Teacher's Guide

INFORMATION TECHNOLOGY

12

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

CAPS

MTN

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As an organisation rooted in technology, we believe in providing a new bold digital world to the communities we operate in. This unique digital book provides the fundamental knowledge necessary for a sound grounding from which to make practical use of the complete and indispensable application-oriented information regarding Computer Applications Technology (CAT) and Information Technology (IT). It is a foundational reference for today's secondary school learners and teachers alike - as well as for the next generation of CAT and IT students.

Information Technology Practical Book Grade 12
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Term 3 - Theory content

Term 3 - Practical content

INTRODUCTION TO INFORMATION TECHNOLOGY

Welcome to the *IT Grade 12 Teacher's Guide*. This book was developed to guide teachers and provide suggested answers that can be used when assessing learners throughout the year.

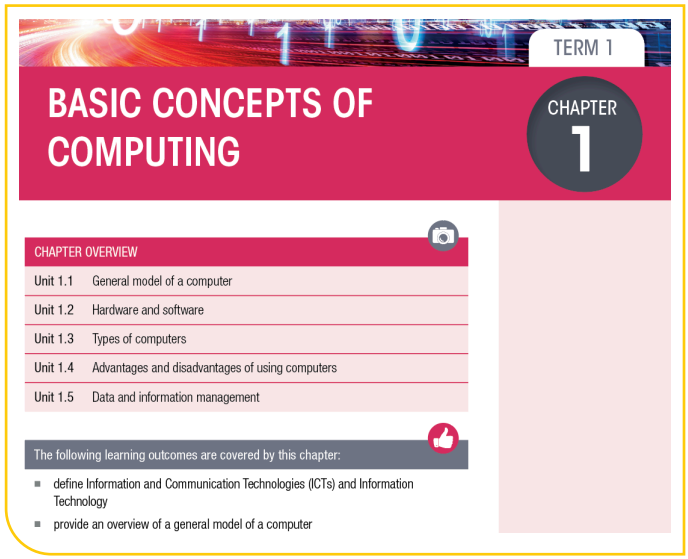
The *IT Grade 12 Theory Book* and the *IT Grade 12 Practical Book* provide learners with interesting, stimulating and challenging learning activities that have been carefully designed and developed so that there is a clear progression of knowledge and skills throughout the FET Phase. These books will make Information Technology an interesting, exciting and meaningful subject that learners will enjoy.

The *IT Grade 12 Teacher's Guide* has been designed so that teachers are able observe and assess their learners' progress and take any corrective measures when necessary. This book is aligned to the CAPS curriculum.

On pages viii – xi you will find the Annual Teaching Plan, which outlines the units, activities and timeframe allocated for each chapter.

HOW THE TEACHER'S GUIDE IS STRUCTURED

Each **Theory** chapter is indicated by this colour:


TERM 1

BASIC CONCEPTS OF COMPUTING

CHAPTER 1

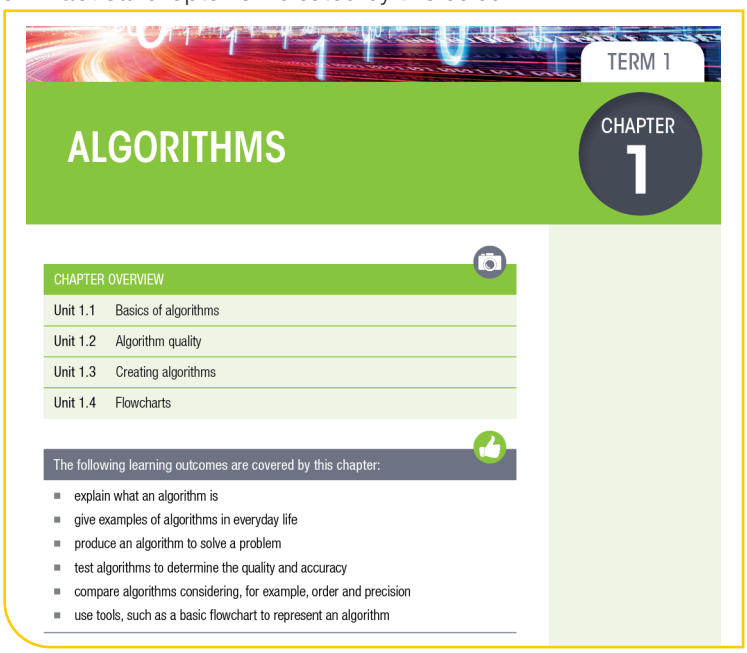
CHAPTER OVERVIEW

Unit 1.1	General model of a computer
Unit 1.2	Hardware and software
Unit 1.3	Types of computers
Unit 1.4	Advantages and disadvantages of using computers
Unit 1.5	Data and information management

The following learning outcomes are covered by this chapter:

- define Information and Communication Technologies (ICTs) and Information Technology
- provide an overview of a general model of a computer

Each **Practical** chapter is indicated by this colour:


TERM 1

ALGORITHMS

CHAPTER 1

CHAPTER OVERVIEW

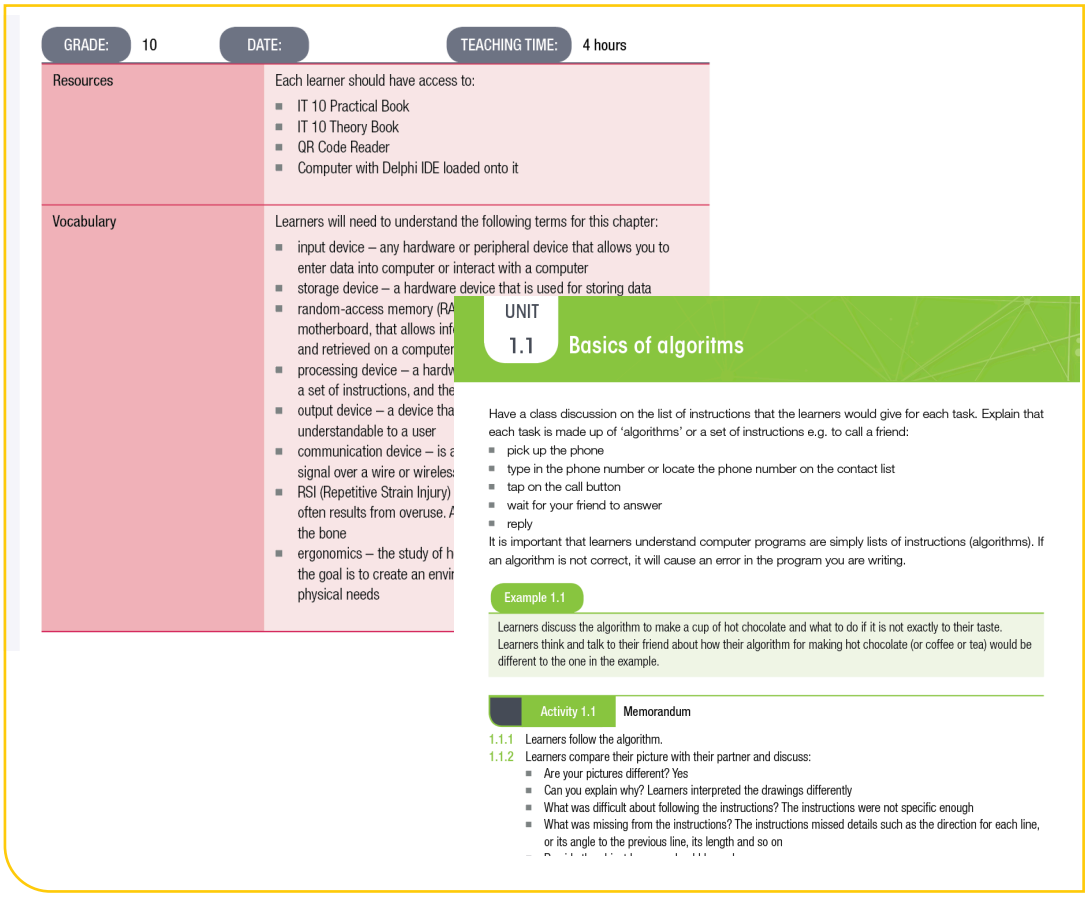
Unit 1.1 Basics of algorithms
Unit 1.2 Algorithm quality
Unit 1.3 Creating algorithms
Unit 1.4 Flowcharts

The following learning outcomes are covered by this chapter:

- explain what an algorithm is
- give examples of algorithms in everyday life
- produce an algorithm to solve a problem
- test algorithms to determine the quality and accuracy
- compare algorithms considering, for example, order and precision
- use tools, such as a basic flowchart to represent an algorithm

For each chapter we have indicated what resources you will need and the teaching time allocated for the content in the CAPS curriculum.

Each unit then has suggested answers for the activities in the Theory and Practical Books.


GRADE: 10 DATE: TEACHING TIME: 4 hours

Resources	Each learner should have access to: ■ IT 10 Practical Book ■ IT 10 Theory Book ■ QR Code Reader ■ Computer with Delphi IDE loaded onto it
Vocabulary	Learners will need to understand the following terms for this chapter: ■ input device – any hardware or peripheral device that allows you to enter data into computer or interact with a computer ■ storage device – a hardware device that is used for storing data ■ random-access memory (RA motherboard, that allows inf and retrieved on a computer ■ processing device – a hardw a set of instructions, and the ■ output device – a device tha understandable to a user ■ communication device – is a signal over a wire or wireles ■ RSI (Repetitive Strain Injury) often results from overuse. A the bone ■ ergonomics – the study of h the goal is to create an envir physical needs

UNIT 1.1 Basics of algoritms

Have a class discussion on the list of instructions that the learners would give for each task. Explain that each task is made up of 'algorithms' or a set of instructions e.g. to call a friend:

- pick up the phone
- type in the phone number or locate the phone number on the contact list
- tap on the call button
- wait for your friend to answer
- reply

It is important that learners understand computer programs are simply lists of instructions (algorithms). If an algorithm is not correct, it will cause an error in the program you are writing.

Example 1.1

Learners discuss the algorithm to make a cup of hot chocolate and what to do if it is not exactly to their taste. Learners think and talk to their friend about how their algorithm for making hot chocolate (or coffee or tea) would be different to the one in the example.

Activity 1.1 Memorandum

1.1.1 Learners follow the algorithm.
1.1.2 Learners compare their picture with their partner and discuss:
- Are your pictures different? Yes
- Can you explain why? Learners interpreted the drawings differently
- What was difficult about following the instructions? The instructions were not specific enough
- What was missing from the instructions? The instructions missed details such as the direction for each line, or its angle to the previous line, its length and so on

ANNUAL TEACHING PLAN - OVERVIEW OF TERMS (THEORY)

TERM 1

CHAPTER 1
Database management
(4 hours)

CHAPTER 2
Database design concepts
(10 hours)

CHAPTER 3
Hardware
(2 hours)

CHAPTER 4
Social implications
(2 hours)

TERM 2

CHAPTER 5
Computer management
(2 hours)

CHAPTER 6
Software
(4 hours)

CHAPTER 7
Social implications
(2 hours)

TERM 3

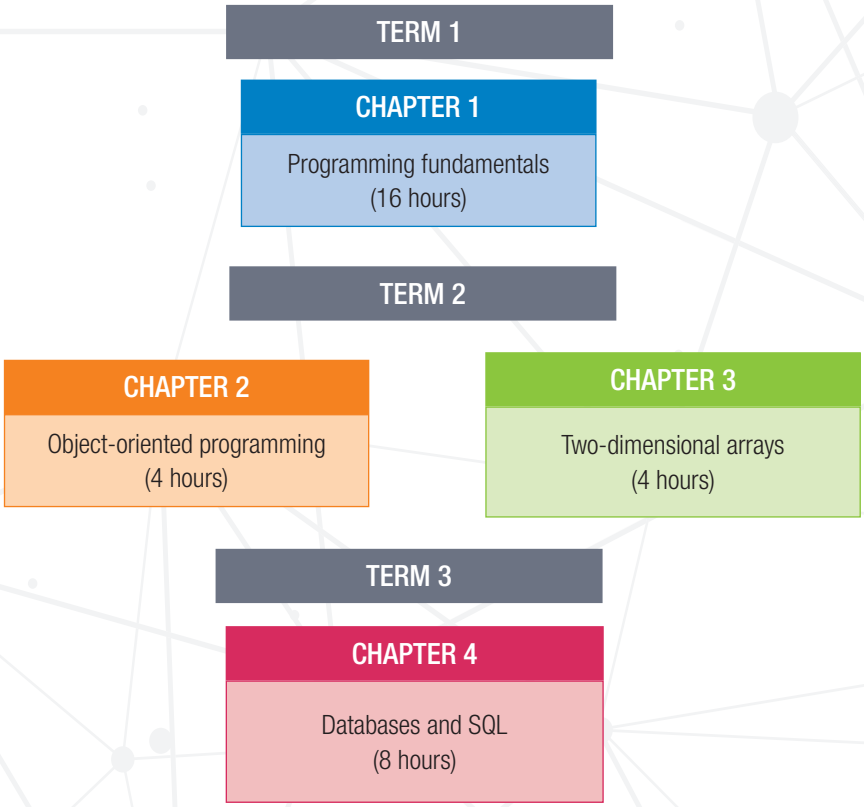
CHAPTER 8
Internet services technologies
(2 hours)

