functions on the computer.

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. Instructions for the learner are also provided. The teacher 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, COVERING EACH OF THE ACTIVITIES IN THE LEARNER'S BOOK.

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: Pairs and class

Purpose:

Discuss the fifth generation of computers, with emphasis on quantum computing.

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 1–9

Teacher:

Read the text in the Learner's Book with the class and make sure that they understand what the term 'fifth-generation computers' means. Discuss the features of fifth-generation computers. If there is time, encourage the learners to share their ideas about, and/or experiences with, advanced computer systems and artificial intelligence (AI) with the class.

Assessment:

The discussions are important. Every learner should prepare some notes beforehand and take part in the discussion. Ensure that all the learners contribute to the discussion, thereby demonstrating their understanding.

Plenary:

Let the learners first work in pairs to make notes and do research for each question, then lead a class discussion. Make sure that all the learners participate in the discussion and share their ideas. Explain any concepts that the learners may struggle with.

LEARNERS

You are going to discuss the features of fifth-generation computers and parallel processing. 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. There are no specific answers to this question, as the pairs and class will have discussions.
2.
 - a. Parallel processing, specifically multiprocessing, takes place when two or more processors (CPUs) are working together in a computer to handle separate parts of one task. A task is split into different parts and each part is processed by a separate processor, so the output is achieved much more quickly.
 - b. AI software makes it possible for a machine to use abilities similar to those of humans (for example, reasoning, learning, planning or creativity) to understand, analyse and make sense of data.

Activity 1.2: Class, individual and groups

Purpose:

Discuss the fifth generation of computers, with emphasis on quantum computing.

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 1–10
- The internet, access to a computer or mobile device with access to the internet
- A projector attached to computer (if you use a single computer for the video)
- The links below

Links:

1. Video: AI explained in 101 seconds (1:41 minutes)
<https://www.youtube.com/watch?v=zjeBGkS4LAA>
2. Video: Artificial Intelligence in 5 minutes (5:27 minutes)
<https://www.youtube.com/watch?v=ad79nYk2keg>
3. Online article: Artificial intelligence facts for kids
https://kids.kiddle.co/Artificial_intelligence

Teacher:

Give the learners a chance to watch the two videos. Encourage them to ask questions if there is anything that they do not understand.

Read the information about AI with the class and explain any difficult concepts.

Assessment:

Observe the learners' performance during the group discussions. Make a note of any concepts that they are struggling with. Provide extra guidance where needed.

Plenary:

Lead a class discussion about AI.

LEARNERS

You are going to watch videos and read about artificial intelligence. Ask your teacher to explain anything that is unclear.

ANSWERS

During the class discussion, check that all learners grasp what AI is and can list some of its many applications.

Activity 1.3: Pairs or small groups

Purpose:

Demonstrate understanding of direct data entry devices (graphic tablet, magnetic card reader, optical card reader, QR code reader, radio frequency identification (RFID) reader).

Show the ability to find and utilise digital content. (Core competency DL5.3)

Resources:

- Learner's Book pages 10–15
- A mobile phone for each pair or small group of learners
- The links below

Links:

1. Free QR reader downloadable app
www.goqr.me
2. Free QR reader downloadable app
https://play.google.com/store/apps/details?id=com.gamma.scan&hl=en_US&gl=US
3. Video: How to open a YouTube video with a QR code (3:26 minutes)
<https://www.youtube.com/watch?v=n5qkGxHQRUQ>

Teacher:

The learners need to understand what bar codes and QR codes are and how they function. Most learners would probably have experienced barcodes, but not QR codes. This activity introduces the learners to creating and using QR codes. It will enable them to use the technology in their daily lives. For instance, they will be able to use the QR codes on goods, such as supermarket items that give further information about a product. This activity will also consolidate the learners' knowledge of the use of RFID tags.

Ask the learners to bring a mobile phone (if they have one) to class for this activity. Divide the learners into pairs or small groups. Make sure that at least one learner in each pair or group has a mobile phone.

To extend the activity, the video will show learners how to create a QR code to their favourite YouTube video.

As an interesting add-on activity, which could be cross-curricular, you could ask the learners to write a short summary of the main points of a book of their choice from the school library. They then generate a QR code that includes the book summary/review. This will allow other learners who are looking for an appropriate book to scan the QR code to find out if they would find the book interesting.

LOW RESOURCE SCHOOLS

Work in a group.

1. Brainstorm possible areas where a radio frequency identification (RFID) system can be used, other than the example discussed in the Learner's Book.
2. Discuss how a stylus can be useful to a graphic designer.
3. Discuss how QR code readers are used. Give three examples of shopping malls in Ghana that use this technology.
4. Present your findings to the class.

ANSWERS

1. The learners' responses will vary. Here are some examples of possible uses of RFID systems:
 - managing and controlling access to secure areas or to events
 - tracking of persons
 - locating lost baggage at airports or stations
 - timing sporting events
 - monitoring the physical state of perishable goods
 - managing library systems
 - managing laundry for large companies
 - interactive marketing.
2. A graphic designer can use a stylus to draw on the tablet. The image will appear on the computer screen at the same time. This avoids having to draw on paper first and scanning the image in, or using a mouse to try and draw an image on the computer. By exerting more or less pressure on the stylus, the designer can create thicker or thinner, and darker or lighter, lines.
3. The best way to scan a QR code is with a smartphone that has a QR app. You need to download and install a QR scanning app. Once the app is installed, you can use it any time. When you want to read a QR code, you tap on the icon to open the app and aim your phone's camera at the code. The QR scanning app then translates the code and displays the information on your phone's screen. If the QR code holds a URL address, the scanner will automatically open the web page. The examples of shopping malls will vary, depending on where the learners live.

Assessment:

Learners will have:

- downloaded a QR code reader successfully
- found appropriate information on RFID codes and copied the URL
- linked the URL to a QR code created by them
- used their QR code reader on a mobile phone to scan and read others' QR codes and read the information on RFIDs.

The learners should generally feel confident about using and creating QR codes.

Plenary:

Ask the learners if they are going to use their QR scanners in their daily lives, and if so, what they will be likely to scan that will be useful to them.

LEARNERS

You are going to work in pairs or in groups of three to generate QR codes and link them to specific websites. Follow the instructions in the Learner's Book. Ask your teacher if you are unsure about anything.

ANSWERS

The expected outcome is that all the learners will have created a QR code and scanned the other learners' QR codes.

Activity 1.4: Pairs

Purpose:

Examine the uses of the output devices: Braille printers, impact, inkjet, thermal, wax, solid ink and 3D printers. Describe storage devices: flash-memory storage systems, embedded flash-memory cards and readers, USB flash drives, solid-state drives and hybrid hard drives.

Speak clearly and explain ideas. Share a narrative or extended answer while speaking to a group. Show the ability to find and utilise digital content. (Core competencies CC8.1 and DL5.3)

Resources:

- Learner's Book pages 15–24
- A computer or mobile device with access to the internet
- USB flash drives
- The links below

Links:

1. Free online mind mapping app
<https://www.mindmup.com/>

2. Free apps for making spider diagrams
<https://creately.com/>
3. Design templates
<https://www.canva.com/>

Teacher:

In this section, the learners will get a wider view of the real-life purposes of different types of printers. It will be a learning opportunity to talk to people about what they use their computers for. There will also be an opportunity to practise their presentation skills, using what they have learnt in previous years about creating presentation slides.

This activity involves research, so it will be best to let the learners work in pairs. Depending on where the school is situated, it may be possible for pairs to go out into the community or town to research places that use different types of printers. Learners can discover a lot by talking to different people, looking through magazines and using the internet. The learners are likely to be familiar with inkjet printers and probably also laser printers, so it is more important for them to investigate the other types listed. If there is a printing business nearby, for example a local newspaper or a computer shop that sells or repairs computers, it would be an ideal place to visit. If there is a business nearby that uses a 3D printer, you could try to arrange a class visit to their premises.

Discuss the use of USB flash drives with the learners. If possible, bring some flash drives to class to show to the learners. The learners can use the free apps to make spider diagrams online.

LOW RESOURCE SCHOOLS

1. Draw up a table to compare the features of SSDs and HDDs.
2. How has the architecture of hybrid hard drive dealt with the weaknesses that existed with hard disk drives (HDD) and solid-state drives (SSD)?
3. State the function of the following parts of a USB flash drive:
 - a. USB connector
 - b. electrical insulation
 - c. circuit board.

ANSWERS

1.

Solid-state drives (SSDs)	Hard disk drives (HDDs)
A solid-state drive (SSD) has no moving parts and uses flash memory to store data. This makes the SSDs faster and more reliable, and also smaller in size.	Hard disk drives (HDDs) made use of moving parts to read and write data. Moving parts are always the weakest points in any construction, and often cause HDDs to fail.
They cannot hold as much data as hard disk drives.	They can store a large amount of data.
SSDs are much faster than HDDs.	They are not very fast.
SSDs are less likely to be damaged if the computer is dropped.	HDDs are likely to lose data if the computer is dropped.

2. A hybrid drive is a storage drive that brings together the large storage of the HDD, and the faster read/write speed of the SSD. A hybrid hard drive is mostly a hard disk drive with a solid-state drive attached to it. This means that data can be written onto either the HDD or the SSD. Data that is not used often is stored on the HDD. Data that is used often is stored on the SSD.
3.
 - a. connects the flash drive to the computer or other electronic devices
 - b. prevents short circuits
 - c. stores data

Assessment:

Opportunities for assessment will be mainly from the presentations. The two core competencies can be used as guidelines when you assess the learners. You can also assess the learners' use of the presentation software. The spider diagram will show the learners' understanding of flash memory storage systems.

Plenary:

Ask the learners to write down one of the partial sentences below, and then complete the sentence in their own words. When the class has completed this exercise, take a survey of what was written for sentence 1, then sentence 2. Ask if anyone who used sentence 3 now has their answer. If not, ask one of the other learners to explain to the class.

Sentence starts:

1. Today I have learnt that ...
2. One thing I must remember from this activity is ...
3. I still don't understand ...

LEARNERS

You are going to work in pairs to explore where different printer types are used in real-life situations and illustrate the use of different storage devices by preparing a poster.

ANSWERS

The outcome of this activity should be that learners have found out a lot of new information about the uses and types of printers and understand flash memory storage.

Remedial activity:

Ask learners who have not understood the concepts of Braille, impact, inkjet, thermal, wax and 3D printers to review the material and explain it to a partner.

Activity 1.5: Groups

Purpose:

Explore the use of the Charms Bar. Identify the icons in the Charms Bar. Practise file management techniques (disk management).

Show the ability to find and utilise digital content. (Core competency DL 5.3)

Resources:

- Learner's Book pages 24–30
- A computer with Windows® 10, if possible

Teacher:

If you have a computer with Windows® 10 available, give the learners the opportunity to find the Charms Bar and explore its functions. Ask the learners if any of them has a computer with Windows® 8 at home. If any learners do, ask them to explain how the Charms Bar works. Read the text in the Learner's Book with them and explain the differences between the Charms Bar in Windows® 10 and Windows® 8.

Explain the process of disk defragmentation and discuss the advantages of defragmenting a hard drive.

Talk about file formats for images. Make sure that the learners understand the concepts of lossy and lossless compression. Explain to the learners that a .jpg image will have a smaller file size than the same image would have when saved in .tif format. As an extension to the activity, and if there is time, you could ask the learners to do a search online to find out more about apps that can be used to reduce file sizes.

Assessment:

Walk around the class and listen to the learners' discussions. Give guidance where needed and take note of learners who are struggling to understand the concepts.

Plenary:

Have a class discussion after the individual group discussions. Ask a learner from each group to report back on the conclusions they reached in their group.

LEARNERS

You are going to have a group discussion about Charms Bar, defragmenting, and file compression. Ask your teacher to explain anything that is unclear. During the feedback session, check that your group's conclusions are accurate.

ANSWERS

1. The purpose of the Charms Bar in Windows® 8 was to be able to give fast access to the five features of the Charms Bar, such as: Search, Share, Start, Devices and Change settings. However, many Windows® 8 users did not like the Charms Bar. In Windows® 10, Microsoft® improved the features but hid the Charms Bar, so that it is only there for users who want to use it. In Windows® 10, the Search feature, in particular, is quicker and more efficient than it was in Windows® 8.
2. The learners' responses may differ, but they should understand that defragmenting means that all the parts of a file are reorganised and stored together on the hard disk. This means that files will load faster. It will also increase the amount of space available on the disk.
3. Kumi must save the photographs as .jpg images, with compression. He must then compress the photographs by creating a zipped folder.

Sub-strand 2: Technology in the community

Activity 1.6: Class or groups

Purpose:

Discuss technologies that help to improve computer accessibility (adaptive and assistive technologies).

Show the ability to find and utilise digital content. Speak clearly and explain ideas. Share a narrative or extended answer while speaking to a group. (Core competencies DL5.3 and CC8.1)

Resources:

- Learner’s Book pages 31–32
- A computer or mobile device with access to the internet
- The link below

Link:

Video: People with disabilities and computer technology (11:33 minutes)

<https://www.youtube.com/watch?v=Zz8gXfluwBs>

Teacher:

Introduce the lesson by asking learners to name the different types of physical challenges that computer users may face. Ask them how technology can be used to overcome each type of challenge.

Let the learners watch the video in the link above. Walk around the class while the learners are watching and answer any questions that they may have. Explain the use of the various technologies where needed.

Assessment:

Walk around and observe learners’ understanding of the video and their communication skills as they discuss what they have seen. Take note of how the groups work together to discuss the topic. Make sure that all the learners in each group contribute to the discussion.

Plenary:

Have a class discussion after the individual group discussions about what the learners have learnt from the video.

LEARNERS

Watch the video and discuss the challenges and solutions shown. Also talk about any other similar challenges that you know of, and how people overcome them.

ANSWERS

The learners discuss what they have seen in the video.

Activity 1.7: Class or groups

Purpose:

Discuss technologies that help to improve computer accessibility (adaptive and assistive technologies).

Show the ability to find and utilise digital content. Speak clearly and explain ideas. Share a narrative or extended answer while speaking to a group. (Core competencies DL5.3 and CC8.1)

Resources:

- Learner's Book pages 33–36
- A computer or mobile device with access to the internet
- The link below

Link:

Video: Meet ScreenReader – Screen Reader with Braille for Windows (2:35 minutes)

<https://www.youtube.com/watch?v=DxLNoUyWU2k>

Teacher:

Explain to the class what Braille is and how it is used. If possible, bring a Braille book to class and let the learners feel the raised dots. Explain that every group of dots represents a letter of the alphabet, and that blind people learn to recognise each letter by feeling the dots with their fingertips.

Guide the learners to understand that a Braille screen uses round-tipped pins raised through holes in the surface of the screen.

LOW RESOURCE SCHOOLS

In a school for the physically challenged, learners face various challenges in the learning process. Suggest the appropriate assistive technology to help learners with the following challenges.

- a. Having difficulty flipping through a book
- b. Cannot communicate verbally
- c. Cannot respond to verbal communication
- d. Can use only one hand

Also explain how the assistive technologies suggested are used.

ANSWERS

Accept any other relevant technologies that are not mentioned in the Learner's Book.

- a. E-books make it possible to move to the next page by swiping or tapping the screen.
- b. Keyboards, touch screens and pointing devices can help people to communicate by entering text into a computer so that the text can be displayed on a screen. Mouth sticks and head sticks are technologies that use a stick, held in the mouth or attached to a headset, to press the keys on the keyboard. Text-to-voice software reads text that appears on a screen out loud. A physically challenged person can use this feature by typing a message and then 'talk' to others by having the messages read out loud.
- c. System sounds, such as beeps, can be replaced with visual messages. Animation technology can translate voice into sign language. Videos can have subtitles so that the user can read the dialogue.
- d. Left-hand or right-hand keyboards are available where the keys are arranged differently so that they can be used easily with only one hand.

Assessment:

Walk around and observe learners' understanding of the video and their communication skills as they discuss what they have seen. Take note of how the groups work together to discuss the topic. Make sure that all the learners in each group contribute to the discussion.

Plenary:

Have a class discussion after the individual group discussions about what the learners have learnt from the video.

LEARNERS

Watch the video and discuss how a blind or visually impaired person can use technology to help them.

ANSWERS

The learners should understand that a Braille reader makes it possible for blind people to use computers to type and read documents, access the internet and use all the functions that sighted people use.

Activity 1.8: Groups

Purpose:

Describe how portable computing devices affect our everyday lives.

Show the ability to find and utilise digital content. Speak clearly and explain ideas. Share a narrative or extended answer while speaking to a group. (Core competencies DL5.3 and CC8.1)

Resources:

- Learner's Book pages 36–37
- The internet, access to a computer or mobile device with access to the internet
- The link below

Link:

Video: How does your mobile phone work? (9:03 minutes)

https://www.youtube.com/watch?v=1JZG9x_VOwA

Teacher:

Before the lesson, watch the video on your own and make sure that you understand how mobile phones work. In class, let the learners watch the video and explain the technology to them. Note that they do not have to memorise the details, but they should understand the basic principles. Point out to the learners that they will learn more about binary data (the ones and zeros referred to in the video) in Strand 4.

Assessment:

Walk around the class while the learners are discussing the video. Observe how the learners work together in groups. Take note if any of the learners are struggling to understand the technology described, and give assistance where needed.

Plenary:

Ask a few learners to describe to the class how mobile phones work. The rest of the class can ask questions or add constructive comments.

LEARNERS

You are going to watch a video and discuss how mobile phones work.

ANSWERS

The learners must understand the technology and be able to explain how a mobile phone works. The key words they should use include the following: microphone, digital signal, antenna, transmit, electromagnetic waves, cell towers, light pulses, destination tower, receives signal, mobile switching centre, SIM card.

Activity 1.9: Groups and individual

Purpose:

Describe how portable computing devices affect our everyday lives.

Show the ability to find and utilise digital content. Speak clearly and explain ideas. Share a narrative or extended answer while speaking to a group. (Core competencies DL5.3 and CC8.1)

Resources:

- Learner's Book pages 36–40
- The link below

Link:

Slide presentation: Portable computing devices

<https://slideplayer.com/slide/4346052/>

Teacher:

Divide the class into small groups for the discussions. The link above is a good starter for this activity. It is a SlideShare presentation with 16 slides about portable computing devices. You can display it with an overhead projector and work through it with the learners. The presentation is set up to move automatically from one slide to the next. You can therefore give the learners the URL so that they can watch it on their own when they need to.

Assessment:

Monitor group discussions to ensure that each learner is contributing with core competency CC8.1 in mind.

Plenary:

The following quiz about the importance of mobile phones to the learners is suitable for a plenary at this stage in the course. It is also a relaxing activity for the end of a lesson.

How important is your mobile phone to you?

1. Where do you keep your phone when you are asleep at night?
 - A. Next to my bed
 - B. Charging in my bedroom
 - C. Don't know
2. You have gone out and realise you forgot your mobile phone. What do you do?
 - A. Panic and go home and get it even if it makes me extremely late
 - B. Arrange to go home at lunchtime and get it
 - C. Don't worry about it
3. How do you tell the time?
 - A. Look at my phone
 - B. Look at my watch
 - C. Ask someone
4. How often do you check your phone?
 - A. Every few minutes
 - B. As soon as I hear a message coming in
 - C. Only at break time

The learners can give themselves three marks for every 'A' answer, two marks for every 'B' answer, and one mark for every 'C' answer. If the total is nine or more, their phone is very important to them.

Take a hands-up survey of anyone with less than six marks, less than nine marks, and more than nine marks.

LEARNERS

You are going to consider the importance of portable computing devices, answer questions about mobile phones and research the uses of different portable computing devices.

ANSWERS

The outcome of this activity will be the contribution of every learner to the discussions.

Activity 1.10: Individual

Purpose:

Explain the issues associated with online services (for example, social media, wikis, blogs, etc.).

Show the ability to find and utilise digital content. (Core competency DL5.3)

Resources:

- Learner's Book pages 40–42
- A computer or mobile device with access to the internet
- The links below

Links:

1. Online article: Security issues and best practices
<https://www.eteam.io/blog/e-commerce-security-issues>
2. Online article: What is a phishing attack?
<https://www.imperva.com/learn/application-security/phishing-attack-scam/>

Teacher:

The first link could be used by the learners or shown to them as a class, before the activity; the second link is one for learners to read in their own time, but they should be encouraged to do further research.

This activity could be extended to include further issues; ask the more able learners who finish early to carry out more research into other issues.

LOW RESOURCE SCHOOLS

Suggest safety tips that can help lessen the risks associated with online services.

ANSWERS

Learners' answers will vary. The main safety tips include:

- Use secure passwords and keep them secret.
- Do not share personal information online.
- Install antivirus software on your computer.
- Do not open unknown or suspect email attachments.
- Avoid websites with odd behaviour in terms of navigation.

Assessment:

Ask some of the learners to read their research about phishing out loud in class. Ask the class to comment on the answers and add information where needed.

It is unlikely that all the learners will find all the words in the word search. It is a good idea to ask direct questions, requesting one word from each learner. Write the words on the board and carry on until you have as many as possible, then add any words that the learners missed.

Make a note of learners who struggled with the activity. Give extra guidance where needed.

Plenary:

- Ask anyone who extended the activity by researching other issues to tell the class what they found.
- You will need to prepare between six to ten words relating to the lesson or activity beforehand. The idea is to get the learners to think carefully about the different issues associated with using online services. Ask two learners to come up to the front of the class. Show only one of them a word that relates to one of the issues discussed during the lesson, such as 'virus' or 'phishing'. The learners must then describe the word to their partner without using the word itself. The 'guesser' can stay at the front to read another secret word and explain it to a new partner, and so on.

LEARNERS

You are going to do research to find out about phishing and identify the names of online services hidden in a word search. Ask your teacher to explain anything that is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

- Answers will vary. The learners must understand that phishing is a cybercrime in which criminals pretend to be from a legitimate organisation to steal the personal information of users. They send fake email or text messages or ask users to follow a link to a fake website on which they must supply personal details.