CHAPTER 9
Networks
(2 hours)

CHAPTER 10
E-communications
(2 hours)

CHAPTER 11
Social implications
(2 hours)

ANNUAL TEACHING PLAN - OVERVIEW OF TERMS (PRACTICAL)



TERM 1					
Hours	Chapters	Units	Informal activities	Date started	Date completed
4	THEORY CHAPTER 1: Database management	Unit 1.1 Data collection			
		Unit 1.2 Data warehousing			
		Unit 1.3 Data mining			
		Unit 1.4 Caring for and managing data			
10	THEORY CHAPTER 2: Database design concepts	Unit 2.1 Characteristics of a good database			
		Unit 2.2 Problems with databases			
		Unit 2.3 How to get rid of anomalies			
2	THEORY CHAPTER 3: Hardware	Unit 3.1 Mobile technologies			
		Unit 3.2 Factors influencing performance of a computer			
		Unit 3.3 Motivate a typical computer system in respect of user requirements			
2	THEORY CHAPTER 4: Social implications	Unit 4.1 Mobile technologies			
		Unit 4.2 Technologies enabling IoT and their impact on society			
16	PRACTICAL CHAPTER 1: Programming fundamentals	Unit 1.1 Problem solving			
		Unit 1.2 Procedures and functions in the Delphi runtime libraries			
		Unit 1.3 Procedures and functions			
		Unit 1.4 User interface design			
		Unit 1.5 Databases			

TERM 2					
Hours	Chapters	Units	Informal activities	Date started	Date completed
2	THEORY CHAPTER 5: Computer management	Unit 5.1 Factors influencing computer managments			
4	THEORY CHAPTER 6: Basic concepts of system software	Unit 6.1 Cloud computing			
		Unit 6.2 Virtual reality			
		Unit 6.3 Augmented reality			
		Unit 6.4 Virtualisation			
2	THEORY CHAPTER 7: Networks	Unit 7.1 Computer criminals			
		Unit 7.2 Types of cybercrimes			
		Unit 7.3 Effects of crimes			
		Unit 7.4 Computer crimes			
		Unit 7.5 Safeguards against computer crimes, threats and criminals			
4	PRACTICAL CHAPTER 2: Object-oriented programming	Unit 2.1 Defining a custom class			
		Unit 2.2 Using the class			
4	PRACTICAL CHAPTER 3: Two-dimensional arrays	Unit 3.1 2D arrays			
		Unit 3.2 2D arrays with data			
		Unit 3.3 Application of two-dimensional arrays			

TERM 3					
Hours	Chapters	Units	Informal activities	Date started	Date completed
2	THEORY CHAPTER 8: Internet services technologies	Unit 8.1 Improve searching			
		Unit 8.2 Online applications			
2	THEORY CHAPTER 9: Networks	Unit 9.1 Essential parts of link nodes			
		Unit 9.2 Connecting to the internet			
		Unit 9.3 Sharing concepts			
		Unit 9.4 Remote access			
2	THEORY CHAPTER 10: E-communications	Unit 10.1 Overview of security concepts			
2	THEORY CHAPTER 11: Social implications	Unit 11.1 Computers provide solutions to issues of national and internation importance			
		Unit 11.2 The evolution of social networking and the effect on society			
		Unit 11.3 Privacy and information sharing			
9	PRACTICAL CHAPTER 4: Database and SQL	Unit 4.1 Select and sort columns			
		Unit 4.2 Select and sort rows			
		Unit 4.3 Calculated columns			
		Unit 4.4 Aggregate functions			
		Unit 4.5 Data maintenance			
		Unit 4.6 Querying two tables			
		Unit 4.7 Database applications			

HOW THE TEACHER'S GUIDE WORKS

In this Teacher's Guide, the information you may need for each lesson and some general things that may assist you in your day-to-day teaching is given.

We will start by:

- Explaining how the practical and theory textbooks work.
- Providing various best practices as per DBE booklets.
- Providing general tips, links and ideas that you can use.

After the general section, each module will focus on the following if available:

- Tips and ideas on presenting the specific information.
- Links to additional information.
- Links to websites for additional activities.
- Memorandum for the activities.

HOW THE TEXTBOOK WORKS

There are two textbooks for each grade, a theoretical textbook and a practical textbook, of which both are available in printed format as well as electronic format. The information in these textbooks are combined in learner-friendly topics, that are divided into chapters and units as per school term.

Teaching elements used in these textbooks are:

- Activities – provide opportunities to the learners to apply their skills.
- Additional information – information that the teacher can use to explain certain concepts to the learners that are not covered in the books.
- Animations and videos – used to explain specific concepts (only available in the e-books).
- Case studies – this can be used in class to support the information covered in the unit. The questions should be discussed with the learners in class or can be given as an informal activity.
- Consolidation – a diagram showing the concepts that were taught in that chapter.
- Consolidation activities – a self-assessment covering the most important information and skills focussed on in the chapter.
- Did you know – boxes in the margin of the book containing information not covered in the main text, but important for the learners to know.
- Enrichment activities – optional activities for the learners to help them to better understand the work.
- Examples – the examples are step-by step procedures on various computing tasks and should be done together with the learners. It is strongly recommended that each learner does the activities on their own computers.
- Glossary – a summary of all keywords given at the end of each module.
- Guided activities – guided activities are practical tasks where you as the teacher guide the learners through the activity. The solutions to guided activities are given in the book.
- Examples – guided examples are practical examples where you as the teacher guide the learners through the example, teaching the valuable concepts. The solutions to guided activities are given in the book.
- New words – definitions of important words or terms.
- Overview – a summary of the Units to follow.
- Learning outcomes – a description of what is covered in the chapter as relevant to CAPS.
- QR codes – it provides the learner with links to optional videos or additional reading materials. Learners must have a QR reader on their phones to read these codes.

- Take note – additional information for the learner to aid in further understanding.
- Theoretical activities – provide learners the opportunity to recap, review and reinforce what they have learnt. These activities are mainly theoretical activities but may include group or pair projects as well as research activities.
- Videos – provides step-by step procedures – only available in the e-books.
- Vocabulary – keywords and phrases the learner needs to understand before going through the text.

BEST PRACTICES – LESSONS FOR THE CLASSROOM

The following information was obtained from a study that was done for the DBE on Successful teaching and learning in information technology – Best practices in the classroom.

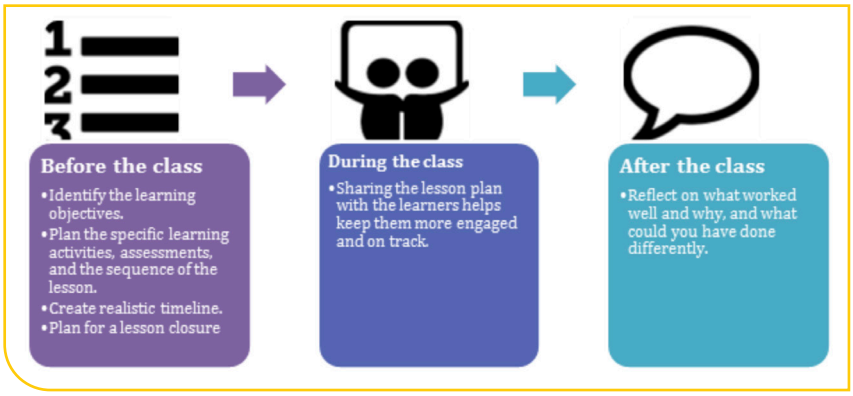
PLANNING

Although the curriculum or CAPS tells you WHAT you will be teaching, and in which SEQUENCE you should teach it, it does not explain HOW you should teach it or which TEACHING STRATEGIES you should apply.

That is where proper and detailed planning of each lesson comes in, breaking up the instruction into small enough chunks of information so that the learners can link it to existing knowledge and synthesise the new knowledge into their understanding.

Planning addresses and integrates the following three key components:

- Learning objectives.
- Learning activities.
- Informal assessment to check for learner understanding.



When doing your planning, it is important that you look at the bigger picture.

The following provides guidelines for effective planning:

- Start with the end in mind – What does the learner need to know and be able to do? Learning goals and objectives.
- Identify curriculum resources – e.g. textbook – does the textbook provide everything needed to achieve the learning goals or does one have to develop/find additional content or activities? What other resources will be needed, e.g. previous papers?
- Identify declarative knowledge – Think about the concepts and ideas learners will need to know. What are developmentally appropriate given the learners' background knowledge and prior learning?
- Identify procedural knowledge – Skills, strategies and processes. Procedural knowledge incorporates the use of declarative knowledge.
- Create, find and select learning activities and assignments – activities are the instructional strategies that allow teacher and learner to interact with content, skills and materials. The goal of classroom activities is to help learners to interact with new knowledge and skills, deepening learner understanding and raising skill levels related to the learning goal(s). Activities often require teacher coaching or guidance. When planning classroom activities, start by selecting the instructional strategies that allow learners to process critical information or vocabulary associated with the learning goals first, i.e. which subject terminology or concepts will be introduced, and when?

ASSESSMENTS

Assessment drives instruction and learning by providing relevant information on the learners' progress and performance. Its main purpose is to support and improve further learning by incorporating artefacts, illuminating various processes, checking in at multiple waypoints and placing value on multiple ways of knowing.

To make sure that tests and examinations are applicable to all learners, you should use Blooms Taxonomy as described below according to the DBE's SBA tasks booklet.

Teachers who are successful also analyse mistakes made by the learners in tests and examinations to inform teaching and to follow-up through improvement strategies.

COGNITIVE LEVELS OF LEARNERS (BLOOMS' TAXONOMY)

The cognitive demand of a question refers to the type and level of thinking learners need to successfully engage with and answer a question.

- High cognitive questions are those which demand that the learners manipulate bits of information previously learnt to create and support an answer with logically reasoned evidence. This sort of question is generally interpretive, evaluative, inquiry-based, inferential, synthesis-based and open-ended.
- Lower cognitive questions are more basic. They ask learners to recall material previously presented and learnt. These questions are generally direct, closed, recall-related and that measure knowledge only – factual and process.

Bloom's revised taxonomy illustrates the different cognitive levels.

COGNITIVE LEVEL		COMMENT	CONTEXT
C1	Knowledge Recall of factual/process knowledge in isolation, i.e. one step/set of steps/ instruction/ process at a time	Requires recalling or recognising only. Practised or learnt the isolatable bit, e.g. fact/skill/ process/steps before.	Exactly the same context as a textbook example or a classroom-based exercise. Explicitly part of the curriculum.
C2	Understanding Convert from one form of representation to another.	Requires knowledge and understanding of steps/process/ isolatable bits. Translating 'words', pictures, symbols, diagrams into e.g. programming code.	Familiar context. Includes interpreting, exemplifying, classifying, summarising, inferring, comparing and explaining.
C3	Application Using known routines/steps/ processes to complete a task. All the information required is immediately available to the learner.	Requires knowledge, understanding and use of steps/ routines/ processes. Application of appropriate abstraction without having to be prompted…and without having to be shown how to use it in a familiar context.	Familiar context but with new elements / new circumstances. Learners have seen the same or very similar steps working with different data or other circumstances.

COGNITIVE LEVEL		COMMENT	CONTEXT
C4	Analysis Understand how parts relate to a whole (pinpoint the core/main aspects) or interact with each other and use appropriate methods to complete task/solve problem.	Requires reasoning/ investigation/ developing a plan or algorithm; has some complexity. Completing task could have more than one possible approach. Organising component parts to achieve an overall objective.	New context. Unseen, unfamiliar problems or tasks.
C5	Evaluation Judging or deciding according to some set of criteria, generally without real right or wrong answers	Requires weighing possibilities, deciding on most appropriate. Testing to locate errors.	
C6	Create Putting elements together to form a coherent or functional whole or re-organising elements into a new pattern or structure.	Requires familiarisation with the task by exploring different approaches and interpreting and analysing relevant approaches. Generalisation.	Novel situation. The learner has no familiarity with completed functional whole.

In IT, the above cognitive levels are collapsed providing for lower-order, middle-order and higher-order levels.

	LOWER ORDER C1	MIDDLE ORDER C2 & C3	HIGHER ORDER C4, C5 & C6
Theoretical	Recall (Knowledge)	Understand and apply	Analyse, evaluate and create
Practical	Routine procedures (Knowledge/Remembering)	Multi-step procedures (Understanding/Applying)	Problem-solving (Analysing/Evaluating/Creating)
Weighing	30%	40%	30%

Cognitive demand describes the type of thought process that is required to answer a question and is not necessarily the same as the level of difficulty of a question, such as the difficulty of the content knowledge that is being assessed.

DIFFICULTY LEVELS

As per the same booklet, the difficulty level of a question refers to the ease with which a learner is able to answer a question. It is described as follows:

LEVEL	DESCRIPTION
1	Easy to answer
2	Moderately challenging
3	Difficult to answer
4	Very difficult (It allows high achieving learners to excel above the others)

The difficulty level of a question is influenced by one or more of the following:

- The content (subject, concept, facts, principles or procedures), e.g.
  - Content that is learnt in Grade 12 and that is repeated and practised in Grade 11 and 12 usually becomes easier by Grade 12.
  - The number of steps required, or the length of the answer could influence difficulty.
- Stimulus (item or question)
  - The language, text or scenario used could influence difficulty.
  - Re-read required or limited time could influence difficulty.
- Task (process)

PRACTICAL ASSESSMENT TASK (PAT)

PAT forms an important part of the learners' learning experience as it consolidates the content done throughout the year and helps learners to make connections and see the relevance of what they learn. The DBE is providing guidelines for PAT each year. These guidelines are usually sent out to schools by the district or provincial IT advisor.

EXAM PREPARATION – TIPS FOR THE TEACHER

Following are some tips on what you can do to prepare your learners for their exams.

- Prepare ahead and make sure that you have an organised schedule covering all the revision work throughout the year. Do not wait till the last minute and then try to cram everything in before the exam. This will also give you the time to include a wider variety of activities to keep the learners' interest.
- Make sure that the learners know and understand what to expect in the exam. This does not only refer to the content of the exam, but also to what is expected of them with each section of the exam. This means they must know how to read and answer multiple choice questions, long questions, true/false questions, etc.
- Narrow the topics down as much as you can so that learners have a clear view of what to expect in the exam. You can even give them a list of topics that they can focus on – even if it is a list of all the topics they covered throughout the year. A list helps them to focus as they can tick items off as they go through the work.
- Make sure that the learners do the work during this period and not you. The more involved they are, the better they will learn.
- Keep your revision activities interesting and use a variety of activity types such as quizzes and other review games. It is here where you can use tools like Kahoot! or Google Quiz with great success. You can also have learners write quizzes for each other as they engage much deeper with the content when they have to write a quiz.
- Teach the learners exam techniques and the meaning of specific keywords that may be used in an exam.

THEORETICAL PAPERS

CLUE WORD	WHAT YOU NEED TO DO	EXAMPLE
Analyse	Separate, examine and interpret	Analyse the correct use of word processing features in the following screenshot:
Categorise	Group concepts/ideas that are similar/have the same characteristics/functions or belong together. How should things be organised	Categorise the following computer devices: keyboard, CPU, printer, mouse, hard drive, SSD according to their main function.
Classify	Divide into groups or types so that things that are similar, are in the same group	Classify the following list of computer devices as input, output or storage devices
Comment on	Write generally about	Comment on the use of a wireless network in the following case:
Compare	Point out or show both similarities and differences between things or concepts. Note that stating the same fact in opposite form, will not earn you another mark.	Compare ROM with RAM
Contrast/ Distinguish	Explain what the difference between certain things are.	Contrast ROM and RAM or Distinguish between a PAN and a HAN

THEORETICAL PAPERS ...*CONTINUED*

CLUE WORD	WHAT YOU NEED TO DO	EXAMPLE
Define	Give a clear meaning of the concept.	Define phishing.
Describe	State in words (using diagrams where appropriate) the main points of a structure or process.	Describe phishing.
Diagram	Make or draw a diagram.	Diagram a generic ICT system.
Differentiate	Use differences to qualify categories.	Differentiate between ROM and RAM.
Discuss	Give a clear, detailed description of the focus topic.	Discuss the use of a PAN in a home office.
Elaborate	Explain in detail	Elaborate on the advice given to Mr X regarding buying a laser printer.
Evaluate	Express an opinion based on your findings	Evaluate the merit of buying computer X for person Y
Examine	Give a clear, detailed description of the focus topic.	Examine the two methods
Explain	Give a clear, detailed description of the focus topic.	Explain how phishing works.
Identify	Name the essential characteristics	Identify the port used to connect the printer.
Illustrate	Give examples to demonstrate or prove something.	Illustrate the information processing cycle.
Interpret	Give the intended meaning of	Interpret the tone of the email message given below: I hate you when you do this J
Justify	Give clear, detailed reasons for taking a particular position.	Justify the use of a table instead of tab stops in the following instance:
List	Write a list of items, with no additional detail.	List the types of information sources one could use when doing research.
Motivate	Provide a reason or justification for an answer or statement	Motivate the use of line and paragraph spacing when working in Word.
Name/ Mention	Write a list of items, with no additional detail.	Name one storage device.
Outline	Give a general summary. It should contain a series of main ideas supported by secondary facts. Show the organisation of the idea.	Outline the information processing cycle.
Order	Provide a chronological or value-based answer by listing several items (terms or events in correct sequence).	Order the storage media according to their capacity
Prove	Show by using an argument or logic or fact that something is true.	Prove that the majority of people like X by looking at the following survey results:
Relate	Show the connection between things, indicating how one causes or is like another	Relate the following terms and explanations:
Review	Give a survey or summary in which you look at the important parts or major points and criticise if necessary. Comment on what is given.	Review Mr X's monthly computer maintenance tasks.

THEORETICAL PAPERS ...*CONTINUED*

CLUE WORD	WHAT YOU NEED TO DO	EXAMPLE
State / Give	Write down information without discussion.	State the functions of the operating system.
Suggest / Recommend	Give your opinion and back it up with facts, reason or an explanation.	Suggest a computer configuration for Mr X.
Summarise	Give a brief, condensed description of the main ideas. Like developing an abstract.	Summarise the problems experienced in the following case:
Trace	Follow the development, progress or history of something, normally from the point of origin, typically in chronological order.	Trace the error in the spreadsheet calculations.

PRACTICAL PAPERS

CLUE WORD	WHAT YOU NEED TO DO	EXAMPLE
Call	Activate a function/method/routine in a program. Similar to invoke.	Call the function/method that will test if a word is a palindrome.
Change	Modify or adjust a structure or program/ program segment according to specific criteria or to produce a different outcome.	Change the loop structure so that it will stop when the user enters 'stop'.
Code	Write program code to accomplish a task. Could be similar to create or develop	Code a Scratch solution to calculate the cost for tiling a specific area.
Complete	Use the code given and finalise a program/ program segment to produce specific output or outcome or add code to finally accomplish a task.	Complete the Scratch program to provide the following output.
Correct	Find the error, often through tracing, then change it to implement a program/program segment correctly	Correct the loop structure so that it will provide the correct output
Create	Write your own program from the problem statement/description given. Analyse, plan and produce a complete program/ program segment from a problem statement by combining elements ('building blocks') in the correct sequence and way to devise algorithm, solve a problem or satisfy a problem statement or produce the required outcomes.	Create a program that will solve the following problem: Convert a fraction to its simplest form, e.g. 8/36 to 2/9
Debug	Find and remove errors in a program/program segment. Similar to correct.	The following code is supposed to determine the average of 10 numbers but is not giving the correct output. Debug the program.
Develop	Plan, write and implement program code Similar to create.	Develop a Scratch program to convert Astronomic Units (AU) to miles and kilometres.
Execute	Run an existing program.	Execute the program and determine if the output is correct

PRACTICAL PAPERS...*CONTINUED*

CLUE WORD	WHAT YOU NEED TO DO	EXAMPLE
Generate	Produce code or code segment(s) to solve a problem or perform a task. Similar to develop or create.	Generate Scratch code to calculate the VAT and the final price of a product.
Implement	Put into effect or activate. Add to existing code to improve/add functionality.	Implement the following function/method/code segment to extend the function of the program.
Invoke	Call or activate a function/method or sub-routine	Invoke a function/method that will validate the ID number entered
Re-factor	Rewrite existing code to make it better or more usable or improve the structure. Change existing code to accommodate added functionality	Re-factor the method/function to provide for the following additional functionality
Rewrite	Transform from one format/approach to another or to correct code or to implement a better/more effective solution or different method to accomplish a task.	Rewrite the program representation in the flow chart as a Scratch program
Trace	Follow the development, progress or history of something, normally from the point of origin, typically in chronological order or in the same sequence it is executed or implemented.	Trace the error in the program
Write	Code a computer program/program segment to perform a specific task or solve a problem	Write a function/method/ set of instructions that will round off a number to 1 decimal place.

- Give the learners various ideas on how to study based on the different learning styles, i.e. visual (read and write), auditory or kinaesthetic. There is a quick quiz that learners can do on their own to determine their learning styles: https://www.thestudygurus.com/learning-styles/
- You can refer to the following link to get ideas on how the various types of learners should study to get the best results: https://www.gavilan.edu/tutor/documents/StudyTipsforDifferentLearningStyles_000.pdf

LEARNING STYLES...*CONTINUED*

The term learning styles refers to the understanding that every student learns differently.

- Visual learners learn best through what they see and should use graphs, diagrams, mind maps and other graphical methods to learn.
- Auditory learners learn through what they hear and remember most things that teachers said in class. They should use audio and video clips or discuss or recite the information with someone.
- Read and write learners focus mostly on interacting with the text. They learn best by reading information and writing it out in their own words. They also learn by answering quizzes in writing as well as from annotated notes.
- Kinaesthetic learners learn by experiencing things and learn best by doing, using models, playing memory games, etc. They also learn by writing things down.

EXAM PREPARATION - GENERAL TIPS FOR THE LEARNERS

The following general notes and tips on how to prepare for exams can be printed and given to the learners.

- Make yourself a schedule so that you will have enough time to study. Do not leave everything until it is too late to study properly.
- Make sure that your study area is organised. Chaos distracts the brain from what it should be focussing on.
- Have all your materials ready before you begin studying – pencils, pens, highlighters, paper, etc.
- Study smaller chunks of information at a time. You will remember them better and for a longer period of time. Trying to learn too much at one time will only result in a tired, unfocused and anxious brain.
- Use visual aids to study, for example, draw mind maps, flowcharts and diagrams to help you remember things better or explain your answers and the reasoning for giving that answer to somebody else.
- Focus on the core material as about 80% of most exams are likely to come from it. Going through old exam papers will help you determine what this is. It will not only help you to study better, it will also show you how exam questions are formulated, and which type of questions are asked.
- Revise new information within 24 hours after you learnt it. Any new information must be recapped, reviewed and reinforced within 24 hours, otherwise you will lose 80% of what you learnt.
- Organise study groups for the various subjects, but make sure that the group members are committed to their studies.
- Make sure that you take regular breaks as your brain loses focus after a while. The optimal time to study consists of periods of 2 hours, broken down into 25 minutes of studying followed by 5-minute breaks. Do not think or do anything study-related during your breaks. Take a walk outside. A change of scenery will stimulate your learning.
- Keep some healthy snacks to nibble on while you are studying. Natural, fresh and vitamin-rich food is good for improving your concentration and memory.
- Drink a lot of water while you are studying to make sure that you do not dehydrate. Staying hydrated is essential for your brain to work at its best.
- Plan the day of your exam beforehand, especially if you are studying at home. Make sure that you know how long it will take you to reach the school during that time of the day and add some extra time to make sure that you are not going to be late.
- Make sure that you sleep sufficiently (7 to 8 hours a night). Proper sleep turns what you learnt (short-term memory) into long-term memory.