- There are 15 words:

- BANKING
- BLOGS
- BOOKINGS
- CHROME
- DROPBOX
- EMAIL
- FLICKR
- GOOGLE
- GRAMMARLY
- PAYPAL
- SKYPE
- SOCIAL MEDIA
- WIKIS
- YOUTUBE
- ZOOM

L	N	N	W	I	K	I	S	W	E	F	Y
V	X	Z	O	B	B	Q	S	P	M	K	O
A	I	D	E	M	L	A	I	C	O	S	U
Y	L	E	L	G	O	O	G	Z	R	G	T
N	L	F	L	I	C	K	R	M	H	N	U
B	V	R	Y	O	I	K	X	S	C	I	B
L	M	P	A	P	P	E	O	K	D	K	E
O	A	A	P	M	F	B	B	Y	Z	O	E
G	A	O	I	U	M	K	P	P	O	O	M
S	H	O	F	L	R	A	O	E	O	B	A
S	L	A	P	Y	A	P	R	J	M	O	I
B	A	N	K	I	N	G	D	G	R	X	L

Activity 1.11: Individual and group

Purpose:

Explain the issues associated with online services (for example, social media, wikis, blogs, etc.).

Show the ability to find and utilise digital content. (Core competency DL5.3)

Resources:

- Learner's Book pages 42–44
- A computer or mobile device with access to the internet
- Access to free online sites for making a blog
- The links below

Links:

- Free wiki site
<https://www.wikihow.com/Make-a-Free-Wiki>
- Online article: Make a free wiki
<https://themeisle.com/blog/best-free-blogging-sites/>

Teacher:

The creation of a blog is an individual task, but any less-able learners may need help. They could sit with another learner, helping each other, but still aiming to achieve one blog each. It may be a good idea to discuss what to name their blog before starting.

Use the links to show the learners how to create a free blog.

Blogs are an ideal place for learners to reflect on their learning, using it as they would use a diary. It is possible to allow others to leave comments, which is a good way for you to assess individual learners' progress. Learners will also benefit from being able to record their reflections in the blog to aid deeper learning.

LOW RESOURCE SCHOOLS

Leaders of the various groups in the class should vote for one of the seven social media types that has been discussed.

1. In your groups, discuss how the social media type selected by the group can be used to support learning.
2. Present the responses to the entire class.

ANSWERS

Learners' answers will vary, but should be supported with reasons.

Assessment:

- Check that every learner has a blog.
- Is the blog sensibly named?
- Do the learners know how to open their blogs at a later date? Do they know how to make and save entries?

Plenary:

Lead a class discussion about wikis. The class could use a wiki to carry out a project; the wiki could be used to enable them all to collaborate in the production of the project. This part of the activity might present opportunities for cross-curricular work.

LEARNERS

You are going to go online to create a blog about the online services that you normally use or to which you have access. You will also make entries in your blog.

1. Go to a website that allows you to create a free blog.
2. Make an entry into the blog that you have made. Think about all the online services that you normally use, or have access to; write about them in your blog – how you use them, which you like and why. Include a brief evaluation of any issues that are associated with each one.
3. Take part in a class discussion about how the class could use a wiki to collaborate on a joint project, either as a small group or as the whole class.

ANSWERS

The expected outcomes from this activity are:

- All learners have a blog.
- A useful discussion has taken place about the use of a class wiki to collaborate on a project.
- Some ideas for the project, even if originally suggested by you, will have been discussed enthusiastically.

Remedial activity:

If a learner struggles with creating a blog, you could ask them to add a blog post to a blog created by their partner.

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

Activity 1.12: Individual

Purpose:

Discuss health issues at workstations.

Show the ability to set and maintain personal standards and values. Show the ability to find and utilise digital content. (Core competencies PL5.6 and DL5.3)

Resources:

- Learner's Book pages 45–47

Teacher:

Read the text in the Learner's Book with the class. Make sure that the learners understand the importance of regular breaks, and how extended work without breaks could affect their health.

If you have a computer in the classroom, demonstrate the correct sitting position and explain the importance of good posture.

Assessment:

Ask the learners to hand in their answers for marking.

Plenary:

Ask a few learners to come to the front of the class and demonstrate how they sit when they work on a computer. The rest of the learners can comment on the postures. Remind the learners that their comments should be constructive and respectful.

LEARNERS

You are going to answer questions about safety at a computer workstation. 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. Spending long hours working at a computer can cause mental strain and affect your physical health. Eye strain, headaches and blurred vision are some common symptoms.
2. Possible answers can include the following:
 - stretching

- looking at a point on the opposite side of the classroom
 - closing your eyes for a minute.
3. Learners' answers will vary. The long-term outcome will come through monitoring future posture when using a computer.

ACTIVITY 1.13: Pairs

Purpose:

Discuss safety measures in risk reduction at workstations.

Show the ability to set and maintain personal standards and values. (Core competency PL5.6)

Resources:

- Learner's Book pages 47–49
- A computer or mobile device with access to the internet
- The link below

Link:

Online information brochure: Make Listening Safe

https://www.who.int/pbd/deafness/activities/MLS_Brochure_English_lowres_for_web.pdf

Teacher:

Explain to the learners that the World Health Organization (WHO) is an international organisation that works worldwide to promote health. The document in the link was compiled by experts in the field. Give the learners a chance to read the document and to discuss it in pairs.

Assessment:

Walk around the class while the learners are discussing the document. Question some learners and take note of their understanding of the topic.

Plenary:

When the learners have finished their summaries, ask a few learners to read their pair's summary out loud to the class. Give time for a class discussion about the summaries. Encourage the learners to make suggestions of ways in which they can apply what they have learnt in everyday life.

LEARNERS

You are going to read a document and write a summary. Read the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear. During the feedback session, check that your summary is accurate. Add points or make corrections if necessary.

ANSWERS

The learners' answers will vary.

ACTIVITY 1.14: Individual

Purpose:

Discuss safety measures in risk reduction at workstations.

Show the ability to set and maintain personal standards and values. (Core competency PL5.6)

Resources:

- Learner's Book pages 49–50
- A computer or mobile device with access to the internet
- The link below

Link:

Online article: How to avoid overloading your plug sockets at home

<https://www.which.co.uk/news/2020/03/how-to-avoid-overloading-your-plug-sockets-at-home/>

Teacher:

Let the learners read the online article and complete the activity. This activity could be done as homework. They can walk through their houses and make a list of electrical appliances, with comments about plug-sockets that are overloaded.

Assessment:

You can take the learners' answers in for marking, or you can ask the learners to mark each other's work.

Plenary:

Have a class discussion about electrical safety. Ask the learners to share some of the safety guidelines that they have given in their written work.

LEARNERS

You are going to think about the electrical appliances and devices that you use at home and at school, and evaluate whether they are being used safely. You are also going to suggest ways to make them safer.

ANSWERS

Learners' answers will vary.

ACTIVITY 1.15: Individual

Purpose:

Discuss safety measures in risk reduction at workstations.

Show the ability to set and maintain personal standards and values. (Core competency PL5.6)

Resources:

- Learner's Book pages 49–50
- A computer or mobile device with access to the internet
- The link below

Link:

Online article: Use our socket calculator

<https://www.electricalsafetyfirst.org.uk/guidance/safety-around-the-home/overloading-sockets/>

Teacher:

Go through the online article with the class. Explain that some appliances or devices use more electricity than others. Show the learners how to use the 'socket calculator' on the website. Give them a chance to experiment with different combinations of appliances or devices.

Assessment:

Walk around the class while the learners are working. Assess the learners' understanding of the power requirement of different appliances and devices, and what it means to overload a plug socket.

Plenary:

Ask a member of each group to present their safety plan to the class. Have the rest of the class discuss how each plan could be improved.

LEARNERS

You are going to use an online calculator to determine how much load a plug socket can safely handle. You are then going to write a plan for electrical safety in your classroom. Ask your teacher to explain anything that is unclear.

ANSWERS

Learners' answers will vary. Make sure that they include the basic guidelines for electrical safety in their answers.

ACTIVITY 1.16: Individual

Purpose:

Discuss safety measures in risk reduction at workstations.

Show the ability to set and maintain personal standards and values. (Core competency PL5.6).

Resources:

- Learner's Book pages 48–51
- The internet, access to a computer or mobile device with access to the internet
- Learners' blogs

Link:

Online article: Safe listening with headphones

<https://www.crutchfield.com/S-GkrVTFpG5Sx/learn/headphones-safe-listening.html>

Teacher:

Have the learners read the online article before they start the activity. It is an interesting read about safe listening with earphones and includes diagrams, information and advice.

The learners should then be allowed some quiet time to think about what they have read and to write down their thoughts. The reflection will aid deeper learning and hopefully reduce risks to learners when using a computer workstation. If the learners use their blog again, it will increase the ease with which they navigate their blog.

This activity could be extended by asking the learners to produce a poster that warns against extreme speaker and earphone volumes.

LOW RESOURCE SCHOOLS

1. Give examples of inappropriate ways of using electrical plugs or sockets that you have observed in houses in your neighbourhood.
2. Suggest measures that you will adopt to reduce the risks posed to your family because of inappropriate use of electrical sockets.

ANSWERS

1. The learners' answers may vary. Examples could include:
 - overloading sockets
 - using plugs with frayed or torn insulation
 - having wires in or near water
 - having wires across the floor where people can trip over them
 - connecting appliances or devices to light sockets.
2. Accept any appropriate precaution. Answers can include the following:
 - Do not overload sockets. Use multi-plugs or extension leads if necessary. Do not overload the extension lead or socket by plugging in items that go over the maximum current rating of the extension lead or socket.
 - Keep all plugs, sockets and cords in good condition.
 - Keep wires away from water.
 - All trailing leads should be secured and if it is necessary for them to cross the floor, they must be taped down with hazard tape.
 - Do not connect electrical appliances to light sockets.

Assessment:

Walk around the class and talk to learners as they write to establish their understanding of health and safety issues. You can also access their blogs and use them to assess the activity.

Plenary:

Learners can be asked to state what they have learnt through this activity and whether they will be turning their volume down in the future.

LEARNERS

You are going to write a blog about health and safety precautions when using ICT tools. Refer to the information in this sub-strand for guidance.

ANSWERS

The expected outcome for this activity is an appropriate blog entry.

Remedial activity:

If learners do not identify relevant health and safety precautions, review the content of the section to ensure they can identify the following:

- taking regular breaks, maintaining good posture and using document holders
- setting appropriate volumes for speakers and earphones
- using screen protectors or spectacles to prevent glare
- using multi-socket multi-plugs rather than plug adapters.

Check your progress

ANSWERS

1. ULSI technology, Artificial intelligence, Natural language processing, Advanced parallel processing, user-friendly interfaces, availability of very powerful/compact/inexpensive computers

2. Any four of the following:

- C#
- C++
- Fortran
- Java
- Java Script
- Python
- PHP
- Perl.

Other languages that the learners may respond with could be: Objective C, Swift, Java.

3. Artificial Intelligence, Machine Learning, Deep Learning

4. A qubit is capable of being in two states at the same time: It can be 1 and 0 at the same time, or true and false

5. Sycamore.

6. Parallel processing is when two or more processors (CPUs) are working in a computer to handle separate parts of one task. A task is split up into different sections to be worked on at the same time, so the output is achieved much faster.

7. Accept any three of:

- Solves large problems quickly.
- Saves time.
- Compared to serial computing where there is one processor, parallel computing can work better on such tasks as simulations and understanding complex, real-world phenomena for AI purposes.
- Because there are more resources working on a task, it is quicker to complete and can save costs.
- Many problems are so large that it is difficult to solve them with a single-processor computer, especially when there is a limited amount of computer memory.
- Stores huge amounts of data so data computations are achieved quickly.

8. Quick Response

9. True

10. a. Accept any one of the following:

- Supermarkets and other shops: Goods can be tagged to track their transport from the supplier, to make it easier to control stock and to prevent theft.
- Public transport: Commuters can get a prepaid card with an RFID tag so that they pay for their journeys as they board a train or bus, without having to use cash.
- Hotels: Items in hotel rooms can be tagged to prevent them from being stolen.
- Farm animals: Ear tags on farm animals can contain information that identifies each animal and provides a record of their pedigree and veterinary treatments.
- Hospitals: RFID tags are used to track equipment, staff and patients, and even laundry.
- Passports: An RFID chip is embedded in the passport. The chip contains the owner's details and information about when the passport was issued, its number and date of expiry.

b. Direct entry devices read data and transfer it directly into a computer system without further human intervention.

11. 3D printers work by printing over and over again thousands of times, building up layers on top of each other, eventually creating a 3D model.

12. False

13. A hybrid hard drive is a storage drive that offers the best features of HDDs and SSDs.

14. Defragmenting causes all the parts of a file to be collected together and put down again in one place on the disk.

15. Sticky keys enable keys such as Control, Shift and others to be held down while another key is tapped.

16. Text-to-speech

Check your progress

17.	Advantages	Disadvantages
	Work remotely or work from home or when travelling	Work disruption if phone rings during a meeting or other work-related activity
	Keep in touch with the office at all times	Personal calls could take place during the time when employees should be working
	Be available for customers or suppliers at all times	Business calls can disrupt workflow
	Increased productivity	Cost to businesses
	Improved customer service	Staff may be tempted to use mobile phones when driving which is illegal
	Frees up time that would have been spent in meetings	Differentiating the cost of personal use from work use

18. A computer virus is usually a small file written to infect your computer by installing itself on your computer and copying itself to other computers with which you communicate, such as the computers of all your friends.

19. 60–85 decibels

20. Prevents neck twisting, unnecessary eye fatigue and headaches, needing to curve your spine to read documents on your desk.

Strand 2: Productivity Software

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

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 create a table and hyperlinks.

Show the ability to visualise alternatives, see possibilities, and identify problems and challenges. Show 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 C15.4 and DL5.1)

Resources:

Learner's Book pages 55–59

Teacher:

This is an easy lead-in activity to this sub-strand. All learners should work individually to complete it.

LEARNERS

You are going to create and format a table.

1. Create a table with five columns and six rows.
2. Change the widths of the columns to 3 cm, except for the first column which should be 5 cm.
3. Save your work as *<your name>_Activity 2.1_Table.docx*.

ANSWERS

Activity 2.2: Pairs

Purpose:

Demonstrate how to format a page (for example, page adjustment, inserting header and footer, page numbers, breaks and orientations). Demonstrate how to create a table and hyperlinks.

Show 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 59–62
- *Activity 2.2_WP Practice.docx*
- *Activity 2.2_WP Practice_answer.docx*

Teacher:

Make the file *Activity 2.2_WP Practice.docx* available to the learners for this activity. The learners should work in pairs to help one another during this activity.

LOW RESOURCE SCHOOLS

1. What is meant by creating a hyperlink in a Word document?
2. What are the benefits of creating hyperlinks in a document?
3. Outline the steps for inserting a website address into a word document.

ANSWERS

1. A hyperlink makes it possible to jump directly to a marked place in the same or a different document, a website or an email address. When you create a hyperlink, you create the link between the current location in the text and the target position in a document, or between the document and a website or email address.
2. You can navigate easily within a single document or between different documents. You can also access a website or email address directly.
3. Follow the steps below.
 - Step 1:** Select the word or text that you want to display as a hyperlink .
 - Step 2:** Press **Ctrl+K**. You can also right-click the text or picture and click Link on the shortcut menu that opens.
 - Step 3:** In the Insert Hyperlink dialog box, type or paste your link in the Address box.
 - Step 4:** Look at the Text to Display box and note that the word or text you highlighted appears there.
 - Step 5:** Click **OK**.

Assessment:

Refer to the answer below. You can use it to check the learners' answers.

Plenary:

Ask the learners to take two minutes to compose and write down two statements to explain what they have learnt about hyperlinks, and how they learnt it. The learners should compare their answers.

LEARNERS

You are going to format a document and add features to make it easier to move around in the file. Read the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear. Save your work as <your name>_Activity 2.2_WP Practice.docx.

ANSWERS

Cambridge University Press is both the oldest printing and publishing house in the world and the oldest university press.

Cambridge originated from Letters Patent (similar to a royal charter) granted to the University by Henry VIII in 1534, and we have been producing books continuously since the first University Press book was printed in 1584.

The beginning

University printing did not actually begin until the first practising University Printer, Thomas Thomas, had been appointed in 1583. He set up a printing house on the site of what became the Senate House lawn – a few yards from where our bookshop now stands. In those days, the Stationers' Company in London jealously guarded its monopoly of printing (which partly explains the delay between the date of the University's Letters Patent and the printing of the first book).

At one point, Thomas was described by the London opposition as 'vtterlie ignoraunte in printinge'. He was in fact a very competent printer and he was a fine scholar. In 1591, Thomas's successor, John Legate, printed the first Cambridge Bible, an octavo edition of the popular Geneva Bible. The London Stationers objected strenuously, claiming that they had the monopoly on Bible printing. The University's response was to point out the provision in its charter to print 'all manner of books'. Thus began our long tradition of publishing the Bible, a tradition that has endured for over four centuries, beginning with the Geneva Bible, and continuing with the Authorized Version, the Revised Version, the New English Bible and the Revised English Bible.

Move quickly to the section of your choice.

[The beginning](#)

[Richard Bentley](#)

[Newton's Principia Mathematica](#)

[John Baskerville](#)

[Printing innovations](#)

[Publishing developments](#)

[Growing as an educational and academic publisher](#)

[The Cambridge Bookshop](#)

Richard Bentley

The restrictions and compromises forced upon us by the dispute with the London Stationers did not really come to an end until the scholar Richard Bentley was given the power to set up a 'new-style press' in 1698. It is difficult to overestimate Bentley's importance in our history. Previously, we had been located in property owned by whomever happened to be appointed University Printer. Under Bentley's reforms, our buildings and equipment became the property of the University, and Bentley must be given most of the credit for the basic idea of an academic press, owned by the University, supervised by a body of its senior members, and aiming to publish works to the greater credit of the University as a place of education, religion, learning and research.

Newton's Principia Mathematica

Bentley also developed the concept of entrepreneurial publishing at a time when the productive role of the printer and the selling role of the bookseller were much more dominant. One of Bentley's major initiatives was a series of editions of the classics, including his own edition of Horace. But his greatest achievement was a new edition of Isaac Newton's *Principia Mathematica* (1713) – one of the most important scientific books ever produced. It was in Bentley's time, in 1696, that a body of senior scholars ('the Curators', known from 1733 as 'the Syndics') was appointed to be responsible to the University for our affairs. Our Syndicate's publishing committee still meets regularly (eighteen times a year), and its role still includes the review and approval of our planned output.

John Baskerville

John Baskerville became University Printer in the mid-eighteenth century. Baskerville's concern was the production of the finest possible books using his own type-design and printing techniques. His Folio Bible of 1763 is one of the finest ever produced.

Of this edition, Baskerville wrote: 'The importance of the work demands all my attention; not only for my own (eternal) reputation; but (I hope) also to convince the world, that the University in the honour done me has not entirely misplaced their favours.'

Caxton would have found nothing to surprise him if he had walked into our printing house in the eighteenth century: all the type was still being set by hand; wooden presses, capable of producing only 1,000 sheets a day at best, were still in use; and books were still being individually bound by hand. A technological breakthrough was badly needed, and it came when Lord Stanhope perfected the making of stereotype plates. This involved making a mould of the whole surface of a page of type and then casting plates from that mould. We were the first to use this technique, and in 1805 we produced the technically successful and much-reprinted Cambridge Stereotype Bible.

Printing innovations

Our successful exploitation of stereotyping and of other innovations, such as the durable iron press, enabled us to make the transition from a small printing office to a large printing works.

By the 1850s, we were using steam-powered machine presses, employing two to three hundred people, and occupying several buildings in the Silver Street and Mill Lane area. The most important of these buildings, and one that we still occupy, is the Pitt Building (1833), which was built specifically for us and in honour of William Pitt the Younger.

Publishing developments

Under the stewardship of C. J. Clay, who was University Printer from 1854 to 1882, we increased the size and scale of our academic and educational publishing operation. An important factor in this increase was the inauguration of our list of schoolbooks (including what came to be known as the 'Pitt Press Series'). During Clay's administration, we also undertook a sizeable co-publishing venture with Oxford: the Revised Version of the Bible, which was begun in 1870 and completed in 1885.

The appointment of R. T. Wright as Secretary of the Press Syndicate in 1892 marked the beginning of our development as a modern publishing business with a clearly defined editorial policy and administrative structure. It was Wright (with two great historians, Lord Acton and F. W. Maitland) who devised the plan for one of our most distinctive contributions to publishing – the Cambridge Histories.

The *Cambridge Modern History* was completed in 1912. Nine years later we issued the first volumes of the freshly edited complete works of Shakespeare, a project of nearly equal scope that was not finished until 1966.

Our list in science and mathematics began to thrive, with men of the stature of Albert Einstein and Ernest Rutherford subsequently becoming our authors. Our impressive contribution to journal publishing began in 1893, and today we publish around 240 journals.

Growing as an educational and academic publisher

The story of the last 150 years is one of phenomenal growth and development. In the 1850s, we were predominantly a printing business, and primarily a printer of Bibles and prayerbooks. We had only the beginnings of a scholarly list, a schoolbook list, and a scientific list. Today, our range covers virtually every educational subject seriously studied in the English-speaking world, with the last part of the twentieth century seeing diversification into professional books, textbooks, reference works, English language teaching publications, software and electronic publishing.

We have also developed strong commitments to environmental policies, and our UK operation has been accredited with ISO 14001, a prestigious standard – currently held by no other publisher and printer – which recognizes our use of non-wasteful materials and processes.

The Cambridge Bookshop

In 1992, we opened our own bookshop at 1 Trinity Street, in the centre of Cambridge. Books have been sold continuously on this site since at least 1581, perhaps even as early as 1505, making it the oldest known bookshop site in Britain. It was in this building that Tennyson gave a reading of his poem *Maud*, that Thackeray took lunch with the founders of the Macmillan publishing empire who ran a bookshop here in the 1840s, and that Charles Kingsley was welcomed as a frequent guest.

Activity 2.3: Individual

Purpose:

Demonstrate how to merge, split, add formula, borders and shades.

Show 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 63–67
- Learners' saved answers to Activity 2.1
- The internet, access to a computer or mobile device with access to the internet
- The link below

Link:

Video: How to design and format tables in Microsoft® Word 2016 (0:40 minutes)

<https://www.youtube.com/watch?v=jxvD-L8LJ0U>

Teacher:

Let the learners watch the video as an introduction to this activity. Read the text in the Learner's Book with the class and pay special attention to the steps set out in the HOW TO? boxes. Encourage the learners to ask questions if there is anything they do not understand. While they are busy with the activity, walk around the class and give guidance where needed.

LOW RESOURCE SCHOOLS

Work in groups and do the following.

1. Why is it useful to be able to merge cells in a table?
2. Draw up a table with five columns and five rows. Fill in the table of data (values) of your choice.
3. Demonstrate how the formula command on the table tool can be used to perform arithmetic operations (add, multiply, subtract and divide).
4. Present your responses to the entire class.