STUDY SKILLS TO BOOST YOUR LEARNING

Mobile notes

Mobile notes are excellent tools for learning all the key concepts in the study guide. Mobile notes are easy to make, and you can take them with you wherever you go:

- Fold a blank piece of paper in half. Fold it in half again. Fold it again.
- Open the paper. It will now be divided into 8 parts.
- Cut or tear neatly along the folded lines.
- On one side of each of these 8 bits of paper, write the basic concept.
- On the other side, write the meaning or the explanation of the basic concept.
- Use different colours and add pictures to help you remember.
- As you learn, place the cards in 3 different piles:
  - I know this information well.
  - I am getting there.
  - I need more practice.
- The more you learn them, the better you will remember them.

Mnemonics

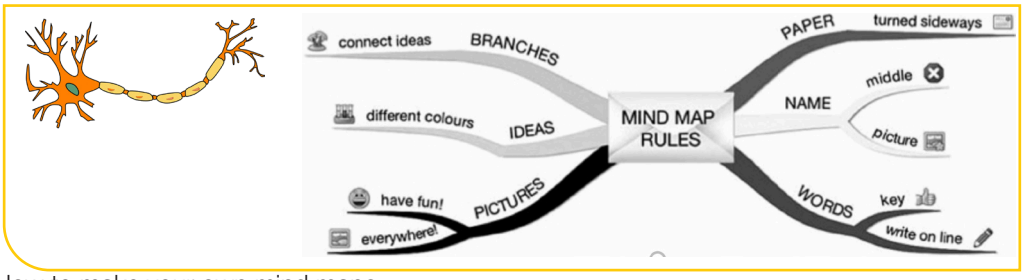
A mnemonic code is a useful technique for learning information that is difficult to remember. This is an example of a word mnemonic using the word BALANCE where each letter of the word stands for something else:

- B – Best – doing your best is more important than being the best.
- A – Attitude – always have a positive attitude.
- L – Load – spread the load so you do not leave everything to the last minute. Use a study timetable to plan.
- A – Attention – pay attention to detail. Only answer what is required.
- N – Never give up! Try, try and try again!
- C – Calm – stay calm even when the questions seem difficult.
- E – Early – sleep early the night before your exam. If you prepare well you will not need to cram the night before.

Mnemonics are code information and make it easier to remember. The more creative you are and the more you link your 'codes' to familiar things, the more helpful your mnemonics will be.

Mind maps

Mind maps work because they show information that we have to learn in the same way that our brains 'see' information. As you study, add pictures to each of the branches to help you remember the content. Make your own mind maps as you finish each section.



How to make your own mind maps:

- Turn your paper sideways so your brain has space to spread out in all directions.
- Decide on a name for your mind map that summarises the information you are going to put on it.
- Write the name in the middle and draw a circle, bubble or picture around it.
- Write only key words on your branches, not whole sentences. Keep it short and simple.
- Each branch should show a different idea. Use a different colour for each idea. Connect the information that belongs together. This will help build your understanding of the learning areas.
- Have fun adding pictures wherever you can. It does not matter if you cannot draw well.

ON THE DAY OF THE EXAM

This section is provided by the Department of Basic Education.

- Make sure you have all the necessary stationery for your exam, i.e. pens, pencils, eraser and calculator (with new batteries).
- Go to the toilet before entering the exam room. You do not want to waste valuable time going to the toilet during the exam.
- Use the 10 minutes reading time to read the instructions carefully. This helps to 'open' the information in your brain. All questions are compulsory, unless indicated otherwise, but you do not have to answer them in order. Start with the question you think is the easiest to get the flow going.
- Break the questions down to make sure you understand what is being asked. If you do not answer the question properly, you will not get any marks for it. Look for the key words in the question to know how to answer it.
- Try all the questions. As each question has some easy marks in, make sure that you do all the questions in the exam.

- Never panic, even if the question seems difficult at first. It will be linked to something you have covered. Find the connection.
- Manage your time properly. Do not waste time on questions you are unsure of. Move on and come back if time allows.
- Check weighting – how many marks have been allocated for your answer? Do not give more or less information than is required.
- Write big, bold and clearly. You will get more marks if the marker can read your answer clearly.

STRUGGLING LEARNERS

You can support struggling learners by doing the following.

SCAFFOLD LEARNING TASKS OR ACTIVITIES

Scaffolding means that you break learning up into chunks and provide a tool or concrete structure for each. This can reduce the cognitive load of the instruction and support the struggling learner.

One of the first things you can do is to choose different activities for different groups of learners. For example, you can take a complex task and divide it into smaller subtasks. Together, these subtasks must achieve the same goal as the big task. After doing this, grade the activities or tasks, with the big task having the highest grading, and all the smaller tasks together having the same grading as the big task.

Have learners then choose whether they want to do the group of smaller activities or tasks or the one big activity or task. Advise struggling learners to do the smaller ones first and then challenge them to try the big one if they feel ready.

Getting the smaller activities or subtasks right could help the learners to feel competent. It allows them to always feel like they are working at a level of challenge that is hard but right for them and that they can accomplish. This will allow them to make much greater progress through learning environments.

Other ways to scaffold learning is to:

- Show and tell. Learners learn best by seeing rather than hearing about something.
- Tap into prior knowledge. You can do this by asking the learners to share their own experiences or ideas about something.
- Give them time to talk about what they learnt in a structured and controlled way.
- Teach them the vocabulary (subject jargon) before you teach them the content. You can do that by introducing the words with photos or in context of things they know and are interested in. You can also use analogies and metaphors to explain the words to them.
- Use visual aids like pictures, graphs, charts and diagrams or graphic organisers such as mind maps, concept maps or story maps.
- Check for understanding by discussing the content, pausing for a moment to let it sink in, and then asking a well thought out question.

BUILD IN AUTONOMY (CHOICE)

- See the principles of gameful learning below.
- Let the learner choose which activities are most relevant, challenging and interesting to them.

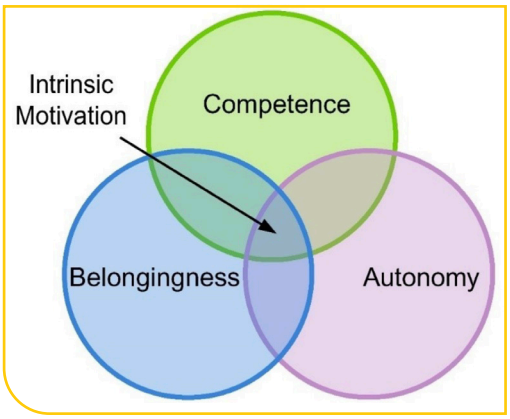
Following are the principles of gameful learning:

- Autonomy is critical, and this is the first of three principles that come from gameful learning.
- The next principle is a sense of belonging, and a really good game environment makes you feel like you are a part of something.
- The third principle is to support feelings of competence.

APPLY GAMEFUL LEARNING

Motivation plays an important role in learning and to be self-motivated, learners must:

- be able to make meaningful choices over what they are doing (autonomy)
- be challenged by a task, but still feel that that they can succeed (competence)
- feel connected to those surrounding them (belongingness).



Supporting these feelings could eventually lead to self-determination and learners becoming self-directed. Other research-based strategies for motivating learners include:

- becoming a role model for learner interest;
- getting to know learners;
- using examples freely;
- using a variety of learner-active teaching activities;
- setting realistic performance goals;
- placing appropriate positive emphasis on testing and grading;
- being free with praise and constructive criticism; and
- giving learners as much control over their own learning as possible (Bain, 2004; Nilson, 2003; DeLong & Winter, 2002). This element is also important when thinking about authenticity. If learners can learn ideas that are connected to their lives and produce representations of their knowledge in ways that matter, they are more motivated.

Gameful learning also relates to personalised learning that supports the notion that children learn best when their individual differences are taken into consideration. Personalised learning is based on the following three principles (Microsoft, 2014):

- It provides multiple means of representation.
- It provides multiple means of action and expression.
- It provides multiple means of engagement.

Another important principle of gameful learning is the freedom to fail (as seen with videogames): you can experiment, take risks and try things you have never done before, fail miserably…and do it again and again until, after much practice, you get it right. Unfortunately, this will not work in all classrooms as it requires a significant amount of grading to manage, and it can hinder the ability to keep a cohort on a specific content progression. But when you can structure learning opportunities in this way, learners' motivation to engage increases, and their learning outcomes improve.

LEARNER EXPERIENCE

Learners:

- respect and value teachers that are positive, enthusiastic about the subject, supportive and have access to a wide range of teaching aids:
- enjoy engaging, interactive and communicative teaching methods;
- value choice and classes that encourage independent learning and learner autonomy.
- want to understand what they are expected to learn – what they are learning, why they are learning it and what quality work looks like.
- enjoy things that interest them.

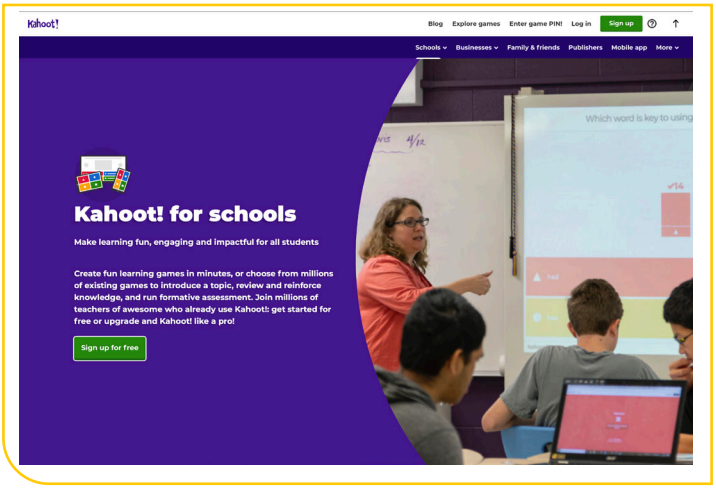
GENERAL TIPS, LINKS AND IDEAS

This section gives you various tips, ideas and links to interesting and/or informative websites.

KAHOOT!

Kahoot! is a free eLearning tool that can be used to create fun learning games, quizzes, surveys or discussion questions, called a Kahoot, in minutes. This can be used to teach, reinforce, assess or share information with learners.

Link: https://kahoot.com/



You can use Kahoot! in your classroom for the following reasons:

- As a class starter or ice breaker.
- To help learners with keywords, terminology or definitions.
- To assess learners' understanding of a subject before or after they learnt about it.
- To zero in on the needs of individual learners by getting a detailed report of which learner missed, which questions.
- To direct classroom activity by organising small groups.
- To review for a test or exam.
- To end a class with Kahoot notes, a quick quiz or formative assessment.
- By encouraging learners to create their own kahoots, the content is reinforced.
- To help learners learn information in a sequential order.

HOW TO USE KAHOOT!

It is easy to use Kahoot!

- To get started, go to the https://kahoot.com/ website and create a free account.

- Use a public kahoots or create your own.

By watching the following video, you can learn how to use Kahoot!

Link: https://www.youtube.com/watch?v=de7G0WioH8E

GOOGLE QUIZ

The Google Quiz is an online assessment tool that will self-mark learners' attempts and give feedback to teachers and learners.

The quiz can be done on desktop or mobile computers and learners need to have access to the Internet. Teachers will provide learners with the link to the quiz (as a URL or QR code).

The platform allows for:

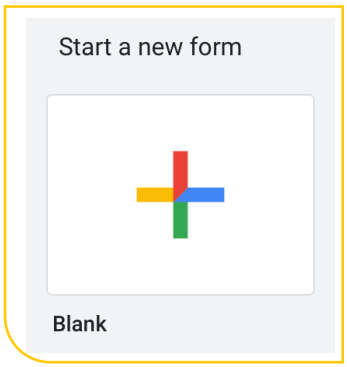
- Learners getting instant feedback to the answers.
- Teachers getting a full report on the performance of the learner.
  Link: forms.google.com

To learn more on how to use google forms to create quizzes, watch the following video.
Link: https://www.youtube.com/watch?v=Pdt8Vv7-3Xk

For a more detailed explanation, you can use the following link.
Link: https://www.youtube.com/watch?v=ayvhVM2BMv0

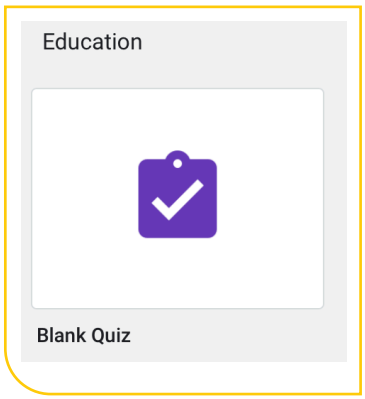
To create a new quiz:

1. Go to forms.google.com.
2. Click on Blank to open a new form.



To create a new quiz from Google Drive:

1. Click New, hover over More and click on the Google Forms arrow.
2. Click on From a template.
3. Scroll to the bottom and click Blank Quiz.

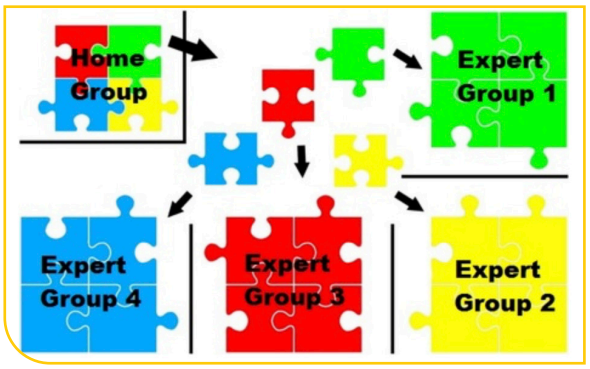


PUZZLEMAKER

You can use the following link to create crossword puzzles step-by-step.
Link: http://puzzlemaker.discoveryeducation.com/CrissCrossSetupForm.asp

JIGSAW ASSESSMENT TECHNIQUE

The cooperative learning strategy known as the jigsaw technique helps learners create their own learning.



To facilitate this, teachers arrange learners in groups. Each group is assigned to research a different topic. Group members then join with members of other groups and share the research about the information.

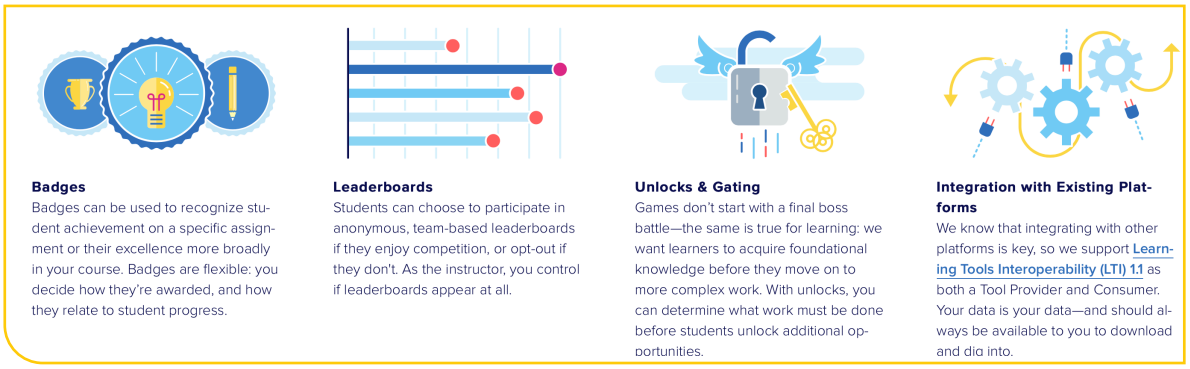
Afterwards, learners must complete a post-assessment questionnaire.

GRADECRAFT

Gameful learning is an educational tool based on the principles that work so well in games, applied to the learning environment. It is about taking elements from games and applying them to non-game settings.

To learn more about the principles upon which gameful learning is based, you can go to the following website: Gameful pedagogy – http://www.gamefulpedagogy.com/

Following are some of the tools you can use from Gradecraft.



Badges
Badges can be used to recognize student achievement on a specific assignment or their excellence more broadly in your course. Badges are flexible: you decide how they're awarded, and how they relate to student progress.

Leaderboards
Students can choose to participate in anonymous, team-based leaderboards if they enjoy competition, or opt-out if they don't. As the instructor, you control if leaderboards appear at all.

Unlocks & Gating
Games don't start with a final boss battle—the same is true for learning: we want learners to acquire foundational knowledge before they move on to more complex work. With unlocks, you can determine what work must be done before students unlock additional opportunities.

Integration with Existing Platforms
We know that integrating with other platforms is key, so we support Learning Tools Interoperability (LTI) 1.1 as both a Tool Provider and Consumer. Your data is your data—and should always be available to you to download and dig into.

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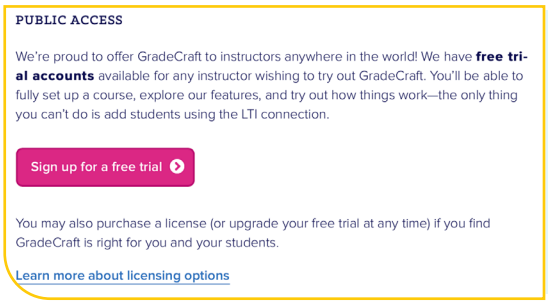
Link: https://www.gradecraft.com/

To sign up with Gradecraft, click on the pink button.

Although it is not a free tool, you can try it out on a free trial basis.



Go to the following YouTube video to listen to an interesting presentation on gameful learning:
Link: https://www.youtube.com/watch?time_contimue=391&v=k)NaJpQbwA0

GENERAL TIPS [H3]

The following are just some general tips that you may want to apply:

- Ensure that you have additional examples other than what the textbook provides to illustrate concepts.
- Encourage learners to compare the world they know today with 30+ years ago - communication, work, family etc. If they explain something clearly with examples, they can often get good marks - e.g. communication using ICTs is much faster than sending a letter by post.
- Teach them the vocabulary (subject jargon) before you teach them the content.
- Read and follow tech blogs (teacher and learner) to stay up to speed with new developments, etc.
- Read and follow http://www.techteachers.co.za/
- Read http://www.techteachers.co.za/category/successful-teacher/ to see what makes a good teacher.
- Become part of the C.A.T and I.T. Teachers group on Facebook https://www.facebook.com/groups/cat.it.teachers

ADDITIONAL RESOURCE SITES [H3]

The following links refer to sites that you can use for additional information on CAT.

- http://www.techteachers.co.za/
- www.gcflearnfree.org/subjects/technology
- www.bbc.com/education/subjects/zqmtsbk
- www.bbc.com/education/subjects/z34k7ty
- www.lifewire.com/
- thenextweb.com/
- toplink.weforum.org/knowledge/explore# (free registration)
- support.office.com/en-us/office-training-center
- www.gcflearnfree.org/subjects/office/

ADDITIONAL ACTIVITIES AND EXAM PAPERS

Various additional activities are provided on the following links or on the DVD at the back of this guide.

- http://www.techteachers.co.za/practical-revision-activities-grades/
- http://www.ecexams.co.za

DATABASE MANAGEMENT

CHAPTER 1

CHAPTER OVERVIEW

The following learning outcomes are covered by this chapter:

- provide an overview of data collection
- provide examples of data collection
- describe data warehousing
- compare data warehousing with database
- describe data mining and provide examples
- describe the processes of data mining
- describe how data should be cared for and managed.

GRADE: 12 **DATE:** **TEACHING TIME:** 4 hours

Resources	Each learner should have access to: • IT 12 Theory Book • QR Code Reader
Vocabulary	Learners will need to understand the following terms for this chapter: • data warehousing – data warehouses and databases are similar in that they are both relational data systems • database – a database is an organised collection of data, generally stored and accessed electronically from a computer system • data mining – a process used to identify trends and patterns between different sets of data in large databases • data capture – the action or process of gathering data, especially from an automatic device, control system, or sensor

INTRODUCTION

Revise database management with learners as a foundation for this unit.
Read and discuss the Did you know box. Ensure learners understand the concept before moving on to the activity.

Activity 1.1 Revision – Memorandum

1. Facts that can be analysed or used in an effort to gain knowledge or make decisions.
2. Collect, store, saved
3. Computers store data for a number of reasons:
   - data containing the instructions that a computer uses to function and run applications
   - data that is loaded into memory, RAM, that the computer is currently using in its applications
   - data storage allows users to keep information that they would like to access on the computer be it short-term or long-term
   - stored data can also contain data your applications need to use, such as data files or images.
4. A collection of data arranged for ease and speed of search and retrieval. Use your discretion for the example.
5. A database provides various functions that allow entry, storage and retrieval of vast quantities of information and provides ways to manage how that information is organised.
6. Database management software (DBMS) is the software responsible for managing a database. This includes creating the database and tables and managing data security.
7. Examples of popular database management software include: Microsoft SQL Server, Microsoft Access, MySQL and SQLite.

UNIT 1.1

Data collection

As a class, read through the information on page 2 and 3 of the Theory book. This information expands on the defintions of ICT and IT and explains them in a more detailed way. Check that learners are able to differentiate between these two terms and are able to provide an explanation including examples for each one.

Revise data collection with learners as a foundation for this unit. Read and discuss the Did you know box. Access the QR codes and the animation for further enrichment on this information. Ensure learners understand the concept before moving on to the activity.

Activity 1.2 Memorandum

1.2.1 Learners' own work. Assess their report to ensure understanding of the content.

1.2.2 Learners' own work. Accept all reasonable answers.

Activity 1.3 Memorandum

1.3.1 A web form, is an online interactive page that allows for user input. This page imitates a physical form that users need to complete. The problem with so much data being stored in databases <u>how to make sense of it and use it </>

1.3.2 Electronic tags transmit a radio frequency from the tag to a tag reader, or vica versa. It transmits the information to a computer program associated with the tag. Tags can be used to track or identify different items and are often used in merchandising warehouses, for vehicle tracking, pet tracking, and so on.

1.3.3
- **a.** True
- **b.** True
- **c.** True
- **d.** True
- **e.** False. A basic RFID reader will only scan the information stored on RFID chips and make them available to a computer.
- **f.** False Databases are important on websites where users create the content, since it is impossible for a data capturer to add this information manually.
- **g.** True
- **h.** True
- **i.** True
- **j.** True

1.3.4 Subtracting the amount paid from the amount owed on the customer's account.

1.3.5 Websites are set up so that any information entered by users are automatically stored in different databases and cookies are created and stored, keeping your data. For example, when you login into a site or your bank account the cookies keep those details and can login automatically from your smartphone.

1.3.6 Teacher discretion. Examples include, SIM card, tag machine, microchip in animal or food or books, payroll, order processing, reservations, employee records, accounts payable and accounts receivable

1.3.7
- **a.** Data is stored on cards, such as credit cards, store cards (for example, Jet or Edgars) and store loyalty cards (for example, Clicks ClubCard, Pick 'n Pay SmartShopper card). Some transaction tracking benefits include: consumer safety when it comes to purchasing toys, cars, food and medication, enhancing a user's on-site experience by tracking browsing history and demographic profiles, fraud detection, and so on.

b. RFID stands for radio frequency identification

c. RFID is used by thousands of businesses across the world. For example, RFID can be used to tag:

- all products stored in a warehouse. When an item is removed from the warehouse, it is automatically scanned and removed from the database.
- tools stored in a workshop. This allows the company to track which tools are being used, which employees are using them, and when the tools are returned.
- the tickets of people going to conferences, sports events or concerts. When a registered RFID chip arrives at the gate, the gates open automatically, and the data on the ticket is added to the database.
- the tickets of people using public transport. For example, the Gautrain uses RFID cards to allow people to board trains. The trip is recorded on a database, and the cost of the trip is subtracted from the user's balance.
- all products sold in a shop. When an item is purchased, the RFID tags are scanned and the details about the product are retrieved and added to the bill. The item can then also be removed from the shop's inventory automatically.