ANSWERS

1. It allows you to join one or more adjacent cells (horizontally or vertically or both) into one larger cell that is then displayed across multiple columns or rows. This is useful for headings that apply to cells in separate rows (or columns, depending on the heading).
2. The data in the learners' tables will differ. Here is an example.

Fruit	Vegetables	Dairy products	Starches	Drinks
apples	potatoes	milk	bread	milk
pears	pumpkin	cheese	rice	water
bananas	beans	yoghurt	maize	tea
grapes	cabbage	butter	pasta	coffee

- 3.–4. These are practical tasks that the learners will perform in class. For Question 3, you can refer to pages 64–65 in the Learner's Book.

Assessment:

Compare the tables produced to the answer below. They do not need to be identical, but the learners should address all the individual tasks correctly. It may also be useful to carry out a quick hands-up poll of who needed help, and whether they now understand what to do.

Plenary:

Allow the learners to look at the tables produced and to give feedback to their creator. Ask the learners what, in their opinion, are the good points of the tables created and have a brief class discussion about it.

LEARNERS

Open your saved work from Activity 2.1, *<your name>_Activity 2.1_Table.docx*. Follow the instructions in the Learner's Book and ask your teacher if you are struggling to carry out any of the actions. Remember to save your work when you have completed the activity.

ANSWERS

Remedial activity:

Allow learners to attempt the activity again after having identified any mistakes they made.

Activity 2.4: Small groups

Purpose:

Demonstrate how to format a page (for example, page adjustment, inserting header and footer, page numbers, breaks and orientations).

Show 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 67–75
- Learners' saved work from Activity 2.2
- *Activity 2.4_WP Practice_answer*
- The internet, access to a computer or mobile device with access to the internet
- The links below

Links:

1. Video: Word adding headers and footers (2:38 minutes)
<https://www.youtube.com/watch?v=INdjuIYuB3o>
2. Video: Word page numbers (3:49 minutes)
<https://www.youtube.com/watch?v=JDqPR98mIZM>
3. Video: Word page breaks (3:22 minutes)
<https://edu.gcfglobal.org/en/word2016/breaks/1/>
4. Video: Word page layout (2:42 minutes)
<https://edu.gcfglobal.org/en/word2016/page-layout/1/>

Teacher:

The videos are an ideal starter for the activity and will need to be made available to the learners or shown to the class using a projector. Depending on the ability of the learners, they may work individually or in small groups to complete the activity.

LOW RESOURCE SCHOOLS

Work in groups and do the following.

1. Explain the main uses of the Paragraph group under Word's Home tab.
2. Give examples of information that can be put in the header and footer of a document.
3. Present your responses to the class.

ANSWERS

1. The Paragraph group provides access to all the paragraph formatting commands. The buttons for alignment, bullets or numbers, and formatting marks are toggle buttons that will remain selected if you click on them. If you click them again, the command will be reversed.
2. Examples include: the name of the person who created the document, the title of the document, the date or the page number.

Assessment:

The tables can be printed out or shown on screen, and peer assessment should be encouraged, with learners giving constructive feedback.

Plenary:

Ask the learners:

- What did you learn from completing this activity?
- Is there anything you would like to go over again?

If the answer to the second bullet point is 'Yes', ask another learner to explain.

LEARNERS

Open your saved file, *<your name>_Activity 2.2.docx*. You are going to format pages. Ask your teacher to explain anything that is unclear. Save the file as *<your name>_Activity 2.4.docx*.

ANSWERS

[Learner's name]

[Today's date]

Cambridge University Press is both the oldest printing and publishing house in the world and the oldest university press.

Cambridge originated from Letters Patent (similar to a royal charter) granted to the University by Henry VIII in 1534, and we have been producing books continuously since the first University Press book was printed in 1584.

The beginning

University printing did not actually begin until the first practising University Printer, Thomas Thomas, had been appointed in 1583. He set up a printing house on the site of what became the Senate House lawn – a few yards from where our bookshop now stands. In those days, the Stationers' Company in London jealously guarded its monopoly of printing (which partly explains the delay between the date of the University's Letters Patent and the printing of the first book).

At one point Thomas was described by the London opposition as 'vtterlie ignoraunte in printinge'. He was in fact a very competent printer and he was a fine scholar. In 1591, Thomas's successor, John Legate, printed the first Cambridge Bible, an octavo edition of the popular Geneva Bible. The London Stationers objected strenuously, claiming that they had the monopoly on Bible printing. The University's response was to point out the provision in its charter to print 'all manner of books'. Thus began our long tradition of publishing the Bible, a tradition that has endured for over four centuries, beginning with the Geneva Bible, and continuing with the Authorized Version, the Revised Version, the New English Bible and the Revised English Bible.

Move quickly to the section of your choice.

[The beginning](#)

[Richard Bentley](#)

[Newton's Principia Mathematica](#)

[John Baskerville](#)

[Printing innovations](#)

[Publishing developments](#)

[Growing as an educational and academic publisher](#)

[The Cambridge Bookshop](#)

[centre the number]

1.

Sub-strand 2: Introduction to presentation software

Activity 2.5: Groups

Purpose:

Demonstrate how to add pictures, screenshots and edit and format pictures.

Show the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Show the ability to work with all group members to complete a task successfully. (Core competencies DL5.1 and CC9.6)

Resources:

- Learner's Book pages 76–86
- *Activity 2.5_Dog Pack Hierarchy.pptx*
- *How to Tell Which Dog is Alpha.pdf*
- *Dog pack.jpg*
- Photos in the Pure Breed Dogs folder
- *Activity 2.5_Dog Pack_answer.pptx*
- *Activity 2.5_Photo album_answer.pptx*
- A data projector

Teacher:

Tell the learners that pictures, screenshots and shapes can be added, edited and formatted to considerably enhance their presentations. Work through the HOW TO? features with the learners, giving them plenty of time to explore the options themselves.

LOW RESOURCE SCHOOLS

1. Discuss precautions to take when resizing a picture in order to avoid distorting the aspect ratio of the picture.
2. The file size of a presentation prepared by Amarkie is too big to be sent via email. Discuss the possible reasons for the large file size. In addition, suggest a solution that can help her to reduce the storage file size.

ANSWERS

1. If you use the side sizing handles to resize the picture, the image will become distorted. If you want the centre of the picture to remain the same, press and hold Ctrl while dragging the sizing handles.
2. The file size will be large if the document includes pictures or other graphics. She can compress the file by zipping it.

Assessment:

Move between the groups and check that all learners are engaged in the activity. Observe learners' communication skills, how they split the work amongst themselves and how well they were able to work together to complete the activity. Review the slide shows to assess learners' ability to interpret, organise and apply information to successfully carry out instructions.

Plenary:

Ask each group to describe to the class how to do one of the following:

- Insert a picture from a folder.
- Insert a picture from an online source.
- Insert a screenshot.
- Resize and rotate pictures.
- Move, crop and delete pictures.
- Compress pictures.
- Apply picture styles.
- Add a border to a picture.
- Create a photo album.

The rest of the class must listen and evaluate the answers.

LEARNERS

1. Open the incomplete presentation, *Activity 2.5_Dog Pack Hierarchy.pptx*, and the article, *How to Tell Which Dog is Alpha.pdf*, and follow the instructions for Question 1 in the Learner's Book. Save your work as <your name>_Activity 2.5_Dog Pack Hierarchy.pptx.
2. Create a photo album of the different types of pure breed dogs, using the pictures in the Pure Breed Dogs folder. Add your name to the title slide. Save your work as <your name>_Activity 2.5_Photo album.pptx

1. Details may vary slightly, but the slideshows should closely resemble the example below.

Dog Pack Hierarchy

How to Tell Which Dog is Alpha?

Introduction

- Dogs are social pack animals with a leader and followers.
- Happiest when they have structure.
- Followers want to be told what to do and know what the leader expects.
- An adult dog knows its pack position and is not going to change it.
- Can't change a follower into a leader or vice versa.



Source of Dominance

- Dominance starts while dogs are still puppies feeding from their mother.
- Bigger, stronger puppies (more dominant) get more milk.
- Smaller, weaker puppies learn to wait.
- As they grow, dominant and subservient behaviour continues.



Identifying the Leader of the Dog Pack

- Easy to spot the leader and omega – they will let you know
- Leader
 - Body language
 - Interaction with other dogs
 - Other dog approaches
- Omega
 - Show submission to every dog & every person
- Beta
 - Trickier to spot
 - Have own hierarchy and submission



Screenshot - Taken from
<https://www.cesarsway.com/dog-pack-hierarchy/>

When You Have Two or More Dogs

If you have more than two dogs, then you need to do these things in pack order – alpha dog first, then the betas, and omegas last. This will reinforce the dog pack hierarchy and make all of your dogs feel confident that they are in their proper place. If the alpha dog begins to feel insecure in his position, then he may compensate for this by exaggerating his dominance, which can lead to aggression.

And remember also that this hierarchal approach does not mean that the omega dog gets less attention or fewer treats than the alpha dog – she just gets them afterwards.

You can't change a dog's position in the pack unless you remove all the more or less dominant dogs from that pack. But you can listen to Mother Nature – and your dogs – and use your dogs' natural pack positions to create balance and harmony by letting them actually be a pack.

Acknowledgment

- <https://www.cesarsway.com/dog-pack-hierarchy/>

2. See below for an example of the photo album.



Remedial activity:

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

Activity 2.6: Groups

Purpose:

Demonstrate how to add a drawing canvas, shapes, and also edit, format and add text to shapes.

Show the ability to visualise alternatives, see possibilities, and identify problems and challenges. Show 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 87–93
- *Activity 2.6_Dog Pack Hierarchy.pptx*
- *Activity 2.6_Dog Pack Hierarchy_answer.pptx*
- A data projector

Teacher:

Guide the learners through the HOW TO? features and allow them time to explore the options themselves.

LOW RESOURCE SCHOOLS

1. How is SmartArt used to illustrate information on a presentation slide?
2. State the differences between shapes and SmartArt.

ANSWERS

1. SmartArt allows you to communicate information using graphics. You can choose from different SmartArt styles to illustrate different types of information, for example:
 - charts
 - hierarchy
 - steps or stages in a process or workflow
 - lists
 - cycles
 - relationship between parts, such as overlapping concepts
 - matrix illustrations
 - proportional or hierarchical information in a pyramid illustration.
2. Shapes are objects such as lines, arrows, rectangles, circles and squares. They are single objects that you must combine to create a more complicated object such as a flowchart. You must choose your own colours and formatting. SmartArt are ready-made objects with selected colour schemes and are ready to be used for various purposes.

Assessment:

Walk around and observe the learners' group-work skills. Encourage fair allocation of the workload as well as respectful communication. Review the documents to assess learners' ability to interpret and organise information and consider options to successfully carry out instructions.

Plenary:

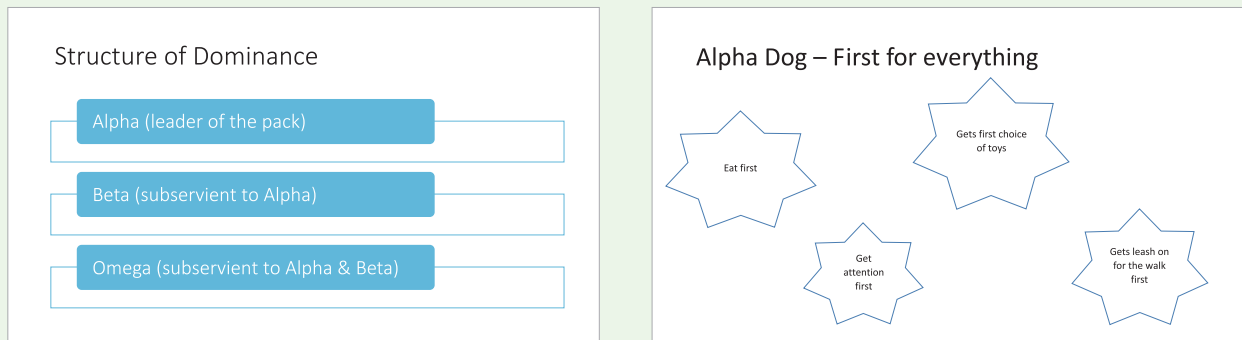
Ask a few learners to describe the process of adding SmartArt to a slide. Give the rest of the learners an opportunity to comment on the suggested process. Remind them that their comments should be respectful and constructive.

LEARNERS

You are going to add SmartArt and shapes to slides. Follow the instructions in the Learner's Book. Ask your teacher for help if you struggle with anything. When you have completed the activity, save your presentation as <your name>_Activity 2.6_Dog Pack Hierarchy.pptx.

ANSWERS

Learners' slides may vary slightly (for example, the size of the stars on Slide 8 may vary), but they should demonstrate that they can use the SmartArt, shapes and text specified in the activity.



Activity 2.7: Groups

Purpose:

Demonstrate how to add text to shapes and arrange shapes.

Show the ability to work with all group members to complete a task successfully. Show 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 CC9.6 and DL5.1)

Resources:

- Learner's Book pages 93–98
- Activity 2.7_Dog Pack Hierarchy.pptx
- Activity 2.7_Dog Pack Hierarchy_answer.pptx
- A data projector

Teacher:

Work through the HOW TO? features. Allow learners time to follow the instructions before attempting the activity.

LOW RESOURCE SCHOOLS

1. Discuss the relevance of shapes and SmartArt in the design of presentations. Give specific examples to support your discussion.
2. Write your responses on a manila card and present it to the class.

ANSWERS

There are no fixed answers, as the learners will express their own opinions. Guide the learners to understand that shapes and SmartArt can help to convey information, they can make a presentation attractive, and they can reflect the user's creativity. Learners should also mention that, when used indiscriminately, shapes and SmartArt can also be distracting and lower the tone and quality of a document.

Assessment:

Move between the groups and check that all learners are engaged in the activity. Observe learners' communication skills, how they split the work amongst themselves and how well they were able to work together to complete the activity. Review the slide shows to assess learners' ability to interpret, organise and apply information to successfully carry out instructions.

Plenary:

Ask each group to describe to the class how to do one of the following:

- Add text to a shape using a text box.
- Align shapes.
- Order shapes.
- Apply pre-set shape styles.
- Change shape colour and outline.

The rest of the class must listen and evaluate the answers.

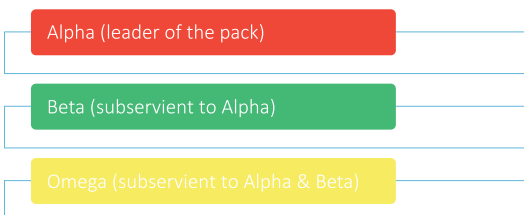
LEARNERS

You are going to change the fill colour of shapes and apply shape effects. Ask your teacher for guidance if you struggle to apply these changes. Remember to save your work as <your name>_Activity 2.7_Dog Pack Hierarchy.pptx.

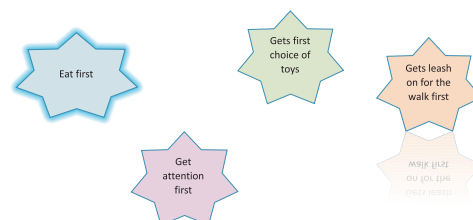
ANSWERS

Colours will vary on Slide 8, but the slideshows should closely resemble the example below.

Structure of Dominance



Alpha Dog – First for everything



Sub-strand 3: Introduction to desktop publishing

Activity 2.8: Pairs

Purpose:

Explain the importance of desktop publishing software.

Show the ability to visualise alternatives, see possibilities and identify problems and challenges. Show 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 99–103
- A selection of publications produced using DTP software, for example advertisements, newsletters, newspapers, magazines, posters, etc.

Teacher:

If possible, bring a selection of publications to class to give the learners an idea of what can be produced using DTP software. Use the image on page 102 as an example of a newsletter. Walk between the pairs as they work through the activity and discuss their research findings. Prompt the learners with questions if they need help.

Assessment:

Take note of the learners' communication skills as they discuss and brainstorm their answers. Review learners' answers to determine if they understand the importance of desktop publishing software, and to assess their ability to interpret and organise information and consider options.

Plenary:

Ask the learners to suggest how the school could use DTP software.

LEARNERS

You will discuss various aspects of desktop publishing software. You will also research and evaluate different DTP programs. You can use books, the internet or computer magazines for your research, or you can talk to people who use these programs for their work, for example, graphic designers.

ANSWERS

1. To create professional-looking documents for mass distribution, such as advertising flyers and newsletters. DTP is much cheaper than previous methods of doing this.
2. Answers may vary. Examples include:
 - advertising flyers, posters, graphics
 - newsletter, graphics
 - columns, layout of the newspaper, layout of advertisements in newspaper
 - change colours or shades of colours, lines or line sizes
 - drawing tools to create logo.

3. The master page style is set up with the same font styles, background styles and borders. The master page style is automatically applied to each new page.
4. Answers may vary, examples include:
 - Create attractive, professional-looking documents.
 - Save time (master page style).
 - All documents can have a similar look (for example in a business or school).
 - Save money (for example, flyers designed in-house instead of paying a design company).
 - Gives a good idea of what a document will look like when printed; objects can be moved to improve the layout.
5. Answers will vary. Although DTP has some drawing tools to create new images and can edit and improve existing images, graphic design packages are used to produce more advanced graphics. Photos can be edited, for example, recoloured, resized, cropped, made brighter, etc. Newspapers and a variety of other publications, such as magazines, newsletters or posters, can be laid out in a way that creates high-quality publications.

Activity 2.9: Groups

Purpose:

Create and save a new document from a pre-designed template.

Show the ability to visualise alternatives, see possibilities and identify problems and challenges. Show the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Show 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 103–108

Teacher:

Guide the learners through using a template, giving them plenty of time to explore the options before they attempt the activity.

LOW RESOURCE SCHOOLS

1. Highlight the unique features of Microsoft® Publisher.
2. Explain the significance of frames in creating publications.

ANSWERS

1. It is a desktop publishing program that is used to create publications such as advertisements, newspapers, flyers, greetings cards and business cards. Users can:
 - choose from a variety of templates
 - insert images, photographs, text or chart and graphs
 - format the page colours, font styles and backgrounds
 - use columns in news publications
 - use master pages to apply settings to all pages
 - edit existing images and photographs
 - create original graphics
 - collaborate and share publications.

2. You should always place frames on your blank page, and then insert the various elements that you want on the page in the frames. These elements include pictures, text, columns, charts, shapes, WordArt, SmartArt, ClipArt and Quick Parts. Frames are also used for headers, footers and page numbers. You can then place the frame in the correct position on the page. A frame for a picture can only be used to insert an image file. A text box frame only allows you to insert letters, including characters that are not on a standard keyboard (for example, mathematical, currency and copyright symbols).

Assessment:

Move around between the groups and ensure that all group members are engaged in the task. Take note of learners' communication skills as they have group discussions. Observe how groups split the work amongst themselves and how well they were able to work together to complete the activity. Review the flyers with the checklist below.

Action	✓	✗
A flyer is created using a pre-designed template		
The flyer advertises a community computer fair		
The event is described		
The venue, date and cost are listed		
Other relevant information is included		
The colour scheme of the template has been edited		

Plenary:

Have the groups present their flyers to the rest of the class. They must note what they like about the flyer and what could be done to improve it.

LEARNERS

You will work in groups and plan and create an event flyer for a community computer fair. Read the instructions in the Learner's Book and make sure that you understand what is required. Ask your teacher if you are uncertain about anything. Save your work as *<your name>Activity 2.9_Flyer.pub*.

ANSWERS

Answers will vary, but should include all of the following:

- a pre-designed template with the colour scheme edited
- content suitable for the event
- venue, date and cost
- other details.

Activity 2.10: Individual

Purpose:

Create and save a new document from a blank document.

Show the ability to visualise alternatives, see possibilities and identify problems and challenges. Show 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 108–110

Teacher:

Explain the difference between the **Save** and the **Save As** commands. Make sure the learners understand what is required in the activity. Walk around and note which learners need help. Consider pairing them with stronger learners until they are more comfortable with the software. Offer assistance where necessary.

LOW RESOURCE SCHOOLS

- State the difference between the **Save** and the **Save As** commands. Give examples to support your answer.
- What are the benefits associated with saving a publication with an appropriate filename?

ANSWERS

- You use **Save** to save a document that you have already saved at least once before. For example, if you open a document called *Invitation.pub* and make changes to it, you can just click **Save** if you want to keep the updated document with the same file name. If you are saving the document for the first time, or you want to save the document under another name, you will use **Save As**. You can then, for example, name your document *Birthday invitation.pub*.
- It will help you to find the file quickly if you search for it on your computer.

Assessment:

Review the cards to assess the learners’ ability to visualise alternatives, identify and solve problems. You can use the checklist below.

Action	✓	✗
A folded card is created		
Heading on page 1		
Image on page 1		
Background on page 1		
Border on page 1		
Appropriate text on page 2		
Centred text on page 3		
Graphics/clip art/image on page 3		
Learner’s name on page 4		
File correctly saved		

Plenary:

Have the learners present their cards to the rest of the class. Their peers should comment on unusual ideas or things they could apply in their own work in the future.

LEARNERS

You are going to work on your own and make a greetings card. Before you start, read the instructions in the Learner's Book and make sure that you understand what is required. Ask your teacher if you are uncertain about anything.

Be as creative as possible and apply the knowledge you have gained in this strand to make your greetings card interesting and attractive. Remember, though, that good design means that you must choose with care the elements that you will use. Save your work as *<your name>Activity 2.10_Card.pub*.

ANSWERS

Learners' cards will differ but must meet all the criteria listed in the Assessment section above.

Remedial activity:

Allow learners to improve their greeting card after having reflected on what they would like to have done differently.

Activity 2.11: Pairs

Purpose:

Demonstrate the use of the commands in the Publisher ribbon under each tab (Home, Page Design, Mailings, Review, View).

Show the ability to work with all group members to complete a task successfully. Show 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 CC9.6 and DL5.1)

Resources:

- Learner's Book pages 110–118

Teacher:

Guide the learners through the information on the Home, Page Design, Mailings, Review and View tabs. Give them plenty of time to explore and apply the information.

Assessment:

Take note of learners' communication skills as they discuss and brainstorm their answers. Review learners' answers to determine if they understand the uses of the tabs discussed, and to assess their ability to interpret and organise information and consider options.

Plenary:

Write the names of the tabs on the board and invite learners to explain what they are used for.

LEARNERS

You are going to think about methods to proofread a document and correct errors. You are also going to talk about using the options on the Review tab, and the benefits and drawbacks of using a master page to create a publication. Before you start, read the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear.