1.3.8 Transaction processing means dividing information processing up into individual, indivisible operations, called transactions, that complete or fail as a whole

1.3.9 Consumer safety when it comes to purchasing toys, cars, food and medication, enhancing a user's on-site experience by tracking browsing history and demographic profiles, fraud detection,

1.3.10 If a transaction is rolled back, it means that the intended transaction could not be completed successfully, for example, when money is subtracted from one account, then transferred from starting bank to another bank over the internet, but before the destination account the connection is broken. This causes all the transactions to be rolled back.'

1.3.11 A complete roll-back is important as it ensures incorrect transactions are not allowed to be completed.

1.3.12 Learners' own work. Accept all reasonable answers.

1.3.13 a. Location-based data is data that provides information about different things that can be shown on maps. It obtains the position of aeroplanes, tracking transport or stolen vehicles, personal positioning, satellites, traffic patterns, rhinos and even pets; all of which are based on input from geographic positioning systems (GPS).

b. Static location-based data includes data such as maps with roads, street names, shops, offices and other features, but also farming information, government buildings and assets, electric distribution networks with pylons and substations, military information and so on. Non-static information obtains the position of aeroplanes, tracking transport or stolen vehicles, personal positioning, satellites, traffic patterns, rhinos and even pets; all of which are based on input from GPS.

c. GPS

d. Location-based services (LBS) are services that use software applications together with the location-based databases to deliver a service such as finding the best route to a destination or shop

e. Weather applications, food ordering applications, car sharing services

f. Static location-based data includes data such as maps with roads, street names, shops, offices and other features, but also farming information, government buildings and assets, electric distribution networks with pylons and substations, military information and so on. Non-static information obtains the position of aeroplanes, tracking transport or stolen vehicles, personal positioning, satellites, traffic patterns, rhinos and even pets; all of which are based on input from geographic positioning systems (GPS).

g. Learner's own work. Answers could include things such as Google maps, UberEats, Uber, Facebook, Weather application, and so on.

h. Location based services (LBS) are services that use software applications together with the location based databases to deliver a service such as finding the best route to a destination.

UNIT 1.2

Data warehousing

Revise data warehousing with learners as a foundation for this unit. Read and discuss the Did you know box. Access the QR codes and the animation for further enrichment on this information. Ensure learners understand the concept before moving on to the activity.

Activity 1.4 Memorandum

1.4.1

a. A data warehouse is a system that combines data from many different sources within an organisation for reporting and analysis.

b. How does data warehousing store the data? Explain it in your own words.

c. Data can be created quickly and easily, without jumping between many tables. This makes the data easier to explore and identify trends.

d. No. A database stores current transactions and enables easy access to specific transactions for ongoing business processes.

1.4.2 This diagram shows how data warehousing is used to make data available for analysis. The data warehouse does not contain copies of the original databases, instead, it is a new database that is created to hold structured data from multiple sources. A data warehouse is usually opened to multiple people in different departments of a company. Each of these people can then access the data and use it to create graphs and reports useful to them.

1.4.3

DATA WAREHOUSING	DATABASE
A data warehouse stores a large quantity of historical data.	A database stores current transaction.
It enables quick and complex queries across all the data.	It enables easy access to specific transactions for ongoing business processes.

Read and discuss the Did you know box and case studies. Access the animations for further enrichment on this information. Ensure learners understand the concept before moving on to the activity..

Activity 1.5 Memorandum

1.5.1 Teacher discretion. Questions must relevant.

1.5.2 Describe how a business owner could you use the datasets to improve their decision making on the following topics:

- **a)** Looking at the data of the number of viewers per televisions show, including information on the time of day and the demographics of the people watching, they will know when women watch more TV.
- **b)** Sales information from Amazon, including sales information per product, per product category and per country can advise you as to the latest trending product and if yours suits the market.
- **c)** List of tweets from the past year, can indict trends in restaurants.

Activity 1.6 Memorandum

1.6.1

- **a.** Teacher discretion. How long is each tour? Which agent takes the most tours? When are the popular times for tours? What is the destination of the tours?
- **b.** Tourists
- **c.** Obtain access to the data. Extract the relevant data. Look for patterns in the data. Develop a strategy.
- **d.** To gain access to a database, which of the following options can you legally apply?
  - **i.** You can buy access to their database from a company.
  - **ii.** You could personally request access to the database.
  - **iii.** You could use a scraper or the website's API to record data directly from the site.

1.6.2 University of Pretoria

1.6.3 Extract the information, creating a new database that contains only the information relevant to you.

1.6.4 Senzo does every second trip.

1.6.5 Developing a strategy.

1.6.6 By decreasing the price of Gautrain tickets by 10%, you hope to increase the number of passengers by 20% over the next six months.

UNIT 1.4

Caring for and managing data

Data can be valuable for many different reasons. For example, online shopping websites can charge owners a fee for placing an advertisement of their house, used car or gym equipment on the website. However, the only way in which owners will be willing to pay this fee is if the database already contains many other products. To gather the data needed to sell these products, the website's creator can ask sellers to enter the important data for their products on the website, from where it is added to the database.

Activity 1.7 Memorandum

1.7.1 Choose the correct answer.

- **a.** C. The process in which you check whether the data is accurate.
- **b.** D. A manual technique that can be used to make sure that the data on a database is correct and accurate.
- **c.** B. A technique used for storing data from more than one database in a way that is secure, reliable and easy to retrieve.
- **d.** B. Unauthorised access
- **e.** A. Who made the changes? C. What did the user change? D. When did they make the changes?
- **f.** D. Errors in computer data that occur during writing, reading, storage, transmission or processing, which introduce unintended changes to the original data.
- **g.** A. Incorrect data entry

1.4.2 Metadata helps to connect data across business enterprises and makes finding data easier. Without metadata, accurate descriptions behind data, there is no real way of understanding what the data is, why it is there and where it is come from.

1.4.3 To ensure that data has not been corrupted or deleted, the database is checked at intervals against a perfect copy of it, called a parallel data set. If there are differences, it means that data was either corrupted or deleted.

1.4.4. To ensure that data has not been corrupted or deleted, the database is checked at intervals against a perfect copy of it, called a parallel data set. If there are differences, it means that data was either corrupted or deleted.

1.4.5.

- **a.** Teacher discretion in learner's explanation and ability to relate to the example. Data validation, data verification, data integrity checks, logging changes, data warehousing, access control, parallel data sets
- **b.** Logging changes, access control
- **c.** Data integrity refers to the reliability, accuracy and trustworthiness of data. This ties in with data security because uncorrupted data (integrity) is considered to be 'clean data' that stays unchanged throughout if lifecycle. It is important that a bank's database is safe.
- **d.** Yes, to check if data is corrupted or deleted.

1. Choose the correct answer.
   a. B. Backing up all the information on your personal computer.
   b. C. Data verification
   c. B. Data corruption, Incorrect data entry and Data loss.
   d. D. Data warehousing
   e. A. Online advertisers C. Database administrators
   f. B. Find, Extract and Store
   g. D. The location of a hotel.
2. a. False. Sample verification is when someone randomly selects a sample of data and manually checks it for systematic errors.
   b. False. Code for South Africa provides free access to databases of South African matric results.
   c. True
3. Note to teacher: Please instruct learners to delete this question.
4. Teacher discretion. Answers need to be relevant.
   a. Retail stores: Tag all products stored in a warehouse. When an item can be removed from the warehouse, it is automatically scanned and removed from the database.
   b. Train transportation systems: Users can use a pre-loaded tag to gain access to the train.
   c. Universities and colleges: Users can use a pre-loaded tag to gain access to the campus.
   d. Medical hospitals: Nurses can use their tag to gain access to medication prescribed by the doctor.
5.

STRATEGY	IS IT A SMART STRATEGY?	EXPLANATION FOR ANSWER
Show car adverts on TV between 10 P.M and 12 P.M.	No	It is not specific or measurable
Sell airtime in clothing stores like Edgars and Woolworths for the next three months to see if it increases clothing sales.	Yes	Its specific, measurable, achievable, relevant and time-bound
Use flyers to advertise a new store opening in a mall, so that people will go and shop at the mall more and increase mall sales by 30% before the store opens.	No	It is not specific about the flyers, where will they be distributed and when

6. Loyalty cards to gain points with each purchase at that retailer. The points entitle the customer to benefits.
7. a. She can see where there is a market for her bakery.
   b. To conduct research on what products the customers want.
   c. Data mining is a process used to identify trends and patterns between different sets of data in large databases. Selecting the right data from such large amounts of data (called big data) can help show trends and patterns between data sets, which can improve decision making dramatically. For example: Marketing: Data mining is used to explore increasingly large databases to improve market segmentation. By extracting data like customer age, gender, tastes etc. and looking for patterns and trends between them, it is possible to guess their behaviour in order to direct personalised loyalty campaigns. Data mining in marketing also predicts which users are likely to unsubscribe from a service, what interests them based on their searches, or what a mailing list should include to achieve a successful response rate.

DATABASE DESIGN CONCEPTS

CHAPTER 2

CHAPTER OVERVIEW	
Unit 2.1	Characteristics of a good database
Unit 2.2	Problems with databases
Unit 2.3	How to get rid of anomalies

The following learning outcomes are covered by this chapter:

- provide the characteristics of a good database
- describe the problems with databases
- explain normalisation and the process

GRADE: 12 **DATE:** **TEACHING TIME:** 10 hours

Resources	Each learner should have access to: • IT 12 Theory Book • QR Code Reader • Computer with Delphi IDE loaded onto it
Vocabulary	Learners will need to understand the following terms for this chapter: • **field** – a category that you want to record data for • **record** – the data that is captured in the table • **compulsory field** – hold a unique identifier for each record in the database • **unique identifier** – something that can be used to only identify a specific object or entity. Unique means there is only one of its kind

INTRODUCTION

Read and discuss the Did you know box and Vocabulary. Ensure learners understand the concept before moving on to the activity.

Activity 2.1 Memorandum

2.1.1 Databases are a collection of organised data. Databases are the single most important tool used to store data by pro-grammers and web developers. It can, for example, be used to store everything such as, the settings in an application, text on a website, graphics, status updates, personal messages and comments on social networks.

2.1.2 True

2.1.3
- **a.** tables
- **b.** record
- **c.** record
- **d.** primary
- **e.** current, warehouse
- **f.** relational

UNIT 2.1

Characteristics of a good database

Ensure learners understand the characteristics of a good database before moving on to the activity.

Activity 2.2 Memorandum

2.1.1 1 – D, 2 – B, 3 – E, 4 – A, 5 – C

2.1.2 There are many people involved with organising a well-run database:

- the developers design and develop the database to suit the need of the enterprise,
- the administrator checks the database for its usages, who is accessing it, provides access to other users, limits the security for the users, and any other maintenance work of the database, and
- the end users use the database and take the advantage of the database e.g. teachers and parents.

2.1.3

CHARACTERISTIC	DESCRIPTION
Accurate	This refers to the exactness of the data, it is true and correct. The data is not misleading or biased.
Consistent	This means that the data in one part of your database should not contradict or differ from the data in another database.
Current	The data needs to up-to-date. If you fail to keep your information current, you run the risk that it will no longer be relevant or accurate.
Complete	Incomplete data can cause the data to be difficult to use, outdated and misleading.
Relevant	There must be a valid reason to collect the data and at the right time; otherwise it could misrepresent a situation and cause inaccurate decisions.

2.1.4 Teacher discretion when learners refer to the scenario. Characteristics of a good database:

- The database should be strong enough to store all the relevant data and requirements.
- Should be able to relate the tables in the database by means of a relation e.g. an employee works for a department so that employee is related to a particular department. We should be able to define such a relationship between any two entities in the database.
- Data redundancy refers to storing the exact same data at different places in a database. Data redundancy increases the size of your database, creates integrity problems, decreases the efficiency of the database and can lead to database anomalies. Data should be stored in such a way that it should not be repeated in multiple tables.
- Database management system has a strong query language, this helps the user to retrieve and manipulate the data. If a user wants to see any specific data, he can apply filtering conditions to pull the data that he needs.
- Multiple users should be able to access the same database, without affecting the other user. For example, several teachers can work on a database update students' marks at the same time. Teachers should also be allowed to update the marks for their subjects, without modifying other subject marks.
- A single database provides different views to different users, it supports multiple views to the user, depending on his role. In a school database, for example, teachers can see the breakdown of students' marks; however, parents are only able to see only their child's report. Additionally, the parents' access would be read only. At the same time, teachers will have access to all the students' information and assessment details with the modification rights. But the database is the same.
- Data integrity refers to how accurate and consistent the data in a database is. Databases with lots of missing information and incorrect information has low data integrity.
- Data independence refers to the separation between data and the application (or applications) in which it is being used. This allows you to update the data in your application (such as fixing a spelling mistake) without having to recompile the entire application.
- Data security refers to how well the data in the database is protected from crashes, hacks and accidental deletion.
- Data maintenance refers to monthly, daily or hourly tasks that are run to fix errors within a database and prevent anomalies from occurring. Database maintenance not only fixes errors, but it also detects potential errors and prevents future errors from occurring.

Problems with Databases

Ensure learners understand the problems with databases before moving on to the activity.

Activity 2.2 Memorandum

2.2.1 Teacher discretion for the examples as they are subjective.

- Insertion anomaly: The database has been created in such a way that required data cannot be added unless another piece of unavailable data is also added. For example, a hospital database that cannot store the details of a new member until that member has been seen by a doctor.
- Deletion anomaly: The legitimate deletion of a record of data can cause the deletion of some required data. For example, deleting some of the patient's details can remove all the details of the patient from the hospital database.
- Modification anomaly: Incorrect data may have to be changed, which could involve many records having to be changed, leading to the possibility of some changes being made incorrectly.

2.2.2 Problems:

- Data redundancy: Data redundancy refers to storing the exact same data at different places in a database. Data redundancy increases the size of your database, creates integrity problems, decreases the efficiency of the database and can lead to database anomalies. Data should be stored in such a way that it should not be repeated in multiple tables. The family can be represented as one unit.
- Update anomaly: Data will be inconsistent If one entity is updated e.g. if the family address, the data capturer will need to change all four entities.
- Unable to represent some Information: the school cannot keep information about students who are on the waiting list as they do not have an account with the school.
- Deletion anomaly: closure of the account for one child will remove all data of the second child from the database.

UNIT 2.3

How to get rid of Anomalies

Ensure learners understand how to get rid of anomalies before moving on to the activity.

Activity 2.3 Memorandum

2.3.1 Normalisation is a systematic approach of decomposing tables to eliminate data redundancy and insertion, modification and deletion anomalies.

2.3.2 Changing your database so that the following requirements are met:

- each table must have a primary key
- each record should have single valued attributes/columns
- there should be no repeating groups of information

2.3.3

- Primary key: the field selected by the database creator to uniquely identify each record on a table. For example, each song in your music database might have a primary key field called "song_id".
- Alternative key: a field containing unique values that could be used as the primary key but is not currently set as the primary key e.g. the artist_id.
- Foreign key: the foreign key is defined in a second table, but it refers to the primary key or a unique key in the first table e.g. "type of music" that links the song to a specific table on examples of types of music table.
- Composite key: a combination of more than one field that uniquely identifies each record on a table e.g. song_id and artist_id.

2.3.4

AccountNo	Name	First subject	Second subject
542	Tafadzwa	English	Maths
543	Sipho	Science	ICT
544	Gift	ICT	Maths
545	Naledi	English	Science

2.3.5 Teacher discretion, each key field must be mentioned and an example provided.

2.3.6 Teacher discretion, students need to support their answers:
Primary key: Student name
Alternative key: Student phone
Foreign key: Teacher

1. a. B. Backing up all the information on your personal computer.
   b. C. Preventing errors from occurring in the database.
   c. C. Primary key
2. Teacher discretion for the student's designed table as an example, it must relate to the keys and answers must be supported.
   - Primary key: the field selected by the database creator to uniquely identify each record on a table. For example, each song in your music database might have a primary key field called "song_id".
   - Alternative key: a field containing unique values that could be used as the primary key but is not currently set as the primary key e.g. the artist_id.
   - Foreign key: the foreign key is defined in a second table, but it refers to the primary key or a unique key in the first table e.g. "type of music" that links the song to a specific table on examples of types of music table.
   - Composite key: a combination of more than one field that uniquely identifies each record on a table e.g. song_id and artist_id.
3. Normalisation rules are divided into the following normal forms:
   First Normal Form (1NF)
   For a table to be in the First Normal Form, it should follow the following 4 rules:
   - It should only have single valued attributes/columns.
   - Values stored in a column should be of the same domain.
   - All the columns in a table should have unique names.
   - And the order in which data is stored, does not matter.

     Second Normal Form (2NF)

     For a table to be in the Second Normal Form,
   - It should be in the First Normal Form.
   - And, it should not have Partial Dependency.

     Third Normal Form (3NF)
   - It is in the Second Normal form.
   - And, it does not have Transitive Dependency.

     This is an indirect relationship between values in the same table.

HARDWARE

CHAPTER 3

CHAPTER OVERVIEW	
Unit 3.1	Mobile technologies
Unit 3.2	Factors influencing performance of a computer
Unit 3.3	Motivate a typical computer system in respect of user requirements

The following learning outcomes are covered by this chapter:

- list the advantages and disadvantages of mobile technologies
- discuss the factors influencing the performance of a computer
- make better hardware buying decisions and make recommendations for specific scenarios.

GRADE: 12	DATE:	TEACHING TIME: 2 hours
Resources	Each learner should have access to: • IT 12 Theory Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher	
Vocabulary	Learners will need to understand the following terms for this chapter: • volatility – something unstable or changeable	

INTRODUCTION

Read and discuss the Take note box. Ensure learners understand the concept before moving on to the activity.

Activity 3.1 Memorandum

1.3.1 Flat-panel, monitor and LCD, gamepad, joystick, keyboard, microphone, mouse, printer, projector, scanner, speakers, USB thumb drive, CPU, Drive (e.g., Blu-ray, CD-ROM, DVD, floppy drive, hard drive, and SSD), fan, modem, motherboard, Network card, power supply, RAM, sound card, video card

1.3.2 Input devices include: touch screen, camera, scanner, microphone, mouse, keyboard, joystick, webcam, track ball

1.3.3 Teacher discretion. Students need to explain how computers have changed and list advantages and disadvantages.

Mobile technologies

Create a class discussion on mobile phones, their benefits and disadvantages, what apps learners use and how they can be helpful. Read and discuss the Did you know and Take note boxes and the case study. Ensure learners understand the concept before moving on to the activity.

Activity 3.2 Memorandum

3.2.1 a. True

b. False. The current trend shows that less desktops are sold than mobile devices.

c. True

d. False. Mobile computing constraints do refer to the disadvantages of mobile computers.

e. False. The more power a CPU uses, the more heat it generates.

3.2.2

	Advantages	Disadvantages
Smart phone	• Small and lightweight • Easy to carry around • Easy to keep on-hand • Can use them in any location • Comfortable to use without a desk • Battery life allows them to work without a power source • Can connect to mobile internet • Do not need additional accessories • Access to a large range of input devices • Can take advantage of location-based computing • Have applications designed specifically to simplify your life • Allow easy electronic communications	• Battery life: the processing power of a CPU is closely linked to the amount of electricity available to it. The more power your CPU uses, the more instructions it can complete. The problem for smart phones and tablets is that they have a limited amount of power stored in the battery, and this power generally needs to last the whole day. • A second major factor affecting mobile computers' performance is their ability to get rid of the heat they generate. The more power a CPU uses, the more heat it generates. As a result, any CPU running at full speed generates a lot of heat. On a desktop computer, the power is supplied to the CPU with a large power supply and the heat it generates is removed from the CPU using heat sinks and fans.
Laptop	• Computers have more ram and faster processing devices, making them better suited to tasks that require significant processing power. • Gaming and video editing functions • Lower power consumption	• Frequent upgrades • Higher price • Difficulty in customisation • Laptops are often stolen due to its heavy cost. The thieves may misuse the stolen business data or personal data that may prove to be very dangerous. • Health issues: prolonged use of laptop can cause RSI due to their flat keyboard and track pad pointing devices. The integrated screen of the laptop often causes the users to hunch for a better view that can cause neck or spinal injuries. • Durability: due to its high portability laptops are subject to more wear and tear.

3.2.3 Smartphone monitors can only display a limited amount of information. This makes it unsuitable to use applications that require a large amount of information to be shown (such as spreadsheets or word processing). Since the monitor is small, it needs to be held close to the user's eyes. While this works well when it is in a user's hands, it makes it difficult to use with a physical mouse and keyboard.

3.2.4 **a.** CPU-intensive programs

b. With regards to the CPU, a smart phone or tablet CPU is almost the same physical size as a desktop CPU. However, unlike desktop CPUs, these chips contain many components, including a CPU, GPU, LTE modem, Wi-Fi connector, RAM, Bluetooth connector and GPS tracker. On a desktop, each of these items are separate, which means each item can be more powerful.

c. Teacher discretion, answers need to be supported

UNIT 3.2

Factors influencing performance of a computer

Read and discuss the Did you know box and factors influencing performance of a computer. Possibly some of the learners in your class are gamers and would be able to give their opinion. Ensure learners understand the concept before moving on to the activity.

Activity 3.3 Memorandum

3.3.1
- **a.** B. Completes the general processing tasks of the computer
- **b.** D. Completes the graphics processing tasks of the computer
- **c.** A. It stores the BIOS, the motherboard's operating software
- **d.** D. Slow, long-term storage of data used on the computer.
- **e.** C. Connects computers to a network and the Internet.

3.3.2 1. – D, 2. – B, 3. – E, 4. – C, 5. – A

3.3.3
- **a.** A. All three
- **b.** D. The speed of the CPU is a direct measurement of how many instructions it can complete per minute.
- **c.** D. When watching multimedia over the network.

3.3.4
- **a.** True
- **b.** True
- **c.** True
- **d.** False. The CPU's clock speed indicates how frequently it will complete an instruction per minute.
- **e.** False. The CPUs ability to do multiple tasks determines how good it is.
- **f.** False. Data that the computer is using, is temporarily stored by the cache and RAM.
- **g.** False. Since the cache and RAM are both much slower than the computer's hard drive, this ensures that the CPU has access to the data it needs.
- **h.** False. If a computer's RAM capacity is too small, using the computer will become much slower as information needs to constantly be added to and removed from the cache.
- **i.** False. Your computer (or CPU's. cache is a longer form of memory, used to send and store all the information the CPU needs.
- **j.** False. Storage speed is important when opening a program or a large data file.
- **k.** True
- **l.** False. Network speed also affects the computer's performance. If the time to download a video is longer than the video time, the video will stutter if you try to play it on YouTube.
- **m.** False. The network speed will affect a computer's performance when downloading applications or games from the Internet.
- **n.** True
- **o.** False. A faster GPU will allow you to complete graphic processing much more quickly.

3.3.5
- **a.** CPU, GPU, RAM, Motherboard
- **b.** The speed of the CPU is a direct measurement of how many instructions it can complete per second. The more instructions it can complete, the faster the CPU and your applications run. This is closely linked to the CPU's clock speed (given in MHz or GHz), which indicates how frequently it will complete an instruction per second.
- **c.** If a computer's RAM capacity is too small, using the computer will become much slower as information needs to constantly be added to and removed from RAM.
- **d.** If a computer's RAM capacity is too small, using the computer will become much slower as information needs to constantly be added to and removed from RAM. This will be especially noticeable when switching between two open applications since the computer would need to remove all the previously open application's data from memory and replace it with the new application's data.

3.3.6 a. If a computer's RAM capacity is too small, using the computer will become much slower as information needs to constantly be added to and removed from RAM.

b. If a computer's HDD capacity is too small, using the computer will become much slower as information needs to constantly be added to and removed from RAM.

c. Slow network speed, lower computer capabilities, less storage

d. GPU completes the graphics processing tasks of the computer

3.3.7 a. Low network speed

b.
- Loading webpages or web applications
- Downloading applications or games from the Internet
- Downloading program updates from the Internet
- Copying large amounts of data over the network
- Watching multimedia over the network

c. Upgrade the speed of her network or Internet.