ANSWERS

1. Re-read your document carefully, ask a friend to check the spelling, use a dictionary to check any spelling you are unsure of, use a thesaurus to find better or more accurate words.
Use the Review tab. Confirm the language is set to the preferred proofing language. Choose to Change or Ignore spelling mistakes, for example a name might come up as a spelling mistake. The Research tool offers you access to ready information online so that you can easily copy and paste information on your topic without having to use separate search engines to find further information on your topic.
2. The Spelling button gives you the option to check the text and correct spelling mistakes. The Research button allows you to access the meanings of words by using a built-in dictionary. The Thesaurus button helps you to find similar words to express yourself more articulately.
3. Advantages: using frames means you can have the same overall layout/look in the whole document; you can change the content of just one frame; you can add a header or footer; same styles are used throughout the document; changes, for example to margins, are applied throughout the document; using the View tab, you can get a very good idea of what the whole document will look like.

Activity 2.12: Group

Purpose:

Change the orientation and margins of a document.

Show the ability to work with all group members to complete a task successfully. Show 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 CC9.6 and DL5.1)

Resources:

- Learner's Book pages 118–122

Teacher:

Work through changing orientation and margins with the class.

Assessment:

Circulate as the groups discuss the questions and pay attention to learners' communication skills. Review the answers orally to ensure that learners understand the application of changing orientation and margins.

Plenary:

Ask the learners to suggest problems that could be solved by:

- changing orientation
- adjusting margins
- using a master page.

LEARNERS

You are going to suggest solutions for some problems when producing publications. Read the scenarios in the Learner's Book and explain how each problem can be solved. Apply the knowledge you have gained in this sub-strand.

ANSWERS

1. Change the orientation of the document to landscape.
2. The font sizes could be adjusted so that there is no spare page at the end. You could add more objects, such as images, and resize them so that the text and the objects all fit into the number of pages you have. You could also change the line spacing, either increase or decrease it, until you have a better fit on your number of pages.
3. Adjust the gutter margins.

Activity 2.13: Individual

Purpose:

Add and modify pictures from different sources. Add and modify text. Create and present a Publisher document (flyer, advertisement, invitation cards, business cards).

Show the ability to visualise alternatives, see possibilities and identify problems and challenges. Show 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 122–138

Teacher:

Guide the learners through the information on working with images, adding and modifying text, creating flyers, creating advertisements, creating invitations and creating business cards. Give the learners plenty of time to experiment with the various options.

LOW RESOURCE SCHOOLS

1. Kojo Poku has created a flyer using Publisher. He has difficulty moving an image to a desired location on the flyer. Outline steps to help him perform the task.
2. A brochure designed by Alhassan contains text together with images. Texts cannot be written around the images as the application is not allowing that.
 - a. What should be done to ensure the texts are written around and close to the images?

- b.** One of the images on the brochure requires that text be written over (shown on) it. Outline the steps to guide Alhassan to perform these tasks.

ANSWERS

1. Kojo must use a Picture Placeholder. To insert a placeholder, click **Picture Placeholder** in the Illustrations group, and then draw a frame on the page. He can then move the picture to within the frame.
2.
 - a. Use the Wrap Text option.
 - b. Select the text and select the Bring to Front option to show the text over the image. Alternatively, select the image and select the Send Backward option. This will position the image behind the text.

Assessment:

Not all learners are equally artistic, but attractive and professional-looking documents should be produced using Publisher's tools. The activity can be assessed using the checklist below.

Action	✓	✗
A logo is created		
A flyer is created		
An invitation is created		
Slogan is in appropriate font and colour		
Colour scheme is consistent between both documents		
Fonts are consistent between both documents		
Design elements and text of the flyer are suitable for the target market		
Design elements and text of the invitation are suitable for the target market		
All relevant information is included and error free on both documents		
Documents are attractive and show creativity		

Plenary:

Have the learners present their documents to the rest of the class. They should respond in three ways:

1. Do the documents meet the criteria of the checklist above?
2. What do they like about the documents?
3. How can the documents be improved?

LEARNERS

You are going to work on your own and use the formatting tools in Publisher to create a set of business publications for a new business called Teens Music Club. Read the instructions in the Learner's Book and create the flyer and business cards. Make sure that you include all the elements listed in the Learner's Book. Be creative and make your publications as attractive as possible.

ANSWERS

Answers will vary, but should meet all the criteria listed in the assessment checklist above.

Sub-strand 4: Introduction to electronic spreadsheets

Activity 2.14: Groups

Purpose:

Perform operations using functions and built-in functions.

Show 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 139–143
- *Built-In Functions.xlsx*
- *Activity 2.14_Neighbourhood Age Groups.xlsx*
- *Activity 2.14_Neighbourhood Age Groups_answer.xlsx*

Teacher:

Give learners time to practise the common spreadsheet functions using the file *Built-In Functions.xlsx*. Make sure that the learners thoroughly understand the difference between formulas and functions. Let them use the spreadsheet to explore the various functions. Give them plenty of time to practise before they attempt the activity.

LOW RESOURCE SCHOOLS

1. Explain the differences between a formula and a function. Support your response with specific examples.
2. The worksheet below contains the assessment records of some learners at Veharo International School. Study the data in the worksheet carefully and answer the questions that follow:

	A	B	C	D	E	F	G	H
1	Verharo International School							
2	Students Assessment Sheet							
3	Term 1							
4	Name	English	Maths	Science	History	RME	Total	Average
5	Kofi	70	62	48	57	61	298	59.6
6	Abena	64	81	56	63	68	332	66.4
7	Amina	83	46	59	58	73	319	63.8
8	SUB-TOTAL	217	189	163	178	202	949	189.8
9	Term 2							
10	Kofi	54	69	67	65	67	322	64.4
11	Abena	62	64	49	49	35	259	51.8
12	Amina	67	63	73	62	68	333	66.6
13	SUB-TOTAL	183	196	189	176	170	914	182.8
14	Term 3							
15	Kofi	52	83	58	76	59	328	65.6
16	Abena	63	76	53	81	57	330	66
17	Amina	64	54	64	58	37	277	55.4
18	SUB-TOTAL	179	213	175	215	153	935	187
19	GRAND TOTAL	579	598	527	569	525	2798	559.6

- a. Write the function to find the highest score for Abena in Term 1.

- b. Write the function to find the lowest score for Kofi in Term 3.
- c. Write the SUM function to calculate the total score of Amina in the Science subject for the three terms (at the end of the academic year).
- d. Write the function to calculate the average score of the 3 learners in all subjects at the end of Term 2.

ANSWERS

1. A formula is user-created. A function is built into the software program and has a name that suggests what it does.
2.
 - a. =MAX(B6:F6)
 - b. =MIN(B10:F10)
 - c. =SUM(D7,D12,D17)
 - d. =AVERAGE(B10:F12)

Assessment:

Walk between the groups as they work through the activity. Observe how groups split the work amongst themselves and how well they were able to work together to complete the activity. Review the spreadsheets to assess learners' ability to interpret, organise and apply information to successfully carry out instructions.

Plenary:

Ask each group to describe a function by explaining what it is used for; they may not use the name of the function (for example, minimum, average, count, etc.). The rest of the class must identify the function.

LEARNERS

You are going to study a spreadsheet to answer questions about the ages of the people living in households in your neighbourhood. Open the file *Activity 2.14_Neighbourhood Age Groups.xlsx* and follow the instructions in the Learner's Book. Ask your teacher to explain anything that is unclear. Save your work as <your name>_Activity 2.14_Neighbourhood Age Groups.xlsx. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

	A	B	C	D	E	F	G	H	I	J	K
1	My neighbourhood age groups										
2	Ages between	Under 10	10 and 19	20 and 29	30 and 39	40 and 49	50 and 59	60+	80+	100+	Number in each household
3	House 1	0	0	1	0	0	0	2	0	0	
4	House 2	2	1	1	1	0		0	0	0	
5	House 3	0	0	1	1	1	1	0	0	0	
6	House 4			0	0	0	0	1	0	0	
7	House 5	4	0	0	2	0	0	1	0	0	
8	House 6	0	2		1	0	0	0	0	0	
9	House 7	4	3	5	2	2	0	2	1	0	
10	House 8	6	2	1	0	4		2	2	1	
11	House 9	3	5	2	1	3	0	3	1	1	
12	House 10	1	4	2	0	4	2	1	1	0	
13	Total in each age group	20	17	13	8	14	3	12	5	2	Average number in all households
14	Average in each age group	2	2	1	1	1	0	1	1	0	
15	Highest in each age group	6	5	5	2	4	2	3	2	1	
16	Lowest in each age group	0	0	0	0	0	0	0	0	0	
17	Number of missing entries	1	1	1	0	0	2	0	0	0	
18	Total number of people over 80	7									

Activity 2.15: Pairs

Purpose:

Demonstrate how to create complex formulas.

Show the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Show the ability to combine information and ideas from several sources to reach a conclusion. (Core competencies DL5.1 and CP5.1)

Resources:

- Learner's Book pages 139–144
- *Activity 2.15_University Student Monthly Budget.xlsx*
- *Activity 2.15_University Student Monthly Budget_answer.xlsx*

Teacher:

Guide the learners through working with percentages as an example of a complex formula.

Assessment:

Move between the pairs and ensure that both members of each pair are engaged in the activity. Apart from percentages, this activity requires simple calculations, so it is a good opportunity to identify learners with gaps in their knowledge. Review the spreadsheets to assess learners' ability to combine information from several sources and use it to successfully solve problems.

Plenary:

Have a class discussion about using a budget spreadsheet such as this one to manage home finances. Ask the learners to suggest sub-headings (expense groups) and how formulas can be used in the spreadsheet.

LEARNERS

You are going to work in pairs, using the spreadsheet *Activity 2.15_University Student Monthly Budget*. Read the instructions and questions in the Learner's Book and complete the activity. Ask your teacher to explain anything that is unclear. Save your work as <your name>_Activity 2.15_University Student Monthly Budget.xlsx. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. This electronic spreadsheet is a monthly budget tracker for a university student. The student can change the numbers to match their real situations. The Monthly Budget is how much they have available to spend in each area of expense. The Actual Spent column reflects how much they have spent, irrespective of how much their budget was originally set at. The sub-sections – Academic Expenses, Personal Expenses and Living Expenses – divide the whole budget into categories relevant to the financial situation of a typical student. The subtotals from these three categories are added up to make up the total Monthly Budget (B6) and total Actual Spent (C6). The student can then see how much of their budget has been spent as they update their electronic spreadsheet throughout the month, thereby helping them to stay within their budget. When they spend more than their budget, the amount appears in a red font to alert them that they went over their budget.

- 4.

5.

- 6.

Activity 2.16: Individual

Purpose:

Demonstrate how to create complex formulas.

Show the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Show the ability to combine information and ideas from several sources to reach a conclusion. (Core competencies DL5.1 and CP5.1)

Resources:

- Learner's Book pages 145–146
- *Activity 2.16_Commission.xlsx*
- *Activity 2.16_Commission_answer.xlsx*

Teacher:

Explain that commission is calculated as a percentage of sales. Learners work alone for this activity, which gives further practice in using complex formulas.

Assessment:

Move around the class and provide assistance and reinforcement where learners are struggling with any aspect of the process. Each learner's spreadsheet needs to be checked for correctness.

Plenary:

Ask individual learners to read out their formulas for specific cells and to give their reasons for creating the formula in the way they did. If anyone had a different way of creating the formula, they should give their reasons.

LEARNERS

You are going to work on your own and use complex formulas to do calculations. Open the file *Activity 2.16_Commission.xlsx*. Read the instructions and questions in the Learner's Book. Ask your teacher to explain anything that is unclear. Save your work as *<your name>_Activity 2.16_Commission.xlsx*. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1.

	A	B	C	D	E	F	G
	Salesperson	Products for sale	Product unit price	Number of sales	Total product sales	Commission rate_1	Commission rate_2
1							
2							
3						1,5%	3%
4							
5	Kwamena	Wind turbines	GHC 6 390,00	89	GHC 568 710,00	GHC 8 530,65	GHC 17 061,30
6	Ntiful	Solar panels	GHC 9 290,00	97	GHC 901 130,00	GHC 13 516,95	GHC 27 033,90
7	Atsu	Heat pumps	GHC 6 350,00	129	GHC 819 150,00	GHC 12 287,25	GHC 24 574,50
8	Yoofi	Battery storage	GHC 8 650,00	168	GHC 1 453 200,00	GHC 21 798,00	GHC 43 596,00
9	Mawuli	Solar water heaters	GHC 1 480,00	237	GHC 350 760,00	GHC 5 261,40	GHC 10 522,80
10							
11	Totals		GHC 32 160,00	720	GHC 4 092 950,00	GHC 61 394,25	GHC 122 788,50

2. Kwamena: In cell F5, =E5*F3
Ntiful: In cell F6, =E6*F3
Atsu: In cell F7, =E7*F3
Yoofi: In cell F8, =E8*F3
Mawuli: In cell F9, =E9*F3
3. The revenue earned by the company increases by the difference between the salespeople's collective 3% commission and the 1.5% commission difference.
4. Yoofi, because he sells the highest number of products and because the unit price of his item is low relative to the items sold by Ntiful.

5.

	A	B	C	D	E	F	G
	Salesperson	Products for sale	Product unit price	Number of sales	Total product sales	Commission rate_1	Commission rate_2
1							
2							
3						1,5%	3%
4							
5	Kwamena	Wind turbines	GHC 6 390,00	89	GHC 568 710,00	GHC 8 530,65	GHC 17 061,30
6	Ntiful	Solar panels	GHC 9 290,00	97	GHC 901 130,00	GHC 13 516,95	GHC 27 033,90
7	Atsu	Heat pumps	GHC 6 350,00	129	GHC 819 150,00	GHC 12 287,25	GHC 24 574,50
8	Yoofi	Battery storage	GHC 8 650,00	168	GHC 1 453 200,00	GHC 21 798,00	GHC 43 596,00
9	Mawuli	Solar water heaters	GHC 1 480,00	237	GHC 350 760,00	GHC 5 261,40	GHC 10 522,80
10							
11	Totals		GHC 32 160,00	720	GHC 4 092 950,00	GHC 61 394,25	GHC 122 788,50
					Company Revenue after paying out commission	GHC 4 031 555,75	GHC 3 970 161,50
				Company Extra Revenue by reducing commission	GHC 61 394,25		
12							

Remedial activity:

Ask learners questions to check that they understand the way the formulas are written, e.g. that * represents multiplication.

Activity 2.17: Groups

Purpose:

Demonstrate how to copy formulas and references.

Show the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Show the ability to combine information and ideas from several sources to reach a conclusion. (Core competencies DL5.1 and CP5.1)

Resources:

- Learner's Book pages 147–150
- *Activity 2.17_Simple Loan Calculator.xlsx*
- *Activity 2.17_Simple Loan Calculator_answer.xlsx*

Teacher:

Guide the learners through these concepts: interest, absolute and relative cell referencing, and copying formulas and references. Move around the class and provide assistance and reinforcement where learners are struggling with any aspect of the process.

Assessment:

Informally assess if the learners understand the concepts of interest and absolute and relative cell referencing by asking questions while they complete the activity. Take note of learners' communication skills as they have group discussions. Review the spreadsheets to assess learners' ability to organise and combine information from several sources to successfully solve a problem.

Plenary:

Provide a scenario from an advertising leaflet, such as purchasing furniture on hire purchase. Ask the class to suggest how to draw up a spreadsheet to calculate: (a) the amount of interest paid and (b) the final amount paid by the purchaser.

LEARNERS

You are going to work in a group to calculate loan repayments. You will use the electronic spreadsheet file *Activity 2.17_Simple Loan Calculator.xlsx* and your knowledge of formulas to complete the activity. Ask your teacher to explain anything that is unclear. Save your work as <your name>_Activity 2.17_Simple Loan Calculator.xlsx. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. In Month 3 (see row 14), the third payment is being made and it is based on the remaining balance from Month 2 (in G13). The amount has been referenced by simply using an = sign and clicking on cell G13 in cell C14. This formula is referenced from another cell, G13, and then replicates the formula by copying this formula down Column C, so that you do not have to spend a lot of time copying each formula for all the 24 months down Column C.
 - In Cell D14, the interest is being calculated as follows: $=C14*\$D\$3/(D8-2)$, where the $\$D\3 is an absolute reference. If you replicate or copy this cell reference, it will not increase as you copy it across the other cells. It will keep the same value in Cell D3 and not use the values found in D4, D5, D6, and so on. This is called absolute referencing. Usually, when you replicate a formula, it will automatically use relative referencing by using the values relative to each row or column that you copy the formula across.
 - (D8-2) refers to the number of months of the loan (24) minus every month that you have paid; this increases by one every month. The next will be (D8-3), (D8-4), and so on.
 - The 'Principal' refers to how much of the original loan amount is left still to pay; as this amount decreases every month, the interest must be calculated on this lower amount. In Month 3, the principal is calculated as follows: $=C14/(D8-)$, where C14 refers to the remaining balance from Month 2 divided by how many months are left to pay off the loan, where D8 was the original 24 months and minus 2 because you have already paid off 2 months.
 - 'Monthly Payments' are calculated by adding the amount of interest and the principal payments, as follows: $=D14+E14$
 - 'Ending Balance' refers to the loan amount left over after you have made the third monthly payment, as follows: $=C14-F14$.

2. Reduce the number of months in Cell D8 from 24 months to 12 months and this is the result:
Notice that after 12 months the formulas do not perform any further calculations because you cannot divide by zero, which is what happens when there is zero left to pay after the 12 months of repayment.

	A	B	C	D	E	F	G
1	Simple Loan Calculator						
2	Loan amount			GHC 5 000,00			
3	Annual interest rate			5,5%			
4	Loan period in years			2			
5	Start date of loan			15/03/2022			
6							
7	Monthly payment						
8	Number of payments			24			
9	Total interest			#DIV/0!			
10	Total cost of loan			#DIV/0!			
11	Number of months	Payment date	Opening balance	Interest	Principal	Monthly payment	Closing balance
12	1	15/03/2022	GHC 5 000,00	GHC 22,92	GHC 416,67	GHC 439,58	GHC 4 560,42
13	2	15/04/2022	GHC 4 560,42	GHC 22,80	GHC 414,58	GHC 437,39	GHC 4 123,03
14	3	15/05/2022	GHC 4 123,03	GHC 22,68	GHC 412,30	GHC 434,98	GHC 3 688,05
15	4	15/06/2022	GHC 3 688,05	GHC 22,54	GHC 409,78	GHC 432,32	GHC 3 255,73
16	5	15/07/2022	GHC 3 255,73	GHC 22,38	GHC 406,97	GHC 429,35	GHC 2 826,38
17	6	15/08/2022	GHC 2 826,38	GHC 22,21	GHC 403,77	GHC 425,98	GHC 2 400,40
18	7	15/09/2022	GHC 2 400,40	GHC 22,00	GHC 400,07	GHC 422,07	GHC 1 978,33
19	8	15/10/2022	GHC 1 978,33	GHC 21,76	GHC 395,67	GHC 417,43	GHC 1 560,91
20	9	15/11/2022	GHC 1 560,91	GHC 21,46	GHC 390,23	GHC 411,69	GHC 1 149,22
21	10	15/12/2022	GHC 1 149,22	GHC 21,07	GHC 383,07	GHC 404,14	GHC 745,08
22	11	15/01/2023	GHC 745,08	GHC 20,49	GHC 372,54	GHC 393,03	GHC 352,05
23	12	15/02/2023	GHC 352,05	GHC 19,36	GHC 352,05	GHC 371,41	-GHC 19,36
24	13	15/03/2023	-GHC 19,36	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
25	14	15/04/2023	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
26	15	15/05/2023	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
27	16	15/06/2023	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
28	17	15/07/2023	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
29	18	15/08/2023	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
30	19	15/09/2023	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
31	20	15/10/2023	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
32	21	15/11/2023	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
33	22	15/12/2023	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
34	23	15/01/2024	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
35	24	15/02/2024	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
36							
37							
38							

3. Once your formulas and functions have been entered, you can easily change the contents of related cells and the new results are automatically calculated throughout the whole electronic spreadsheet. This saves users a lot of time and gives them the opportunity to make decisions more quickly.
4. Possible answers can include the following:
 - forecasting numbers of sales and its impact on future revenue
 - changing a rate, such as, a conversion rate, interest rate, commission rate, and comparing the resulting figures
 - if a data trend is following a particular path, perhaps upwards, downwards or a neutral path, etc.

Activity 2.18: Pairs

Purpose:

Demonstrate how to copy formulas and references.

Show the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Show the ability to combine information and ideas from several sources to reach a conclusion. (Core competencies DL5.1 and CP5.1)

Resources:

- Learner's Book pages 150–153

Teacher:

Work through the typical formula errors that learners will encounter. Explain that an inconsistent formula may not necessarily be an incorrect one.

Assessment:

Assessment will be informal through observation of the pairs' discussions and informal questioning during the session.

Plenary:

Get feedback from each pair. Invite the rest of the class to comment on the feedback and give reasons why they agree or disagree.

LEARNERS

You are going to work in pairs and explain how you would solve a problem with an incorrect formula. You will also discuss ways in which you can check that the formulas in electronic spreadsheets are correct.

ANSWERS

1. Use the pop-up Help options to explore how to solve the problem formula.
2. Use test data that can be verified using a calculator on one or two sets of data. Check that the formulas used actually do the correct calculation you require.
3. Inconsistent Formula – means that you may have one formula in a range of formulas which is different from all the others. It might be correct, but it gets flagged as a possible error for you to check.
 - Copy Formula from Above – means that if you are not sure about entering a complex formula or function into subsequent cells, you could copy a formula from above because it will reference the correct cells when being replicated.
 - Help on this Error – this uses a help section that highlights the incorrect part of a formula and suggests what you need to do to correct the formula, such as, possibly add brackets or inverted commas, etc.
 - Ignore Error – use this option if you know for certain that your formula is correct.
 - Edit in Formula Bar – when you are making changes to a formula, you should edit it in the formula bar at the top of your sheet and press enter when you have completed editing it.
 - Error Checking Options – this opens in a new window offering you further options to correct any errors you may still have in your formulas and functions.

Remedial activities

The following activities are suitable for learners who need more practice with some of the skills.

1. Open the *Strand 2 Extra activity 1_Future Threats* presentation and edit the format of the presentation as follows:

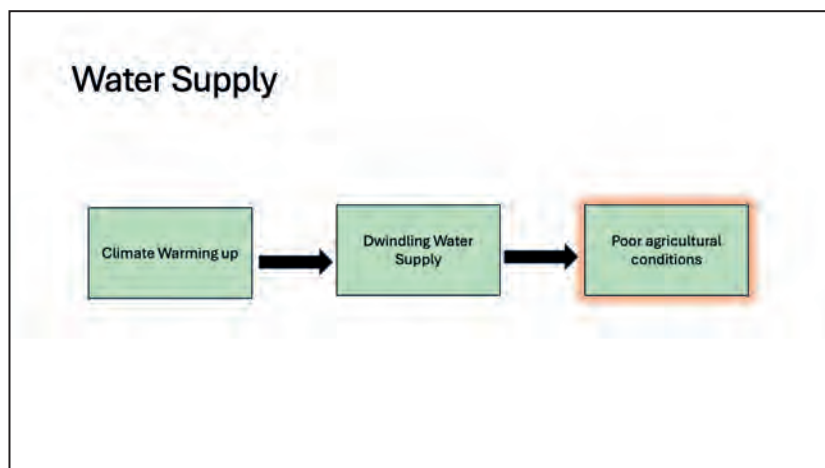
- a. Slide 1:

- Insert the *Strand 2 Extra activity 1_Flooding* image on the slide and format the picture to display as shown below:

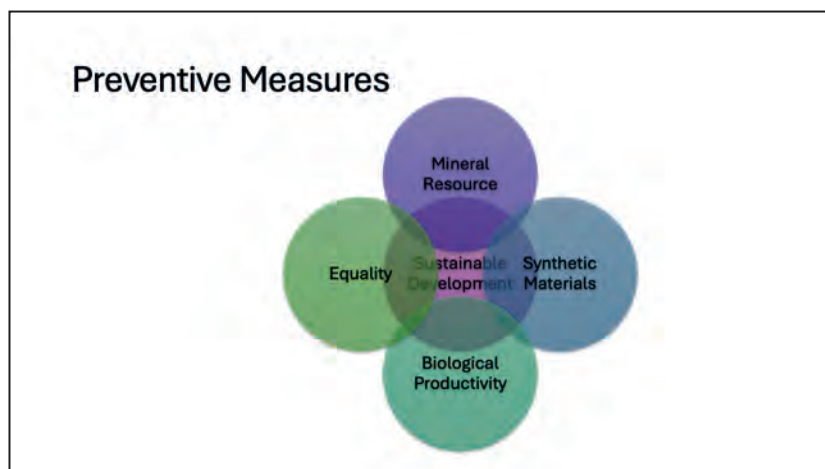


- Add a picture of yourself below the text 'A Threat to Our Future'.

- b. Slide 2: Create slide 2 to display as shown below. The diagram must be created using shapes.



- c. Slide 3: Edit the SmartArt to display as shown below.




2. Open the *Strand 2 Extra activity 2_Carbon Emissions* spreadsheet document.
 - a. Insert a function in cell E21 to determine how many countries display a one-year change.
 - b. Insert a function in E22 to determine the average carbon (CO₂) emissions of the countries.
 - c. Insert a function in cell E23 to determine the total population. Display the total population to zero display places.
- d. Insert a function in cell E24 to determine how many countries contributed more than 10 tons per capita.
 - e. Insert a formula in cell E25 to determine the difference between the top two countries' share of world carbon emissions.
 - f. Each country's share of the world carbon emissions will increase by the value stored in cell H2. Insert a formula in cell H4 to determine the increased share of carbon emissions for China. Copy the formula for the rest of the countries.

ANSWERS

1. Presentation:
 - a. Slide 1: Flooding Image
 - Inserted
 - Cropped
 - Rotated: 19° to 25°
 - Border added: Scribble
 - b. Slide 2:
 - Heading 'Water Supply' added
 - Rectangles
 - Three Rectangle shapes added
 - Fill colour changed to green
 - Font added and font colour changed to black
 - Green glow added to third rectangle only
 - Two arrows added. Fill colour changed to black
 - c. SmartArt amended:
 - Additional shape added in correct position
 - Additional shape of a similar size to the other shapes
 - Text 'Equality' inserted in additional shape
 - All text clearly visible
2. Spreadsheet:
 - a. Cell E21: =COUNTA(D4:D18)
 - b. Cell E22: =AVERAGE(C4:C18)
 - c. Cell E23: =SUM(E4:E18), format to zero decimal places
 - d. Cell E24: =COUNTIF(F4:F18,">10")
 - e. Cell E25: =G4-G5
 - f. Cell H4: =G4*(\$H\$2+100), absolute addressing applied: \$H\$2

Check your progress

ANSWERS

- Any three of the following:
 - Display complex information in clear ways.
 - Make clear comparisons of information.
 - Easy way to position text and graphics precisely.
 - To transfer information from one program to another.
 - Do calculations in the word processor.
- Insert table or draw table.
- Create a bookmark as a marker for the hyperlink to go to.
- A bookmark name must:
 - start with a letter, although it can contain numbers
 - not have any spaces, although an underscore can be used to bridge the gap between words.
- In the table drag the pointer across the cells that you want to merge, to highlight them. Go to the Layout tab. In the Merge group, click **Merge Cells**.
- =SUM(ABOVE)
- =MAX(E3:E10)
- Shades added to a table can make it easier to read, or it can pick out cells holding important information for a presentation.
- 
- If you click the **Increase Indent** button once, the next level of bullet will automatically be shown. If you click the **Decrease Indent** button, you go back to the previous bullet level.
- Click where you want the page break. On the Insert tab, click the **Page break** button.
- Click the **Show/hide** button.
- A.** Portrait
B. Landscape
- Details may vary, but the slideshows should closely resemble the example below.

Rainfall Types

Learner's name

Resources ...


- Taken from: <https://s-cool.co.uk/gcse/geography/weather-and-climate/revise-it/rainfall-types>

Rainfall types

- Convection rainfall
- Frontal rainfall
- Relief rainfall

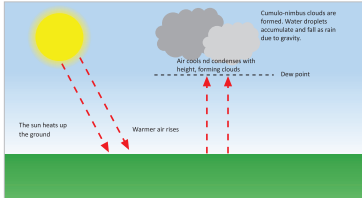
How is rainfall created

- Warm air is forced to rise up
- As air rises it cools and cannot hold as much moisture
- Air reaches a point of 100% saturation – it cannot hold more water – called dew point
- Above dew point – condensation occurs
- Condensation is the process by which the water vapour (a gas) held in the air is turned back into water droplets (a liquid), which fall as rain.



Convectional rainfall

- The surface of the earth is heated by the sun.
- The warm surface heats the air above it. Hot air always rises so this newly heated air does so.
- As it rises, the air cools and begins to condense.
- Further rising and cooling causes a large amount of condensation to occur and rain is formed.
- Convection tends to produce towering cumulo-nimbus clouds, which produce heavy rain and possible thunder and lightning



The sun heats up the ground

Warmer air rises

Air cools and condenses with height forming clouds

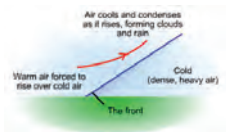
Cumulo-nimbus clouds are formed. Water droplets accumulate and fall as rain due to gravity.

Dew point

Frontal rainfall

- Two air masses meet, one a warm air mass and one a cold air mass.
- The lighter, less dense, warm air is forced to rise over the denser, cold air.
- This causes the warm air to cool and begin to condense.
- As the warm air is forced to rise, further condensation occurs and rain is formed.
- Frontal rain produces a variety of clouds, which bring moderate to heavy rainfall.

Frontal Rainfall Cycle



Air cools and condenses as it rises, forming clouds and rain

Warm air forced to rise over cold air


Cold (denser, heavy) air

The front

Relief rainfall

- The prevailing winds pick up moisture from the sea as they travel across it, making the air moist.
- The moist air reaches the coast and is forced to rise over mountains and hills.
- This forces the air to cool and condense, forming clouds.
- The air continues to be forced over the mountains and so it drops its moisture as relief rain.
- Once over the top of the mountain the air will usually drop down the other side, warming as it does so. This means it has a greater ability to carry water moisture and so there is little rain on the far side of the mountain. This area is called the **rain shadow**.

Relief Rainfall Cycle



Cloud development because of frontal lifting of warm moist air

Receding warm air ahead of cold front

Direction of frontal movement

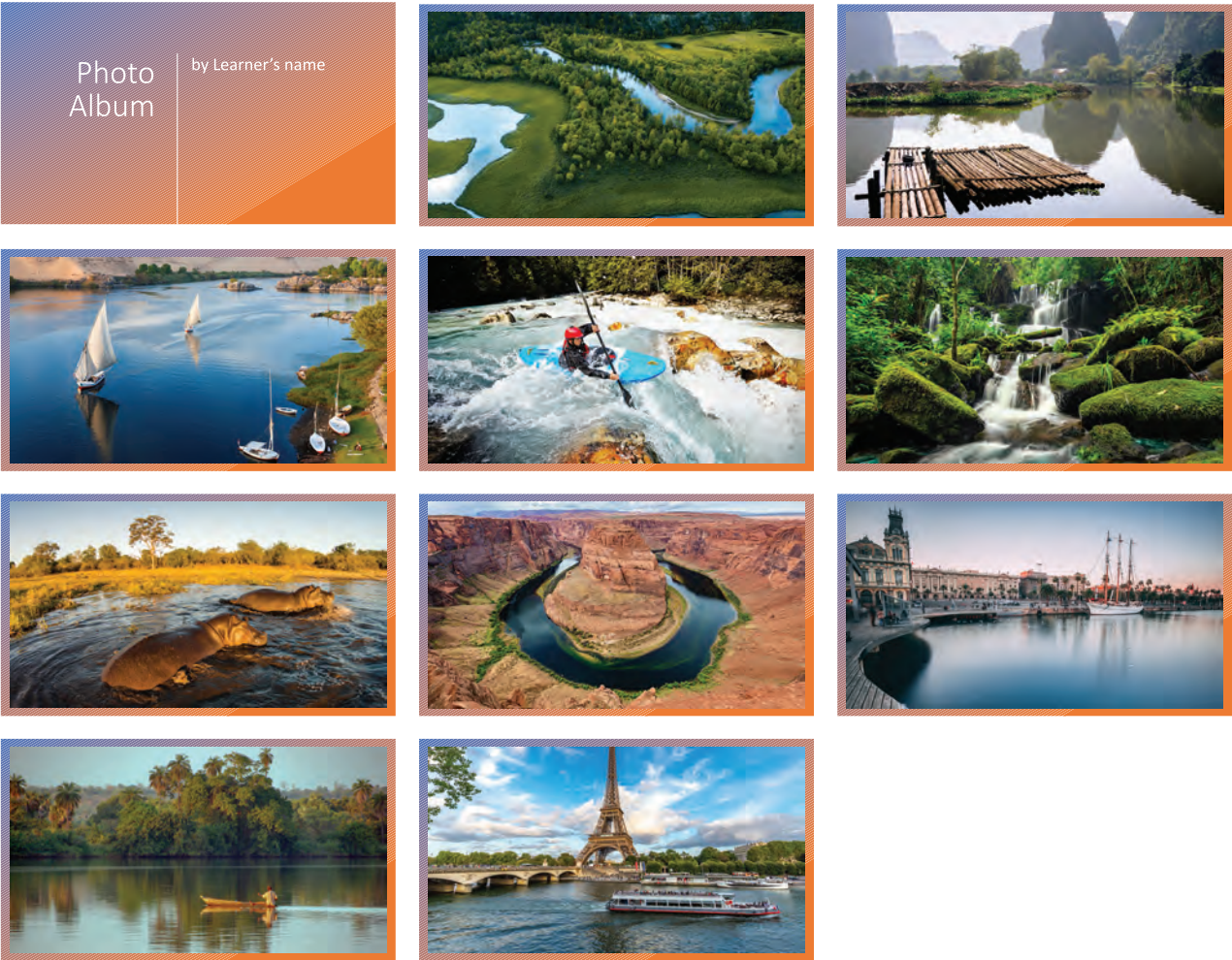
Cold front map symbol

Check your progress

You can use the following checklist for assessment:

Action	✓	✗
Learner's name appears in the subtitle box.		
Slide 2: Correct SmartArt is added.		
Slide 2: Correct text is added.		
Slide 2: Correct colours are applied.		
Slide 3: Pictures is moved and resized as specified.		
Slide 4: Gradient fill background added		
Slide 4: Yellow 'sun' shape with a glow effect.		
Slide 4: Two clouds, one brought forward.		
Slide 4: Red arrows.		
Slide 4: Text boxes added.		
Slide 7: Image inserted from data folder.		
Slide 9: Online image inserted.		
Image in Slide 9 is acknowledged.		

15. Albums will differ, but should resemble the one below.



Check your progress

16. DTP stands for desktop publishing software, and you can create and publish a variety of publications, such as, greetings cards, advertisements, business cards, booklets, newsletters, calendars, banners and posters.
17. Method 1: Blank pages where you start from scratch and use all your own designs, colours, images and font styles.
Method 2: Pre-designed templates where you can use the designs, colour schemes, font styles provided and all you must do is fill in your own content and images. You can also amend any of these pre-designed items if they are not exactly what you require.
18. Pre-designed templates save you time because you do not have to start from scratch. If you are not good with creative designing, you can choose from the wide variety of ready-made designs, colour schemes and font styles. The wide variety of template types makes it easier to create many different types of publications in a short space of time. Publications created by using pre-designed templates tend to look professional.

19. In Publisher follow these steps:
- Step 1:** Prepare a list of people to send the letter to those customers who should return the vehicles and save it as a spreadsheet or database file. There should be fields such as, title, first name, last name, address, email address, etc.
- Step 2:** Create and save the letter to the customers to return the vehicles in your database or list as a DTP document.
- Step 3:** In Publisher, open your saved letter from step 2. Open the Mail Merge tab. In the Start group, click **Mail Merge**. On the dropdown menu, click **Step-by-Step Mail Merge Wizard**. Instructions for using Mail Merge will appear in a panel on the right-hand side of the screen.
- Step 4:** Decide whether you want to send the document by email or by post. Instructions will appear in a panel on the right-hand side of the screen.

- If you choose to send the

document by email: Click **E-Mail Merge** and select **Step-by-Step E-Mail Merge Wizard**.

- If you choose to print and send the publication by post: In the Start group, click **Select Recipients**. This will give you three options for compiling your list of recipients:
 - Type a New List
 - Use an Existing List
 - Choose from Outlook Contacts.

Step 5: On your publication, insert your cursor at the spot where you want your first field in your database to be and click Title. Leave a space and click **First Name**. Leave a space and then click **Last Name**.

Step 6: Preview your publication before printing it. You should have a separate publication for each person in your database.

20. a. TRUE
b. TRUE
c. FALSE
d. TRUE
e. FALSE
21. Contiguous
22. Non-contiguous
- 23.

Cell contents	Simple formula, complex formula or a function?
D12	Complex formula
E13	Complex formula
F15	Simple formula
G18	Simple formula
D9	Function or In-built function

24. Click the drop-down arrow and select the most likely option. This formula has an addition sign whereas all the other formulas in the same column use a subtraction sign, so it is most likely a typo error in the formula.

Check your progress

25. The formula in cell D14 is as follows:

$=C13*\$D\$3/(D8-1)$.

- a.** In cell D14, the interest rate is being calculated on the remaining balance of the loan. The interest rate is applied to fewer months because this payment will be for the third month, which is why it subtracts 2 from the total of 24 months, which is the duration of the loan. It then multiplies the remaining balance found in cell C 14 by the interest rate which does not change (hence the \$ signs to keep its absolute value when copying the formula) and then it divides by the 22 months.

- b.** The \$ signs represent an absolute reference, where the value stays the same as the formula is copied across the data range.

- c.** Absolute referencing.

26. a. $=16/24*100$. The result will be 67% of the loan will have been paid up after 16 months.

- b.** $=SUM(D12:D18)$ The result will be GHC79,59

27. The interest decreases because it is calculated on the decreasing monthly balances.

Strand 3: Communication Networks

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

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 where appropriate
- 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. Also in this section, are 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:

Describe the data communication models for networks.

Demonstrate the ability to work in a group. (Core competency CC9.1)

Resources:

- Learner's Book pages 160–163

Teacher:

Cover the content in the Learner's Book. Learners can find the different layers of the OSI model confusing, so be sure to spend time ensuring that the learners understand the role of each layer. Let the learners use sentences such as **All People Seem To Need Data Processing** (reading from layer 7 down to layer 1) to help remember the names of the layers. There are other examples of mnemonics that can be found on the internet.

Assessment:

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

Plenary:

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

LEARNERS

Read through the questions in the Learner's Book. Ask your teacher if anything is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1.
 7. Application
 6. Presentation
 5. Session
 4. Transport
 3. Network
 2. Data link
 1. Physical
2. This model helps to understand how a network works by breaking the functions into seven layers. The OSI model can help with troubleshooting network problems. It is used to give a visual representation for something we cannot actually see to make it easier to understand.
3.
 - a. Data link layer: switch
 - b. Network layer: router
4. Physical layer

Remedial activity:

Ask learners to work in pairs to ask each other questions about the OSI model to consolidate their understanding.

Activity 3.2: Group

Purpose:

Describe the internet, world wide web (www) and Internet Protocol (IP) addresses.

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

Resources:

- Learner's Book pages 163–165
- The internet, access to a computer or mobile device with access to the internet
- A data projector or screen-sharing software for the teacher to demonstrate the steps that need to be followed

Teacher:

Cover the content in the Learner's Book, taking care to explain all the new concepts clearly. Demonstrate to the learners how to ping a web server.

LOW RESOURCE SCHOOLS

Move into your groups.

1. Explain Internet Protocol (IP) address and how it works on the internet.
2. Discuss the relationship between Domain Name Server (DNS) and Uniform Resource Locator (URL).
3. Present the responses to the class for evaluation.

ANSWERS

1. Each device and website connected to the internet that uses the Internet Protocol to communicate has a unique address. This is the Internet Protocol address. An IP address consists of four groups of up to three digits separated by a point.
2. Every website has a unique IP address. The IP address is masked by a text-based web address; this is what we see written in the address bar of a web browser. This is known as the Uniform Resource Locator (URL). The Domain Name Server (DNS) is a directory of all the URLs that are linked to the IP address of the website.

Assessment:

Informally assess the activity as you move around the class and ensure that each learner is actively involved. Ask informal questions to ensure that each learner understands the concepts and techniques as you move around.

Plenary:

Ask learners to explain the new concepts such as IP address, DNS and URL.

LEARNERS

Work in groups to complete the activity. Read through the steps in the Learner's Book. Ask your teacher if anything is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

This is a practical activity where you need to observe whether the learners can ping a server and note the format of the IP addresses that are displayed.

Activity 3.3 Pairs

Purpose:

Describe the internet, world wide web (www) and Internet Protocol (IP) addresses.

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

Resources:

- Learner's Book page 166

Teacher:

Cover the content in the Learner's Book, taking care to explain all the new concepts clearly.

Assessment:

Informally assess the activity as you move around the class and ensure that each learner in a pair is actively involved. Ask informal questions to ensure that each learner understands the concepts.

Plenary:

Ask learners to explain the difference between IPv4 and IPv6 addresses to consolidate these new terms. Check the answers to the questions posed in the activity.

LEARNERS

Work in pairs to complete the activity. Ask your teacher if anything is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. There is a limit to the number of unique IPv4 addresses. The internet is constantly growing, so the demand for more unique IP addresses is also growing. To solve this, IPv6 has been created.
2. IPv4 consists of four groups of digits. IPv6 consists of eight groups of numbers.
IPv4 groups of numbers consist of three decimal digits. IPv6 groups of numbers consist of four hexadecimal numbers.
IPv4: The groups are separated by points. IPv6 the groups are separated by a colon (:).

Activity 3.4 Individual

Purpose:

Describe the internet, world wide web (www) and Internet Protocol (IP) addresses.

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

Resources:

- Learner's Book pages 166–167

Teacher:

Cover the content in the Learner's Book, taking care to explain all the new concepts clearly.

Assessment:

Informally assess the activity as you move around the class. Ensure that each learner understands the work while completing the activity. Ask informal questions to ensure that each learner understands the concepts.

Plenary:

Ask learners to explain the difference between the internet and the world wide web to consolidate these new terms. Check the answers to the questions posed in the activity.

LEARNERS

Read through the questions in the Learner's Book. Ask your teacher if anything is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. The internet refers to the whole infrastructure of connected computing devices across the whole world that can communicate with each other. The internet includes many services such as all the websites in the world, email, social media and voice over internet services (VoIP).
2. All the websites in the world form what is known as the world wide web or www. The world wide web is thus a subdivision of the internet and not the same thing. The world wide web of websites is one of the services of the internet.
3. Accept any two of the following: email, social media, voice over internet services (VoIP).

Sub-strand 2: Internet and social media

Activity 3.5: Group

Purpose:

Identify the various types of social media sites such as photo sharing (Instagram, Snapchat, Pinterest, etc.) and video sharing (YouTube, Facebook Live, Periscope, Vimeo, TikTok).

Explain ideas in a clear order, with relevant detail. Recognise societal issues raised by digital technologies. (Core competencies CC8.2 and DL6.5)

Resources:

- Learner's Book pages 168–170
- The internet, access to a computer or mobile device with access to the internet
- In the case where the teacher is doing this activity as a demonstration, a data projector to display the social media example to the whole class would be an advantage.

Teacher:

If the learners do not have access to computers or mobile devices that have access to the internet, this activity could be done as a demonstration.

The teacher can set up an Instagram®, Snapchat® or Pinterest® account that is not their own private one, but one used for academic purposes. The learners will benefit from being taken through the setup process.

Should access to the internet not be possible during the actual lesson, a series of screenshots can be made and put into a slide presentation to show the learners what the social media platform looks like and how it works. Make the screenshots by using the snipping tool or by holding down the ALT key and pressing the PrntScr key (Print screen).

Assessment:

Informally assess each learner's knowledge of the social media platforms by asking questions in the class. Where the learners are working in groups on their own to create a login and investigate the social media

platforms, move around and provide assistance and reinforcement where learners are struggling with any aspect of the process.

Plenary:

Check the answers to the activity. Discuss any questions and observations that the learners might have about Instagram, Snapchat and Pinterest as social media platforms.

LEARNERS

You will either observe a demonstration of how to create a login and use Instagram, Snapchat and Pinterest, or you will be working in a group to complete this activity. Once you have completed the task of creating a login, answer the questions in your groups as posed in the activity.

Log into an account for each of these photo sharing sites – Instagram, Snapchat and Pinterest. Your teacher may also choose to rather show you one. Discuss the questions. Ask your teacher if anything is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. Instagram: a representation of a camera on a multi-coloured background



Snapchat: cartoon representation of a ghost in white on a yellow background



Pinterest: a cursive letter p in white on a red background



2. Instagram: photo and video-sharing platform
Snapchat: the photo posted is visible only for a certain period of time and then they disappear after being viewed
Pinterest: pin boards are used to organise images into related topics much like using bookmarks

Activity 3.6: Group

Purpose:

Identify the various types of social media sites such as photo sharing (Instagram, Snapchat, Pinterest, etc.) and video sharing (YouTube, Facebook Live, Periscope, Vimeo).

Explain ideas in a clear order, with relevant detail. Recognise societal issues raised by digital technologies. (Core competencies CC8.2 and DL6.5)

Resources:

- Learner's Book pages 170–173
- The internet, access to a computer or mobile device with access to the internet
- In the case where the teacher is doing this activity as a demonstration a data projector to display the social media example to the whole class would be an advantage.

Teacher:

If the learners do not have access to computers or mobile devices that have access to the internet, this activity could be done as a demonstration.

The teacher can set up YouTube, Facebook Live, Vimeo and TikTok accounts that are not their own private ones, but ones used for academic purposes. Note that Periscope was discontinued in 2021. The learners will benefit from being taken through the setup process.

Should access to the internet not be possible during the actual lesson, a series of screenshots can be made and put into a slide presentation to show the learners what the social media platform looks like and how it works. Make the screenshots by using the snipping tool or by holding down the ALT key and pressing the PrntScr key (Print screen).

Assessment:

Informally assess each learner's knowledge of the social media platform by asking informal questions in the class. Where the learners are working in groups on their own to create a login and investigate the social media platforms, move around the class and provide assistance and reinforcement where learners are struggling with any aspect of the process.

Plenary:

Check the answers to the activity. Discuss any questions and observations that the learners might have about YouTube, Facebook Live, Vimeo and TikTok as social media platforms. Ask leading questions of the learners about the different uses of these platforms and any possible dangers of their use.

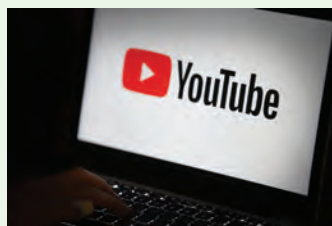
LEARNERS

Explore the different video-sharing sites in your group. If possible, have a member log into each of the sites and explore how it works. Your teacher may also choose to rather show you examples. Discuss the questions. Ask your teacher if anything is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

1. YouTube: a pure video sharing platform where a person can create a login and then create their own YouTube channel.
Vimeo: a video hosting and sharing site that is focussed on the creation of high-definition video. It offers subscription services to video editing and video creation applications.
Facebook Live: a live video streaming service from Facebook that can be used to live stream events as they happen.
TikTok: a video sharing social media site that appeals to the younger generation with a focus on short video clips with a maximum length of 15 seconds.

2. YouTube: a red shape resembling an old tube screen with a white play triangle shape on it or the word YouTube with the tube section surrounded by the red tube screen shape.



Vimeo: a cursive letter v, often white on a light blue background



Facebook Live: the normal Facebook logo of a white f on a blue background with the word live in white letters on a red background next to it.



TikTok: a stylised music note in white, pink and turquoise on a black background.



Activity 3.7: Pairs

Purpose:

Demonstrate the use of social networking and electronic mail. Illustrate the steps involved in attaching a document to an email.

Explain ideas in a clear order, with relevant detail. Recognise societal issues raised by digital technologies. (Core competencies CC8.2 and DL6.5)

Resources:

- Learner’s Book pages 173–175
- The internet, access to a computer or mobile device with access to the internet
- An email account per learner either provided by the school or by setting up individual webmail accounts
- A document that can be used as an email attachment for each learner

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 use of email attachments for themselves, as this is a skill often required in the modern world.

Let the learners follow the steps as provided in the activity.

LOW RESOURCE SCHOOLS

1. Discuss why you need to attach a file to an email.
2. Email systems such as Gmail®, Yahoo® and Outlook® limit the size of the file that can be attached to an email to 25 MB. Discuss the possible reason(s) behind this limitation.
3. Discuss why one needs to be cautious when downloading email attachments, especially those received from unfamiliar sources.

ANSWERS

1. When sending an email, you may need to attach a document, such as a quote for a job, an invoice, a receipt or a photograph.
2. Very large files mean that the receiver will have to use a lot of data when they download the attachment.
3. Attachments may contain viruses that will infect your computer if they are downloaded.

Assessment:

Informally assess each learner’s knowledge of the use of email attachments through asking questions in the class. Where the learners are working in pairs, move around and provide assistance and reinforcement where learners are struggling with any aspect of the process. Confirm that each learner is able to perform the actions as set out in the activity.

Plenary:

Hold an informal question and answer session to consolidate the use of email attachments and their limitations.

LEARNERS

Work with a friend to do this activity. Follow the steps. Ask your teacher if anything is unclear. During the feedback session, check that your answers are accurate. Make corrections if necessary.

ANSWERS

Your teacher will check to see that you have sent an email message with an attachment.

Activity 3.8: Group

Purpose:

Demonstrate the use of social networking and electronic mail. Explore the use of the address book as a feature of email. Explain ideas in a clear order, with relevant detail. Recognise societal issues raised by digital technologies. (Core competencies CC8.2 and DL6.5)

Resources:

- Learner's Book pages 175–176
- The internet, access to a computer or mobile device with access to the internet
- An email account per learner either provided 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 use of email address books for themselves, as this is a useful skill to master. Divide the learners into groups of at least four for this activity. Let the learners follow the steps as provided in the Learner's Book.

LOW RESOURCE SCHOOLS

Brainstorm the importance of contacts saved on a mobile phone and then link it to the address book in emails. Discuss as a class.

ANSWERS

Saving contacts on a phone makes it easy for us to get hold of people when we need to. In other words, we do not need to remember their individual phone numbers. This is the same for address books in emails. It would be impossible to remember everyone's email address, so the address book means we do not have to.

Assessment:

Informally assess each learner's knowledge of the use of an address through asking questions in the class. Where the learners are working in groups, move around the class and provide assistance and reinforcement. Observe that each learner is able to perform the actions as set out.

Plenary:

Hold an informal question and answer session to consolidate the use of address books.

LEARNERS

Work in a group of at least four. Follow the steps given. Ask your teacher if anything is unclear. Check that you receive at least one email from each member of your group.

ANSWERS

You should be able to create a new contact in an address book and then use the address book contacts to send an email message.

Remedial activity:

Review problems that learners may have encountered in using address books.

Sub-strand 3: Information security

Activity 3.9: Group

Purpose:

Describe the nature of four major data threats (interruption, interception, modification, fabrication).

Recognise societal issues emanating from the use of digital technologies. Explain ideas in a clear order with relevant detail. (Core competencies: CC8.2 and DL6.5)

Resources:

- Learner's Book pages 177–178
- The internet, access to a computer or mobile device with access to the internet
- If the video clip is being shown to the class as a whole, a data projector and a set of computer speakers
- The link below

Links:

Video: Four types of threats in information security (6:56 minutes)

<https://www.youtube.com/watch?v=COi178UNckM>

Teacher:

Either divide the class into groups to watch the video clip on their own and then answer the questions asked in the video, or show the video to the whole class and then let the learners work in their groups to answer the questions.

Assessment:

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

Plenary:

Discuss the answers to the questions asked at the end of the video clip and write the correct answers on the board.

LEARNERS

Watch the video clip on the threats to data security before answering the questions. Watch the video in your group (your teacher might also choose to first show this video to the whole class). Ask your teacher if anything is unclear. During the feedback session, check your answers and make any corrections necessary.

ANSWERS

1. modification
2. interception
3. interruption (could also be denial of service attack as an example)
4. fabrication

Activity 3.10: Individual

Purpose:

Describe the nature of four major data threats (interruption, interception, modification, fabrication).

Recognise societal issues emanating from the use of digital technologies. Explain ideas in a clear order with relevant detail. (Core competencies: CC8.2 and DL6.5)

Resources:

- Learner's Book pages 178–179

Teacher:

Present the content in the Learner's Book as consolidation to the video clip watched in the previous activity. Take time to ensure that the learners clearly understand each of the four types of threats to data.

Assessment:

Assessment can take place through discussion during the plenary.

Plenary:

Go through the answers to the questions in the activity, allowing time for questions to clear up any misunderstandings.

LEARNERS

Work on your own and apply your knowledge of the four threats to identify the types of threats given. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any corrections necessary.

ANSWERS

1. modification or fabrication
2. interception
3. interruption

Activity 3.11: Group

Purpose:

Map the protection methods to each of the four identified data threats (authorisation, authentication, encryption and decryption).

Show the ability to effectively work in a group towards a common goal. Evaluate the success of solutions used in an attempt to solve a complex problem. (Core competencies CC9.1 and CP5.5)

Resources:

- Learner's Book pages 180–182

Teacher:

Explain the content in the Learner's Book, dealing with the different protection measures that could be employed. Divide the class into groups to complete the activity. Move between the groups and assist and guide the learners where necessary.,

Assessment:

Assessment can take place through discussion during the plenary.

Plenary:

Let each group in turn present a solution for the protection against one of the threats, until all the threats have been covered. Ensure that every learner has the correct answers. Refer them to the examples provided after the activity in the Learner's Book.

LEARNERS

Work as a group to do the activity. Ask your teacher if anything is unclear. During feedback check your answers and make any corrections necessary.

ANSWERS

Accept any other logical answers provided by the learners.

Data can be protected against interruption by:

- ensuring that only authorised users can access a computer system
- helping ensure the above by installing up-to-date anti-virus and anti-malware software that will prevent spyware being installed on your system, so avoiding the unauthorised use of logins and passwords
- installing good anti-virus and anti-malware software that will protect your system from being infected by malware that can launch a DoS attack
- backing up regularly and storing data off-site so that, if data is stolen or destroyed, the system will be up and running again with minimum downtime.

Data can be protected against interception by:

- ensuring that all communication happens along encrypted channels on the internet and by only using encrypted websites for secure online transactions
- encrypting storage devices so that, if they are intercepted through theft, the data will be useless as it will be scrambled
- making sure that private keys are kept secure and never sent publicly so that encrypted data cannot be decrypted.

Data can be protected against modification by:

- encrypting data kept on storage and mobile devices
- ensuring that electronic communications are encrypted so that they cannot be tampered with
- using proper authentication and authorisation so that access to data is limited to the users that need to work with it.
- ensuring correct levels of authorisation so that only the necessary users can modify data as the fewer people who have the rights to modify the data, the less the chance of a data breach.

The measures to prevent fabrication are similar to those used against modification. Data can be protected against fabrication by:

- encrypting data kept on storage and mobile devices so that an unauthorised user cannot add false data
- ensuring that electronic communications are encrypted so that they cannot be tampered with and new data added
- using proper authentication and authorisation so that access to data is limited to the users that need to work with it
- ensuring correct levels of authorisation so that only the necessary users can add data as the fewer people who have the rights to modify and write data, the less the chance of false data being added.

Remedial activity:

Ask learners to match the definitions below with these terms: encryption, authentication, authorisation.

1. verifying the identity of the user (authentication)
2. converting a normal message into a cipher text (encryption)
3. ensuring that only the correct people have access to a system (authorisation)

Sub-strand 4: Web technologies

Activity 3.12: Pairs

Purpose:

Demonstrate how to effectively search from a web browser.

Effectively evaluate the success of solutions used in an attempt to solve a complex problem. Demonstrate the ability to select alternatives that adequately meet selected criteria. (Core competencies: CP5.5 and CP6.5)

Resources:

- Learner's Book pages 184–187
- The internet, access to a computer or mobile device with access to the internet

Teacher:

The learners will investigate performing effective internet searches using a search engine. The activity should preferably be done by the learners using a search engine on a computer with internet access, but can be done as a demonstration by the teacher using suggestions from the learners. It can also be done as a paper exercise if necessary. It is important to first demonstrate the different search techniques to the learners before asking them to do the activity themselves. Let the learners work in pairs so that they can share ideas with each other.

LOW RESOURCE SCHOOLS

1. Discuss the functions of a web browser and search engines in locating information on the web.
2. Discuss, with examples, how the following search techniques are used:
 - Quotation marks ("")
 - AND operator or the plus sign (+)
 - OR operator
 - NOT operator or the minus sign (-)
3. Using the information provided in this lesson, suggest other options to consider if your search engine does not produce the result you want.
4. Present your responses to the class for evaluation.

ANSWERS

1. Web browsers are applications that display all the websites available on the world wide web. Search engines help us find particular websites by searching for keywords.
2. As an example, imagine searching for information about traditional food. If you search for *traditional food*, the results will give websites about traditional food all over the world.
 - If you search "*Ghana traditional food*", the results will give websites where these three words are found together.
 - If you type *traditional food AND Ghana*, the results will give websites for traditional food in Ghana.
 - If you type in *traditional food Ghana OR Nigeria*, the results will give websites for traditional food in both Ghana and Nigeria.
 - If you type in *traditional food NOT Ghana*, the results will give websites for traditional food in other countries, excluding Ghana.

Assessment:

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

Plenary:

Use a class discussion to get examples of the search terms used by the various pairs of learners and list the best options on the board after discussing why these are the best options.

LEARNERS

Do the activity in pairs. If anything is unclear, ask your teacher. During the feedback session, check your answers and make any corrections necessary.

ANSWERS

The following are suggested effective search phrases:

1. "Self-catering accommodation" +coast
2. "cheap flights" OR "budget flights" Accra to London
3. effect of deforestation +"West Africa"
4. traditional music instruments +Africa -Ghana
Or traditional African music instruments AND NOT Ghana

Remedial activity:

Let learners repeat their searches using more effective search phrases to see the difference in the results.

Activity 3.13: Pairs

Purpose:

Explore the use of more than one search engine.

Demonstrate the ability to ascertain when information is needed and be able to identify, locate, evaluate and effectively use it to solve a problem. Show an ability to combine information and ideas from several sources to reach a conclusion. (Core competencies DL5.1 and CP5.1)

Resources:

- Learner's Book pages 187–188
- The internet, access to a computer or mobile device with access to the internet

Teacher:

The learners will investigate performing effective internet searches using more than one search engine. The activity should preferably be done by the learners using a search engine on a computer with internet access, but can be done as a demonstration by the teacher using suggestions from the learners. It is important to first demonstrate the results of an internet search using two different search engines before letting the learners do the activity. Let the learners work in pairs so that they can share ideas with each other.

LOW RESOURCE SCHOOLS

1. Brainstorm why it is advisable to try different search engines with the same keyword.
2. Discuss why different search engines produce different search results with the same keyword.

ANSWERS

1. Search engines use software called a search engine spider or crawler in their searches for your keywords. Because the different search engines use different software, they will get different results. Using different search engines with the same keyword might give you better results.
2. Crawlers collect information, such as what sites you have visited in the past, and use it to decide which results land at the top of your search results.

Assessment:

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

Plenary:

Use a class discussion to get examples of the search results obtained by the various pairs of learners and list possible answers to the questions as a summary for the learners.

LEARNERS

Do the activity in pairs. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any corrections necessary.

ANSWERS

There is a different number of results between the search engines, and the order of the websites given may differ; there may be completely different websites at the top of the search results.

This demonstrates why, if we are not getting the desired results, we need to search using more than one search engine.

Check your progress

ANSWERS

1.
 - a. Open System Interconnection model
 - b. Application
Presentation
Session
Transport
Network
Data link
Physical
 - c. Layer 2: switch
Layer 3: router
 - d. Internet Protocol
2. The Domain Name Server (DNS) is where each URL is linked to the actual IP Address of the website.
3.
 - a. Each device and website connected to the internet and that uses the Internet Protocol to communicate needs to have a special unique address known as an IP Address (Internet Protocol Address).
 - b. Accept any two of the following:
 - IPv4 consists of four groups of digits. IPv6 consists of eight groups of numbers.
 - IPv4 groups of numbers consist of three decimal digits. IPv6 groups of numbers consist of four hexadecimal numbers.
 - IPv4: The groups are separated by points. IPv6: the groups are separated by a colon (:).
4. The internet refers to the whole infrastructure of connected computing devices across the whole world that can communicate with each other. All the websites in the world form what is known as the world wide web or www. The world wide web is thus a subdivision of the internet and not the same thing. The world wide web of websites is one of the services of the internet.
5. Instagram: photo and video-sharing platform where your posts remain forever.
Snapchat: the photo posted is visible only for a certain period of time and then they disappear after being viewed.
6. YouTube: a pure video sharing platform where a person can create a login and then create their own YouTube channel.
Vimeo: a video hosting and sharing site that is focussed on the creation of high-definition video. It offers subscription services to video editing and video creation applications.
7.
 - a. PDF
 - b. the size of the attachment
8.
 - a. Example: Denial of Service attack (answers given may vary)
Data can be protected against interruption by:
 - ensuring that only authorised users can access a computer system
 - helping ensure the above by installing up-to-date anti-virus and anti-malware software that will prevent spyware being installed on your system so that unauthorised use of logins and passwords can be avoided
 - installing good anti-virus and anti-malware software that will protect your system from being infected by malware that can launch a DoS attack
 - making regular backups so that the system can be back up and running with minimum downtime.
 - b. Example: a new user account that has admin access could be inserted into a computer system. The cybercriminal can now have admin access to the system using this new username and password.
Data can be protected against fabrication by:
 - encrypting data kept on storage and mobile devices so that an unauthorised user cannot add false data
 - ensuring that electronic communications are encrypted so that they cannot be tampered with and new data added
 - using proper authentication and authorisation so that access to data is limited to the users that need to work with it

Check your progress

- ensuring correct levels of authorisation will also ensure that only the necessary users can add data as the fewer people who have the rights to modify and write data, the less the chance of false data being added.
9. Encryption is the use of an algorithm to scramble data so that it cannot be read. Decryption is the reverse process where an algorithm is used to unscramble data so that it can be read again.
10. Search engines make use of software called a search engine spider or crawler that searches the world wide web for information on new websites and updates to websites already in their databases. Because the different search engines use different web crawlers and techniques to gather their information, they may produce different results for the same search terms.
11. a. OR: Use the word OR to include either of two words in your search results. For example, cotton OR grain farming Ghana will provide websites that include either or both words cotton and grain.
- b. AND: Use the word AND to include more than one item in your search results. For example, cotton AND grain farming Ghana will provide websites that include both words cotton and grain.
- c. The minus sign will exclude the word or term directly after it from the search results.
- d. The use of quotation marks around a search phrase will look for a site where the words inside the quotation marks occur together and not as separate words in the content.
12. a. Authentication refers to the process of verifying the identity of the user. This is done using unique usernames and strong passwords.
- b. Encryption is the process of scrambling the text in a normal message into a meaningless series of characters.
- c. A search engine is used on a web browser to search the world wide web for information using key words.

Strand 4: Computational Thinking

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

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 where appropriate
- 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. Also in this section, are 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 basic concepts in programming (constants, variables, expressions, statements /instructions, logical and arithmetic operators, operator precedence, etc.).

Show an ability to combine information and ideas from several sources to reach a conclusion. (Core competency CP5.1)

Resources:

- Learner's Book pages 192–197
- A computer with an integrated development environment (IDE), such as Scratch, installed to demonstrate the creation of variables and how they are used in a program
- A data projector if possible to demonstrate the creation of variables to the learners

Teacher:

It is important that the learners master an understanding of the basic concepts of programming, such as constants, variables, expressions, statements/instructions, logical and arithmetic operators, operator precedence. Explain the various concepts and give suitable examples. Work through the examples given in the Learner's Book before letting the learners complete the activity.

Assessment:

The activity will be assessed by checking the learners' answers to the questions.

Plenary:

As you mark the answers to the questions, give the learners turns to provide their answers with reasons for their choices. 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

Use the content from the book and your own mathematical knowledge to complete this activity. If anything is unclear, ask your teacher to explain again. During the feedback session, check your answers and make any corrections necessary. When you make corrections, make sure that you understand the reason for the correct answer.

ANSWERS

1. integer; 55
2. float; 0.455
3. integer; 48
4. integer; 684
5. integer; 146

Activity 4.2: Individual

Purpose:

Describe the basic concepts in programming (constants, variables, expressions, statements /instructions, logical and arithmetic operators, operator precedence, etc.).

Show an ability to combine information and ideas from several sources to reach a conclusion. (Core competency CP5.1)

Resources:

- Learner's Book pages 197–200
- A computer with an IDE such as Scratch installed
- A data projector if possible to demonstrate the creation of variables to the learners

Teacher:

It is important that the learners master an understanding of the basic concepts of programming, such as constants, variables, expressions, statements /instructions, logical and arithmetic operators, operator precedence. Explain the various concepts and give suitable examples. Work through the examples of comparison and logical operators in the Learner's Book before letting the learners complete the activity.

Assessment:

The activity will be assessed by checking the learners' answers to the questions.

Plenary:

As you mark the answers to the questions, give the learners turns to provide their answers with reasons for their choices. 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

Use the content in the Learner's Book and your own mathematical knowledge to complete this activity. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any corrections necessary. When you make corrections, make sure that you understand the reason for the correct answer.

ANSWERS

1. In arithmetic, the = sign shows equivalence; in programming, it is used to assign values to a variable.
2. Add 1 to the existing value stored in answer and then save the result over the old value for answer.
- 3.

Mathematical operator	Programming operator	Type of operator
+	+	arithmetic
=	(a) ==	comparison
(b) ≤	<=	(c) comparison
≠	(d) != or <>	(e) comparison
OR	OR	(f) logical

Activity 4.3: Individual

Purpose:

Describe the basic concepts in programming (constants, variables, expressions, statements /instructions, logical and arithmetic operators, operator precedence, etc.).

Show an ability to combine information and ideas from several sources to reach a conclusion. (Core competency CP5.1)

Resources:

- Learner's Book pages 197–200

Teacher:

It is important that the learners master an understanding of the basic concepts of programming, such as constants, variables, expressions, statements /instructions, logical and arithmetic operators, operator precedence on an individual basis. Explain the various concepts and give suitable examples.

Assessment:

The activity will be assessed by checking the learners' answers to the questions.

Plenary:

As you mark the answers to the questions, give the learners turns to provide their answers with reasons for their choices. 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

Use the content in the Learner's Book and your own mathematical knowledge to complete this activity. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any necessary changes. When you make corrections, make sure that you understand the reason for the correct answer.

ANSWERS

The variable price holds the value 27.95.

1.

(price > 10) AND (price < 27)
= True AND False
= False

2.

(price < 100) AND (price = 27.95)
= True AND True
= True

3.

NOT (price < 20)
= NOT(False)
= True

4.

(price >= 27) OR (price < 25)
= True OR False
= True

5.

NOT((price > 21) AND (price <= 31))
= NOT(True AND True)
= NOT(True)
= False

Remedial activity:

Give learners more practice with these core concepts if necessary.

Sub-strand 2: Algorithms

Activity 4.4: Individual

Purpose:

Apply variables, expressions, assignment statements and operator precedence order (BODMAS rule) to process and store numbers and text in a program.

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

Resources:

- Learner's Book pages 201–204
- A computer with an IDE such as Scratch installed
- A data projector if possible to demonstrate the creation of variables to the learners

Teacher:

It is important that the learners master an understanding of the basic concepts of programming, such as variables, expressions, assignment statements and operator precedence order (BODMAS rule) to process and store numbers and text in a program on an individual basis. Explain the various concepts and give suitable examples. Work through the examples given in the Learner's Book before letting the learners complete the activity. If possible, use Scratch or a similar IDE to demonstrate the concepts to the learners.

Assessment:

The activity will be assessed by checking the learners' answers to the questions.

Plenary:

As you mark the answers to the questions, give the learners turns to provide their answers with reasons for their choices. 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

Do this activity individually. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any necessary changes. When you make corrections, make sure that you understand the reason for the correct answer.

ANSWERS

Variable number has been assigned the value 5.5 in the following programming statement:

number = 5.5;

1. float; 0.55
2. integer; -218
3. real; 13.75
4. integer; -48
5. float; 22.5

Activity 4.5 Individual

Purpose:

Apply variables, expressions, assignment statements and operator precedence order (BODMAS rule) to process, store numbers and text in a program.

Effectively evaluate the success of solutions used in an attempt to solve a complex problem. (Core competency CP 5.5)

Resources:

- Learner's Book pages 201–204
- A computer with an IDE such as Scratch installed
- A data projector if possible to demonstrate the creation of variables to the learners
- *Expressions1.sb3*
- *Expressions2.sb3*
- *Expressions3.sb3*
- *Expressions4.sb3*
- *Expressions5.sb3*

Teacher:

Demonstrate how to use key elements in the programming environment before letting the learners attempt the activity. It is important that the learners work individually to master the skill of creating simple programs. Let the learners take turns to work on the available computers, making sure everyone gets a turn. Should there not be sufficient computers, do a demonstration and let the learners write the algorithms on paper. Printouts of Scratch programming blocks can also be made and cut out so that the learners can arrange the paper or card blocks to form the program.

Assessment:

Walk around and check that each learner is engaged with creating the programs. Assist any learners who are struggling to use the software. If some learners finish the work faster than their peers, encourage them to experiment and add features to their programs. Self-assessment will take place as the learners test their algorithms and programs.

Plenary:

Use the example answer files so that the learners can check their programs against these model solutions or code the solutions step-by-step so that the learners can ask questions about any aspect that they do not understand. Encourage experimentation and inquisitiveness, as this is the best way for learners to become confident problem solvers and improve their programming skills.

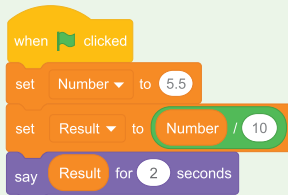
LEARNERS

Do this activity individually. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any necessary corrections. When you make corrections, make sure that you understand the reason for the correct answer.

ANSWERS

Sample solutions may be found in the attached files, as below.

1.



2.

```

when clicked
  set Number to 5.5
  set Result to 7 - 9 * 25
  say Result for 2 seconds

```

3.

```

when clicked
  set Number to 5.5
  set Result to Number * Number - 3
  say Result for 2 seconds

```

4.

```

when clicked
  set Number to 5.5
  set Result to 25 * 5 - 2 - 25 * 5 - 2
  say Result for 2 seconds

```

5.

```

when clicked
  set Number to 5.5
  set Result to Number * 3 + 30 / 5
  say Result for 2 seconds

```

Activity 4.6: Individual

Purpose:

Describe and use sequence, selection and iteration statements in a program. Understand the difference between variables and constants and be able to choose appropriate naming conventions when writing statements.

Demonstrate the ability to select alternative(s) that adequately meet selected criteria. Effectively evaluate the success of solutions used in an attempt to solve a complex problem. (Core competencies CP6.5 and CP5.5)

Resources:

- Learner's Book pages 205–206
- A computer with an IDE such as Scratch installed
- A data projector if possible to demonstrate to the learners

Teacher:

Go through the difference between a rule and a convention and teach the basic rules and conventions used in naming variables. You can use Scratch or a similar IDE to demonstrate the application of the rules and conventions. It is important that every learner understands and can remember these rules and conventions on their own.

Assessment:

Use informal assessment through discussion during the plenary while checking the answers to the questions.

Plenary:

As you mark the answers to the questions, give the learners turns to provide their answers with reasons for their choices. 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

Work on your own using your knowledge of the rules and conventions in naming variables to complete this activity. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any necessary changes. When you make corrections, make sure that you understand the reason for the correct answer.

ANSWERS

1. Allowed
2. Allowed
3. Allowed
4. Not allowed – cannot use a question mark symbol
5. Not allowed – cannot use a hyphen
6. Allowed
7. Not allowed – may not use a space in the name
8. Not allowed – may not use a point in the name
9. Allowed
10. Allowed

Remedial activity:

Give learners more practice with these core concepts if necessary.

Activity 4.7 Individual

Purpose:

Describe and use sequence, selection and iteration statements in a program. Understand the difference between variables and constants and be able to choose appropriate naming conventions when writing statements.

Demonstrate the ability to select alternative(s) that adequately meet selected criteria. Effectively evaluate the success of solutions used in an attempt to solve a complex problem. (Core competencies CP6.5 and CP5.5)

Resources:

- Learner's Book pages 206–207
- If preferred, access to a computer with word processing software to type out the algorithms per learner

Teacher:

Discuss and demonstrate the writing of sequential algorithms using pseudocode before letting the learners attempt the activity. Emphasise the need to break down all steps into their simplest form. It is important that learners master the skill of writing algorithms on their own.

Assessment:

Walk around and check that each learner is engaged in writing the algorithms. Provide guidance where needed if any individual is struggling.

Plenary:

Use the suggested answers as a start to a class discussion to determine the best solutions to the activity. Write the solutions on the board so that the learners can be sure to record the best possible solutions.

LEARNERS

Work on your own using your knowledge from the Learner's Book and the previous activities. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any necessary changes. When you make corrections, make sure that you understand the reason for the correct answer.

ANSWERS

The learners will give answers with differing levels of detail. Use this as a teaching point when sharing the solutions during a class discussion.

1. Select underwear
Put left foot through left leg hole
Put right foot through right leg hole
Pull up until waist band around waist
Select a clean school shirt
Put left arm through left sleeve
Put right arm through right sleeve
Button shirt starting with the top button
Push button through matching buttonhole
Repeat until all buttons buttoned
Put left leg through left trouser leg
Put right leg through right trouser leg
Pull up so that waist band around waist
Close button
Close zipper
Tuck shirt into pants
Put sock on left foot
Put sock on right foot
Place left shoe on left foot
Tie shoelaces on left shoe
Place right shoe on right foot
Tie shoelaces on right shoe

2. Dig over bed
Remove all weeds
Dig in compost or manure
Dig furrows 5 cm deep and 75 cm apart
Place maize seeds 25 cm apart
Cover seeds
Water
3. Walk to shop or market
Find stall that sells bananas
Check price for bananas
Weigh bananas if sold by weight
Check weight and price to see that price is not more than 10 Cedi
Pay
Collect change
Put bananas in bag
Return home

Activity 4.8: Individual

Purpose:

Describe and use sequence, selection and iteration statements in a program. Understand the difference between variables and constants and be able to choose appropriate naming conventions when writing statements.

Demonstrate the ability to select alternative(s) that adequately meet selected criteria. Effectively evaluate the success of solutions used in an attempt to solve a complex problem. (Core competencies CP6.5 and CP5.5)

Resources:

- Learner's Book pages 207–209
- If preferred, access to a computer with word processing software to type out the algorithms per learner

Teacher:

Discuss and demonstrate the writing of sequential algorithms using pseudocode and flowcharts before letting the learners attempt the activity. Again, emphasise the need to break down all steps into their simplest form. It is important that learners master the skill of writing algorithms on their own, so they should complete this activity on their own.

Assessment:

Walk around and check that each learner is engaged in writing the algorithms and the drawing of the flowcharts. Provide guidance where needed if any individual is struggling.

Plenary:

Use the suggested answers as a start to a class discussion to determine the best solutions to the activity. Write the solutions on the board so that the learners can be sure to record the best possible solutions.

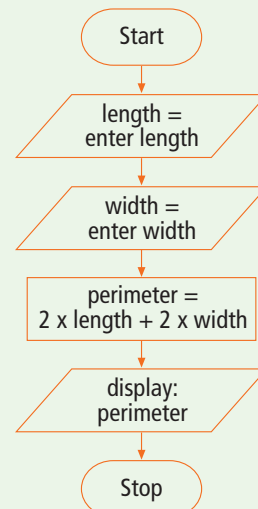
LEARNERS

Work on your own using your knowledge from the previous activities as well as the content in the Learner's Book to answer the questions. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any necessary corrections. When you make corrections, make sure that you understand the reason for the correct answer.

ANSWERS

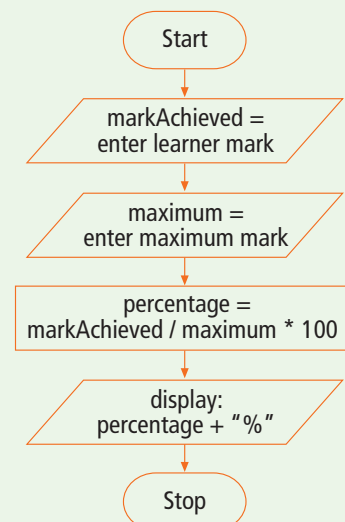
1.

length \leftarrow enter size of long side in cm
width \leftarrow enter size of short side in cm
perimeter $\leftarrow 2 \times \text{length} + 2 \times \text{width}$
display perimeter of rectangle



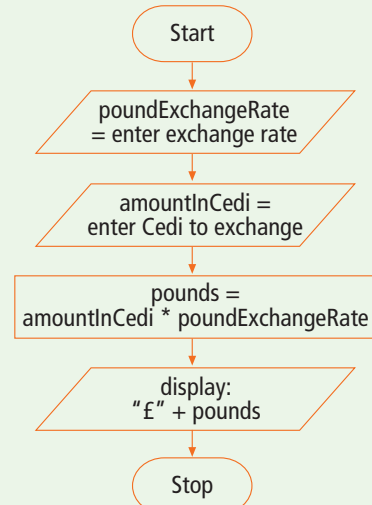
2.

markAchieved \leftarrow enter learner mark
maximum \leftarrow enter maximum mark
percentage $\leftarrow \text{markAchieved} / \text{maximum} \times 100$
display percentage



3.

```
poundExchangeRate ← enter exchange rate
amountInCedi ← enter Cedi to exchange
pounds ← amountInCedi * poundExchangeRate
display pounds received
```



Activity 4.9 Individual

Purpose:

Describe and use sequence, selection and iteration statements in a program. Understand the difference between variables and constants and be able to choose appropriate naming conventions when writing statements.

Demonstrate the ability to select alternative(s) that adequately meet selected criteria. Effectively evaluate the success of solutions used in an attempt to solve a complex problem. (Core competencies CP6.5 and CP5.5)

Resources:

- Learner's Book pages 209–212
- If preferred, access to a computer with word processing software to type out the algorithms per learner
- *TestResult.sb3*
- *TestResultImproved.sb3*
- *WeeklyWages.sb3*

Teacher:

Discuss and demonstrate the writing of sequential and selection algorithms using pseudocode and flowcharts before letting the learners attempt the activity. Again, emphasise the need to break down all steps into their simplest form. It is important that learners master the skill of writing algorithms on their own, so they should complete this activity on their own.

Assessment:

Walk around and check that each learner is engaged in writing the algorithms and the drawing of the flowcharts. Provide guidance where needed if any individual is struggling.

Plenary:

Use the suggested answers as a start to a class discussion to determine the best solutions to the activity. Write the solutions on the board so that the learners can be sure to record the best possible solutions.

LEARNERS

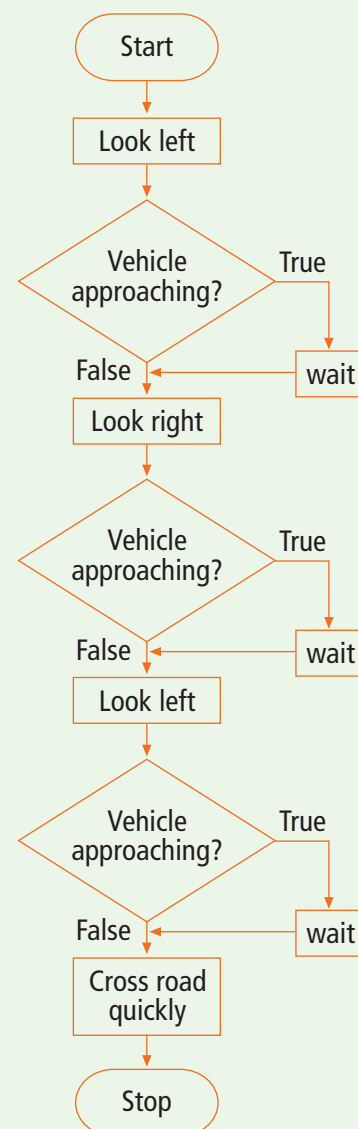
Work on your own to write pseudocode and draw the flowcharts to illustrate the algorithms. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any necessary changes. When you make corrections, make sure that you understand the reason for the correct answer.

ANSWERS

The amount of detail given by the learners may differ. Check that they provide sufficient detail and have broken down the process into the simplest steps.

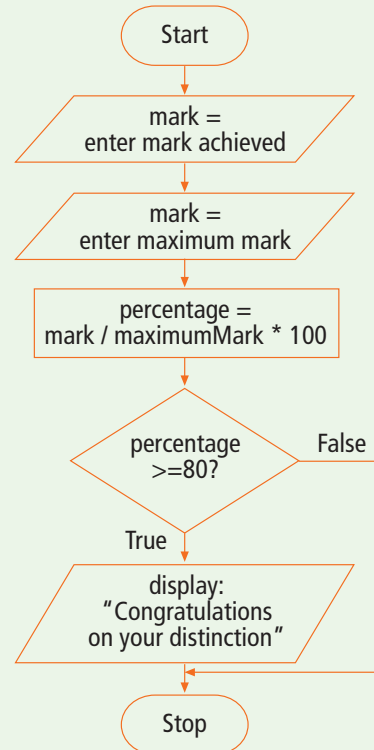
1.

```
Stop on edge of road
Look left
IF vehicle approaching
    Wait
END IF
Look right
IF vehicle approaching
    Wait
END IF
Look left
IF vehicle approaching
    Wait
END IF
Cross road quickly
```



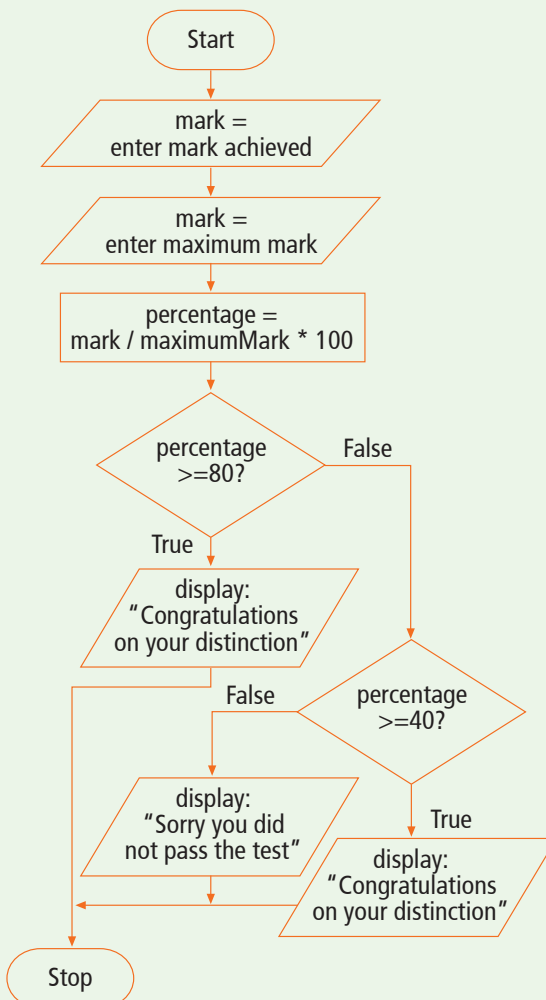
2.

mark \leftarrow Enter mark achieved
 maximumMark \leftarrow maximum mark possible
 percentage \leftarrow mark / maximumMark * 100
 IF percentage \geq 80 THEN
 Display "Congratulations on your distinction"
 END IF



3.

mark \leftarrow Enter mark achieved
 maximumMark \leftarrow maximum mark possible
 percentage \leftarrow mark / maximumMark * 100
 IF percentage \geq 80 THEN
 Display "Congratulations on your distinction"
 ELSE IF percentage \geq 40 THEN
 Display "Congratulations you have passed"
 ELSE
 Display "Sorry you did not pass the test"
 END IF



4.

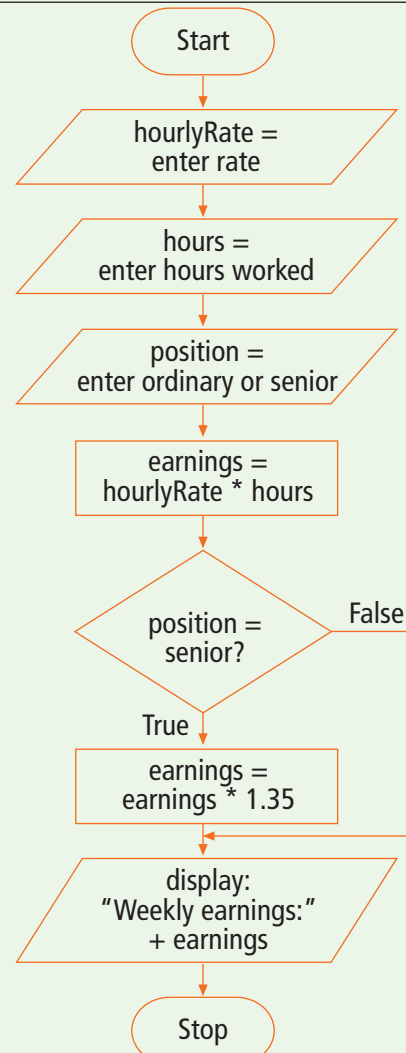
```

hourlyRate ← Enter rate
hours ← Enter hours worked
position ← Enter ordinary or senior

earnings ← hourlyRate * hours

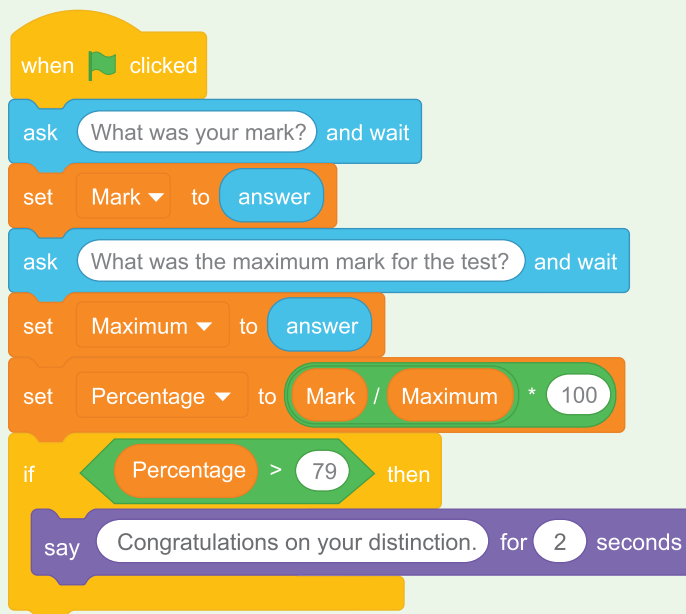
IF position = senior THEN
    earnings ← earnings * 1.35
END IF

Display: "Weekly earnings: " + earnings
    
```

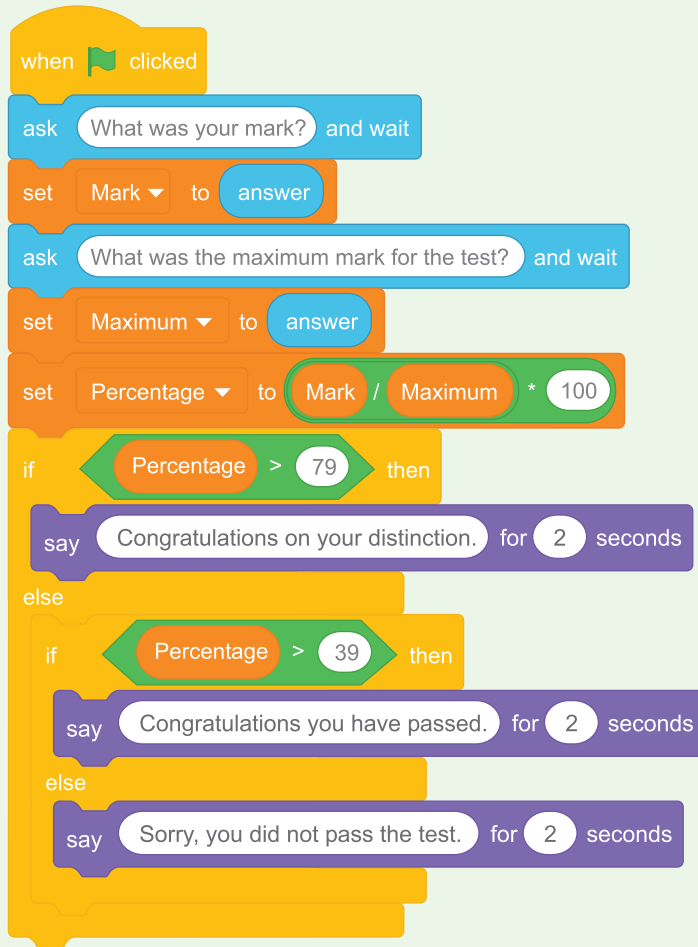


ENRICHMENT

2.



3.



4.



Activity 4.10: Individual

Purpose:

Describe and use sequence, selection and iteration statements in a program. Understand the difference between variables and constants and be able to choose appropriate naming conventions when writing statements.

Demonstrate the ability to select alternative(s) that adequately meet selected criteria. Effectively evaluate the success of solutions used in an attempt to solve a complex problem. (Core competencies CP6.5 and CP5.5)

Resources:

- Learner's Book pages 212–216
- If preferred, access to a computer with word processing software to type out the algorithms per learner

Teacher:

Discuss and demonstrate the writing of sequential, selection and iteration algorithms using pseudocode and flowcharts before letting the learners attempt the activity. Again, emphasise the need to break down all steps into their simplest form. It is important that learners master the skill of writing algorithms on their own, so they should complete this activity on their own.

Assessment:

Walk around and check that each learner is engaged in writing the algorithms and the drawing of the flowcharts. Provide guidance where needed if any individual is struggling.

Plenary:

Use the suggested answers as a start to a class discussion to determine the best solutions to the activity. Write the solutions on the board so that the learners can be sure to record the best possible solutions.

LEARNERS

Work on your own to write pseudocode and draw the flowcharts to illustrate the algorithms. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any necessary changes. When you make corrections, make sure that you understand the reason for the correct answer.

ANSWERS

The amount of detail given by the learners may differ. Check that they provide sufficient detail and have broken down the process into the simplest steps.

1.

Pseudocode	Flowchart
<pre> answer ← 0 FOR counter = 1 to 10 answer ← counter * 12 display answer END FOR </pre>	<pre> graph TD Start([Start]) --> Init[answer = 0] Init --> Counter[counter = 1] Counter --> Calc[answer = counter * 12] Calc --> Display[/Display answer/] Display --> Inc[counter = counter + 1] Inc --> Decision{Counter > 10?} Decision -- False --> Calc Decision -- True --> Stop([Stop]) </pre>

2.

Pseudocode	Flowchart
<pre> area ← 0 FOR radius = 5 to 20 area ← 22/7 * radius * radius display: area + " cm²" END FOR </pre>	<pre> graph TD Start([Start]) --> Init[answer = 0] Init --> Radius[radius = 5] Radius --> Calc[area = 22/7 * radius * radius] Calc --> Display[/Display: area + "cm²"/] Display --> Inc[radius = radius + 1] Inc --> Decision{radius > 20?} Decision -- False --> Calc Decision -- True --> Stop([Stop]) </pre>

3.

Pseudocode	Flowchart
<pre> randomNumber ← random number between 1 and 100 counter = 0 Repeat guess ← enter guess counter = counter + 1 IF guess = randomNumber Display: "You win!" ELSE IF guess < randomNumber Display: "Too low" ELSE Display: "Too high" END IF ELSE Until counter = 3 OR (guess = randomNumber) IF guess != randomNumber display: "The computer wins" END FOR </pre>	<pre> graph TD Start([Start]) --> Init[randomNumber = random number between 1 and 100] Init --> Counter[0] Counter --> LoopStart(()) LoopStart --> Guess[/Guess = enter guess/] Guess --> CounterInc[counter = counter + 1] CounterInc --> WinCheck{guess = randomNumber?} WinCheck -- True --> WinWin[/Display: "You win!"/] WinCheck -- False --> LowCheck{guess < randomNumber?} LowCheck -- True --> TooLow[/Display: "Too low!"/] LowCheck -- False --> TooHigh[/Display: "Too high!"/] TooLow --> Counter3{Counter < 3?} TooHigh --> Counter3 Counter3 -- True --> LoopStart Counter3 -- False --> ComputerWins[/Display: "The computer wins!"/] ComputerWins --> Stop([Stop]) </pre>

4.

Pseudocode	Flowchart
<pre> firstNumber ← 1 Display firstNumber secondNumber ← 2 Display secondNumber counter ← 3 FOR counter = 3 to 10 thirdNumber ← firstNumber + secondNumber display thirdNumber firstNumber ← secondNumber secondNumber ← thirdNumber END FOR </pre>	<pre> graph TD Start([Start]) --> Init1[firstNumber = 1] Init1 --> Display1[/Display: firstNumber/] Display1 --> Init2[secondNumber = 2] Init2 --> Display2[/Display: secondNumber/] Display2 --> Init3[counter = 3] Init3 --> LoopStart(()) LoopStart --> Calc3[thirdNumber = firstNumber + secondNumber] Calc3 --> Display3[/Display: thirdNumber/] Display3 --> Assign1[firstNumber = secondNumber] Assign1 --> Assign2[secondNumber = thirdNumber] Assign2 --> IncCounter[counter = counter + 1] IncCounter --> Decision{counter > 20?} Decision -- True --> Stop([Stop]) Decision -- False --> LoopStart </pre>

Sub-strand 3: Robotics

Activity 4.11: Group

Purpose:

Describe the principles underlying the operation of the components of a robot (controller, mechanical, sensors).

Explain ideas in a clear order with relevant detail. Analyse and make distinct judgement about viewpoints expressed in an argument. (Core competencies CC8.2 and CP5.2)

Resources:

- Learner's Book pages 217–221
- The internet, access to a computer or mobile device with access to the internet
- In the case where the teacher is doing this activity as a demonstration, a data projector to display the video clips to the whole class would be an advantage
- The links below
- A robotic kit with examples of the parts covered in the book, or images of the parts as provided in the book or downloaded from the internet

Links:

1. Video: Lego EV3 robot parts and assembly (35 minutes)
<https://www.youtube.com/watch?v=0DPMt2pMabU>
2. Video: mBot assembly guide (20:53 minutes)
<https://www.youtube.com/watch?v=liCpEwCvpAc&t=1051s>
3. Video: mBot assembly instructions (14:52 minutes)
<https://www.youtube.com/watch?v=CSHVS9g5RJE>
4. Video: Robot tank Arduino Uno bluetooth kit unboxing and assembly (25:47 minutes)
<https://www.youtube.com/watch?v=SOYHafCALo0>

Teacher:

Use the content in the Learner's Book to describe the parts of a robot. It is very important for the learners to see the different parts as these will be unfamiliar to most. Use pictures, the video clips and/or actual parts from an educational robot kit. Allow for ad hoc discussions to take place as the learners' interest is bound to be aroused by this topic.

LOW RESOURCE SCHOOLS

1. Explain the main features of the controller board of a robot.
2. Explain the function of the following mechanical parts of a robot:
 - a. Actuators
 - b. Gears
 - c. Grippers
 - d. Motors.

ANSWERS

1. The controller board is a computer circuit board. It has a microcontroller chip that contains the integrated circuits that provide the processing ability of the controller. The controller board is essentially the robot's 'brain'.
2.
 - a. Actuators are used to allow robots to grab, move and lift items.
 - b. Gears convert rotary to linear motion, and slow down movement or make it faster.
 - c. Grippers are used to pick up, move and manipulate items.
 - d. Motors make the robot move. They are controlled independently and can make the robot turn forward or backward, or to make specific movements.

Assessment:

Informally assess each learner's knowledge of the parts of a robot. Where the learners are working in groups, move around the class and provide assistance and reinforcement.

Plenary:

Hold a class discussion to reinforce knowledge of the different mechanical parts of a robot. Let the learners indicate which of the robots that they have seen in the book or in the videos they like the most and why. Hold a quick quiz using pictures or actual examples of parts to reinforce the knowledge of each of the parts.

LEARNERS

Choose one of the video clips on the links provided to see how educational robot kits are assembled. Identify your favourite type of robot and decide why you like it.

ANSWERS

Answers will vary, but should be supported by reasons.

Activity 4.12: Pairs

Purpose:

Describe the principles underlying the operation of the components of a robot (controller, mechanical, sensors).

Explain ideas in a clear order with relevant detail. Analyse and make distinct judgement about viewpoints expressed in an argument. (Core competencies CC8.2 and CP5.2)

Resources:

- Learner's Book pages 221–224
- The internet, access to a computer or mobile device with access to the internet
- A robotic kit with actual examples of the sensors covered in the book, or images of the sensors as provided in the book or downloaded from the internet

Teacher:

Use the content in the Learner's Book to explain about the sensors used in a robot. It is very important for the learners to see the different parts as this will be unfamiliar to most. Use pictures, the video clips and/or actual sensors from an educational robot kit. Some of the sensors will have been seen in the video clips in the previous activity. Allow for ad hoc discussions to take place as the learners' interest is bound to be aroused by this topic.

Assessment:

Informally assess each learner's knowledge of the sensors used in robots. Where the learners are working in pairs, move around the class and provide assistance and reinforcement.

Plenary:

Hold a class discussion to reinforce knowledge of the different sensors. Hold a quick quiz using pictures or actual examples of parts to reinforce the knowledge of each of the sensors. Go through the answers to the questions and check that the learners all know the correct ones.

LEARNERS

Work with a partner to answer the questions. Ask your teacher if anything is unclear. During the feedback session, check your answers.

ANSWERS

1. Note that the examples given by the learners may vary.
 - Ultrasonic – to detect objects to avoid collisions
 - Line sensing – to follow a track
 - Light – to record light intensity to control things such as turning on lights in low light
 - Temperature – record the atmospheric temperature
 - Magnetic field – to determine the distance to a magnetic object
 - Gas – to detect smoke or gases such as propane and butane in a warning device
 - Pressure – detect changes in atmospheric pressure as part of a weather monitoring system
 - Moisture – detect soil moisture in an automated irrigation system
 - pH – to detect the acidity or alkalinity of a solution in a chemistry or biological laboratory
 - Motion – to detect human movement in a home alarm system
2.
 - a. temperature, humidity and pressure (accept any two)
 - b. moisture sensor
 - c. light sensor

Remedial activity:

Check that learners can explain the difference between ultrasonic sensors and line-following sensors.

Activity 4.13: Individual

Purpose:

Describe the principles underlying the operation of the components of a robot (controller, mechanical, sensors).

Explain ideas in a clear order with relevant detail. Analyse and make distinct judgement about viewpoints expressed in an argument. (Core competencies CC8.2 and CP5.2)

Resources:

- Learner's Book pages 225–226
- The internet, access to a computer or mobile device with access to the internet

Teacher:

Present the content on the use of sensors in everyday life. Use pictures, the video clips and/or actual sensors as examples.

Assessment:

Informally assess each learner's knowledge of the sensors used in everyday life. Assess the answers to the questions.

Plenary:

Go through the answers to the questions and check that the learners all know the correct ones.

LEARNERS

Work on your own to answer the questions. Ask your teacher if anything is unclear. During the feedback session, check your answers and make any necessary changes.

ANSWERS

The following are some suggested answers. The learners will also come up with other options as a result of their research.

- Motor vehicles: Parking sensors that tell the driver how far they are from an obstacle.
 - Factories: Pressure and temperature sensors in machines to warn if they are overheating or the pressure in the pipes is too high.
 - Agriculture: Sensors to determine how compacted the soil is or how much clay there is in the soil.
 - An aeroplane: Altitude sensors, cabin pressure sensors.
- A computer circuit board that contains the circuitry to control the robot based on instructions received from a program uploaded to it. It is the brain of the robot or system.
- Accept any three of the following:
 - Motors are essential to make a robot move and to control actuators and robotic arms.
 - Wheels and tracks: robots can move by using wheels, tank tracks or jointed legs.
 - Actuators are used to allow robots to grab, move and lift items.
 - Hydraulic or pneumatic pistons can also be used to control the movement on robotic arms and legs.
 - Gears are not only used to convert rotary to linear motion, but also to slow movement down or make it faster. Combinations of a motor and a series of gears can be used to turn parts of a robot such as a crane or gripper arm.
 - Robotic claws or grippers are used to pick up, move and manipulate items.

Sub-strand 4: Artificial intelligence

Activity 4.14 Group

Purpose:

Discuss Artificial Neural Networks (ANN) and compare intelligence in humans, animals and machines.

Understand roles during group activities. (Core competency CC9.3)

Resources:

- Learner's Book pages 227–230

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 interesting videos on this topic.

Assessment:

Informally assess each learner's knowledge of the intelligence found in humans, animals and machines. Where the learners are working in groups, move around the class and provide assistance and reinforcement.

Plenary:

Check the answers to the activity. Discuss any questions and observations that the learners might have about the various forms of intelligence.

LEARNERS

Debate the questions in your group and summarise your conclusions. Ask your teacher if anything is unclear. Discuss the questions as a class.

ANSWERS

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

1. There are limitations to the amount of data that a human can process to make a decision and it can take a long time to work through data.
 - Animals mostly react on a purely instinctive level and, to a certain extent, through being trained to do things.
 - Machines make decisions without empathy.
2. Human intelligence also makes it possible to solve problems and reason things out. It allows us to engage in debates with other people and make reasoned statements and have opinions.
 - Animals generally react on a more instinctive level. For example, a predator will learn from its parents how to hunt, but the need to hunt in order to eat and survive is very much instinctive. Some animals, especially mammals and primates, show intelligence in learning how to do clever things, but this may very well only be because they are mimicking observed behaviour.

- Machines such as computers, on the other hand, do not have wisdom and do not use empathy and emotions in their decision-making process. They also cannot make a decision if they have not been fed the relevant data. However, when it comes to working through massive amounts of data to find patterns and make suggestions, computer systems are better than humans. It would take a human too much time to sift through and analyse really huge amounts of data, such as the data generated by the online activity of humans daily.

Activity 4.15: Group

Purpose:

Discuss Artificial Neural Networks (ANN) and compare intelligence in humans, animals and machines.

Understand roles during group activities. (Core competency CC9.3)

Resources:

- Learner's Book pages 230–231

Teacher:

Present the content on this topic. Draw a table as the basis for a discussion, with the headings Weak AI and Strong AI. 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 interesting videos on this topic.

Assessment:

Informally assess each learner's knowledge of strong and weak artificial intelligence. Where the learners are working in groups, move around the class and provide assistance and reinforcement.

Plenary:

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

LEARNERS

Debate the statements in your group and summarise your conclusions. Ask your teacher if anything is unclear. Discuss your ideas as a class.

ANSWERS

1. Most artificial intelligence systems we find today are classified as weak AI. Weak AI is also known as narrow AI. These systems are focussed on a particular area. A strong AI system can make its own, independent decisions, while weak AI depends on human input and programming for its decisions.
2. Accept any other relevant examples given by the learners.
 - A self-driving car system: Such a system allows a car to safely navigate the roads and intersections and drive itself to a specified location, but it is not capable of learning to do something else, such as play chess.

- The use of assistants on smartphones, such as Siri and Bixby: These virtual assistants use voice recognition to answer our queries or carry out our commands. However, their responses are limited to what they have been 'taught' or programmed to do. For example, if you ask your virtual assistant to make a phone call to your boyfriend or girlfriend, it will not know which number to call unless you have tagged that contact on your phone as your boyfriend or girlfriend.
3. The learners will give different examples as answers. Allow for a class discussion to select the best examples.
- A strong AI system can make its own independent decisions. For example, a robot assistant that takes care of a household, making decisions about cleaning needs, ordering and preparing food. It would also be able to automatically take into account the number of people in the house and their individual needs, likes and dislikes.

Activity 4.16: Group

Purpose:

Discuss Artificial Neural Networks (ANN) and compare intelligence in humans, animals and machines.

Understand roles during group activities. (Core competency CC9.3)

Resources:

- Learner's Book pages 231–232
- The internet, access to a computer or mobile device with access to the internet
- The link below
- A data projector and a good set of speakers if necessary

Link:

Video: HoloLens 2 AR Headset: On Stage Live Demonstration (10:59 minutes)

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

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 interesting videos on this topic. Let the learners watch the video clip on the link provided before attempting the questions posed in the activity.

LOW RESOURCE SCHOOLS

1. Discuss virtual reality and augmented reality. Establish the relationship between them.
2. What is the difference between a user's experience of virtual reality and their experience with augmented reality?

ANSWERS

Answers may vary.

1. Virtual reality takes you into a virtual world out of your current surroundings. Augmented reality places an artificial item into real surroundings.
2. The similarity between virtual reality and augmented reality is that the users are engaged in virtual technology. However, virtual reality isolates the user and limits their interaction with the real world; this may negatively impact their ability to be social while interacting with virtual objects. Augmented reality enables the user to interact with their surroundings while interacting with virtual objects.

Assessment:

Informally assess each learner's knowledge of mixed reality and the use of holograms. Where the learners are working in groups, move around the class and provide assistance and reinforcement.

Plenary:

Check the answers to the activity. Discuss any questions and observations that the learners might have about virtual reality.

LEARNERS

Watch the video clip that demonstrates the use of the Microsoft® HoloLens headset. Discuss the scenarios in your group. Ask your teacher if anything is unclear. Discuss your ideas as a class.

ANSWERS

The learners may give other examples. Allow for discussion on all that they saw and were excited by.

1. the Playground app – there are sliders and buttons on the wind farm simulation as well as the keys on the electric piano
2. Jinha – a hologram of a colleague in a virtual meeting
3. objects in the Spatial app, such as a virtual pin board and the toy holograms, such as the fire truck

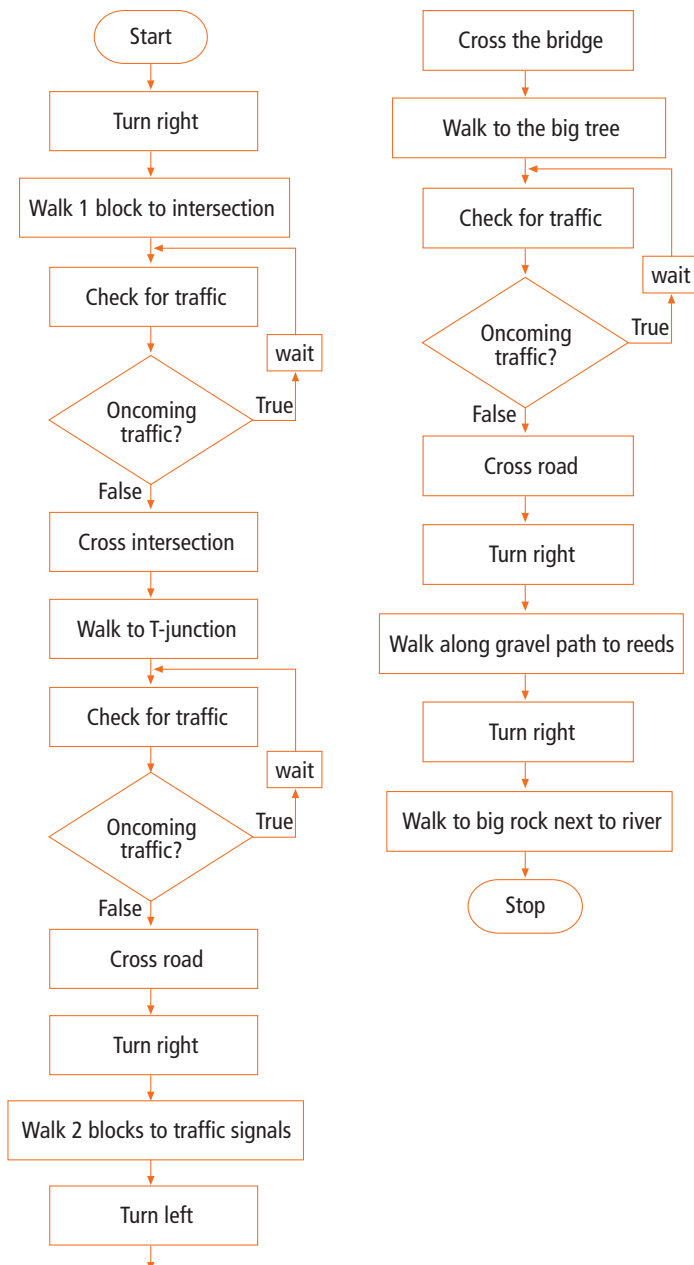
Remedial activity:

Check in with learners about which topics they would like to review in order to consolidate their understanding.

Check your progress

ANSWERS

1.
 - a. A variable is a named place in the RAM of a computer that can store a value that can be changed by a computer program. A constant is a named place in the RAM of a computer that can store a value where a computer program is not able to change the value that has been stored.
 - b. Answers will vary but may include values such as VAT and PI.
2.
 - a. decision making (selection)
 - b. processing
3.
 - a. $(7 > 5) \text{ AND } ((11 < 9) \text{ OR } (63 < 53))$
= True AND (False OR False)
= True and False
= False
 - b. age = 21;
(age > 20) AND (age < 30)
= True AND True
= true
4.
 - a. float; 5.5
 - b. float; 43.4
 - c. integer; 246
5. The learners may provide more detail.



Check your progress

6.
 - a. A computer circuit board that contains the circuitry to control the robot based on instructions received from a program uploaded to it.
 - b. Components that are used to allow robots to grab, move and lift items which often requires a motion where the rotary movement of a motor is converted to linear motion using a circle or worm gear.
 - c. Gears are not only used to convert rotary to linear motion, but also to slow movement down or make it faster.
7. The learners will describe different projects. Accept any relevant examples. Possible answers include:
 - a. a weather station that monitors temperature and humidity
 - b. an automatic irrigation system.
8. Human intelligence makes it possible to solve problems and reason things out. It allows us to engage in debates with other people and make reasoned statements and have opinions.

Machines such as computers, on the other hand, do not have wisdom and do not use empathy and emotions in their decision-making process. They also cannot make a decision if they have not been fed the relevant data. However, when it comes to working through massive amounts of data to find patterns and make suggestions, computer systems are better than humans as it would take a human too much time to sift through and analyse really huge amounts of data such as the data generated daily by the online activity of humans.

9.
 - a. AI is found where computers can solve problems and respond in a human-like manner to questions and other inputs.
 - b. A strong AI system will be able to make its own independent decisions while weak AI depends on human input and programming for its decisions. Weak AI is often able to simulate human behaviour such as being able to speak using a human voice, but this remains limited to the knowledge that it has stored. Weak AI can learn, such as the case with a system that converts hand-written text or spoken sentences to text, but ultimately that is just adding more data to its knowledge bank. It is not learning to do something new.
10. Mixed reality places a computer-generated holographic object into the real world in such a way that you can interact with the object. Augmented reality places a computer-generated object into the real world as an overlay.

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ISBN 978-9-9889423-6-6



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