UNIT 3.3

Motivate a typical computer system in respect of user requirements

Read and discuss the Did you know boxes, case study and the examples of computer systems. Access the Animations to further enrich the information. Ensure learners understand the concept before moving on to the activity.

Activity 3.4 Memorandum

3.4.1 The Megatek Ryzen 7 Player 1+ Gaming PC
3.4.2 The MSI GS 65
3.4.3 Learners' own responses. Accept all reasonable answers.

Activity 3.5 Memorandum

3.5.1 Note to teacher: The number in the table should be from 1 – 10.
1 – B, 2 – D, 3 – A, 4 – C, 5 – D, 6 – A, 7 – B, 8 – D, 9 – D, 10 – B
3.5.2 Teacher discretion
3.5.3 Yes, need improved network speed, storage and CPU
3.5.4
- Mobility, which allows them to take their computers to meetings or home
- Battery life, which allows them to use their computers for extended periods of time without access to a power source
- Screen resolution, which allows them to view more information on a screen at a time
- Speed, since they business users are usually paid for the work they deliver, the computer should never decrease their productivity

3.5.5 processing power of CPUs and GPUs
3.5.6 The term power user is a general term that refers to people who use their computers to do advanced tasks. Examples of power users include computer programmers, web developers, video editors and graphic designers
3.5.7 Hardware configuration references the details and system resource settings allotted for a specific device.
3.5.8 Teacher discretion; to know what to do if something goes wrong or is faulty with your computer, to be able to improve the hardware configuration for your needs
3.5.9
a. Computer 1: Intel Core 13-7100 processor
Computer 2: AMD RYZEN 7 2700
Computer 3: Intel 8th generation
b. RYZEN and Intel 8th generation
c. Computer 2
d. Teacher discretion; CPU affects the speed and capabilities of the computer
e. Operating system is optional
f. Which computer would you suggest for the following users? Give reasons for your answers.
i. Computer 1
ii. A gamer: Computer 2
Power user: Computer 3
iii. Laptop

3.5.10 This is an optional activity and will benefit the learners by giving them further experience in computer systems. Teacher discretion as answers are subjective.

1. a. A. Memory clock speed
   b. A. CPU
   c. A. Smart phone
   d. D. Mainframe computer
   e. D. Mid-range desktop PC
   f. C. Central processing unit
   g. A. Storage space
   h. A. Bus system
   i. B. Desktop PC
   j. B. CPU speed and GPU processing power.
2. a. True
   b. True
   c. True
   d. False. Two of the most important requirements for a business user are mobility and battery life.
   e. False. The most important requirements for a power user are a lot of RAM, CPU speed and storage space.
3. 1. – B, 2. – N, 3. – A, 4. – O, 5. – E, 6. – F, 7. – G, 8. – H, 9. – I, 10. – D
4.

PERFORMANCE ISSUE		FACTOR
a.	Clarissa recently built a top of the range desktop computer, with all the best and most expensive components. But for some reason her computer's performance is very slow.	CPU
b.	Every time Jung Min opens an application his computer automatically closes any other open applications.	Memory capacity
c.	Kiva is a teacher and usually creates PowerPoint presentations from digital textbooks that are in a PDF format. Whenever she switches between the presentation and textbook to compare the two, her computer starts to lag and freeze.	Graphics processing ability
d.	Yves is a gamer who loves playing first-person shooter games. Whenever he plays online games, they load slowly and have reduced graphic quality.	Network speed
e.	All the applications on Mpano's computer slow down each time he opens a new application in the background.	Storage speed
f.	Whenever Nicolas copies files from his flash disk onto his computer's hard drive, his computer takes a long time to complete the copying process.	Bus performance
g.	Tsholofelo bought a brand-new notebook but noticed that whenever she tries to run Adobe products like Adobe Premiere her computer takes a long time to open it and it takes a long time to compile video files.	Memory capacity
h.	Imogen likes to play the latest racing games for titles like Dirt, Forza and Need for Speed. Her computer has an overclocked Intel i5 core processor, but her games perform very slowly when she tries to use high resolution settings, so she must use the lower game graphic settings.	Graphics processing ability
i.	Every time Martinique tries to install a new program on her computer, her computer starts to slow down significantly.	Storage speed
j.	Before Sean buys an album from a musician, he prefers to download the songs so that he can listen to them because it takes too long to stream them online.	Network speed

5. a. Laptop
   b. Business user, computer
   c. Gamer, computer

6. Power user, processing speed and RAM are important
7. Mobile computer, screen size and storage speed
8. a. GPU, increased graphic processing and speed
   b. CPU not being able to process and store necessary data
9. a. Computer A: 3.2 GHz Quad Core CPU with 4 MB cache
   Computer B: 3.6 GHz Dual Core CPU with 1 MB cache
   b. Each "core" is the part of the chip that does the processing work. Essentially, each core is a central processing unit (CPU). There is always only one processor chip. That chip can have one, two, four, six or eight cores. More cores are faster only if a program can split its tasks between the cores. Not all programs are developed to split tasks between cores. It is not about how many cores you are running, it is about what software you are running on them.
   c. Quad core as it has a higher cache
   d. Cache memory is computer memory that provides high-speed data access to a processor and stores frequently used computer programs, applications and data. It is the fastest memory in a computer, and is typically integrated onto the motherboard and directly embedded in the processor or RAM.
   e. Computer A as the graphics card can store 4GB
   f. Computer A: Windows Home 10
   Computer B: Ubuntu Linux
   g. Computer A as you need to pay for the software
   h. Multitasking: With multitasking, a single processor splits its time between different processes.
Multithreading: Multithreading completes the instructions for multiple different tasks inside the same program (called threads) by quickly switching between them.

TERM 1

CHAPTER 4

SOCIAL IMPLICATIONS

CHAPTER OVERVIEW	
Unit 4.1	Mobile technology
Unit 4.2	IoT – Technologies enabling the IoT and their impact on society

The following learning outcomes are covered by this chapter:

- describe the evolution of social networking and the effect on society
- list and discuss issues regarding privacy and information sharing

GRADE:	12	DATE:	TEACHING TIME:	2 hours

Resources	Each learner should have access to:
	• IT 12 Theory Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher

INTRODUCTION

Ensure learners understand the concept before moving on to the activity.

Activity 4.1 Memorandum

Learners discuss the following questions in small groups and give feedback to the class.

- How has your life changed over the last three years?
- Have your computer skills improve in this time?
- Do you feel more confident with computers than you used to be?
- Is ICT more interesting for you than it used to be?
- Do computers play an important role in your life?
- Have you considered continuing to learn about ICT after school?
- Are you excited about the future of ICT?

Read and discuss the Did you know boxes and case studies. Access the QR codes to further enrich the information. Ensure learners understand the concept before moving on to the activity..

Activity 4.2 Memorandum

4.2.1 a. Privacy
b. Cookies
c. General Data Protection Regulation

4.2.2 a. Teacher discretion, learners should answer yes and support with reasoning
b. Teacher discretion, learners should answer bad thing and support with reasoning
c. Teacher discretion, learners should answer yes and support with reasoning
d. Teacher discretion, learners should answer yes and support with reasoning
e. Teacher discretion, learners should answer yes and support with reasoning
f. Teacher discretion, learners should support answers with reasoning

Ensure learners understand the concept before moving on to the activity.

Activity 4.3 Memorandum

4.3.1 Provide learners time and resources to research at least three ways IoT impacts society. Each group presents their findings to the class.
4.3.2 Teacher discretion, learners should support answers with reasoning.
4.3.3 Teacher discretion, learners should support answers with reasoning.
4.3.4 Teacher discretion, learners should support answers with reasoning.

1. Mention any THREE mobile technologies that make life easier, how they have improved your life, and the danger of using this technology.
Teacher discretion, this needs to relate to the learner

2. Mention any THREE mobile technologies that make life easier, how they can improve a business, and the danger of using this technology.
Teacher discretion, this needs to relate to a business man

TECHNOLOGY	BENEFIT	RISK
Smart phone	• Small and lightweight • Easy to carry around • Easy to keep on-hand • Can use them in any location • Comfortable to use without a desk • Battery life allows them to work without a power source • Can connect to mobile internet • Do not need additional accessories • Access to a large range of input devices • Can take advantage of location-based computing • Have applications designed specifically to simplify your life • Allow easy electronic communications	• Battery life: the processing power of a CPU is closely linked to the amount of electricity available to it. The more power your CPU uses, the more instructions it can complete. The problem for smart phones and tablets is that they have a limited amount of power stored in the battery, and this power generally needs to last the whole day. • A second major factor affecting mobile computers' performance is their ability to get rid of the heat they generate. The more power a CPU uses, the more heat it generates. As a result, any CPU running at full speed generates a lot of heat. On a desktop computer, the power is supplied to the CPU with a large power supply and the heat it generates is removed from the CPU using heat sinks and fans.
Laptop	• Computers have more RAM and faster processing devices, making them better suited to tasks that require significant processing power. • Gaming and video editing functions • Lower power consumption	• Virus, adware, ransomware, phishing and email spoofing, pharming, spam • Frequent upgrades • Higher price • Difficulty in customisation • Laptops are often stolen due to its heavy cost. The thieves may misuse the stolen business data or personal data that may prove to be very dangerous. • Health issues: Prolonged use of laptop can cause RSI due to their flat keyboard and track pad pointing devices. The integrated screen of the laptop often causes the users to hunch for a better view that can cause neck or spinal injuries. • Durability: Due to its high portability laptops are subject to more wear and tear.

Tablet	• Portability • Light weight • A flexible screen (you can choose to place the screen in landscape or portrait.); • An attractive design; • Handwriting recognition; • Can be used as a GPS navigation device; • Offer the same functionality as a normal computer; • Gesture recognition; • Pen recognition; • XP-compatible regular applications can run on the tablet PC; • Handy for note taking; • You can connect a keyboard to a tablet computer • A multi-touch tablet permits you to interact with all the subject matter material quickly; • Audio recording; • Connection to the Internet • Longer battery lifetime	• Hardware is prone to damage; • Traditional keyboards are much more comfortable; • The screen size is small • Higher cost; • Does not come with optical drives for use with CDs or DVDs; • Potential screen damages and repair costs • Difficulties to work on the small screen as compared to larger screen size of the laptops; • Less number of ports; • Cannot hold large amounts of data; • The type and speed of the input process is slower

3. Teacher discretion

APP	HOW CAN IT HELP SOCIETY?	HOW CAN THE APP HINDER SOCIETY?
BackaBuddy campaign	Set up a crowd funding campaign to support worthy causes	-
Moodle	A free and open-source learning management system	-
FaceBook	Social media app	Addiction, malware, viruses, identity theft, reduced productivity, antisocial behaviour and relationship issues
LinkedIn	Social media networking tool	The potential of a profile or activity causing harm to your professional reputation as well as causing you to overlook professional contacts who are not actively engaged on LinkedIn
Shopify	eCommerce platform	-

4. Teacher discretion. There are various components to this question, break it down into sections for learners to achieve.

PROGRAMMING FUNDAMENTALS

CHAPTER 1

CHAPTER OVERVIEW	
Unit 1.1	Problem solving
Unit 1.2	Procedures and functions in the Delphi runtime libraries
Unit 1.3	Procedures and functions
Unit 1.4	User interface design
Unit 1.5	Databases

The following learning outcomes are covered by this chapter:

- use algorithms, flowcharts and pseudocode to plan applications
- debug applications using a variety of different techniques
- create applications using the Delphi IDE
- list and describe the most commonly used properties
- create events for Delphi applications
- use number variables and functions in applications
- use string variables and functions in applications
- use arrays and lists in applications
- use different looping structures in applications
- use conditional structures in applications
- create user-defined methods for applications
- describe and implement the principles of user interface design
- dynamically create Delphi components in applications
- create and read text files in Delphi applications
- create a connection to a database using Delphi components
- use data from a database in applications.

GRADE: 12	DATE:	TEACHING TIME: 16 hours
Resources	Each learner should have access to: • IT 10 Practical Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher	
Vocabulary	Learners will need to understand the following terms for this chapter: • debugging – the systematic process of finding errors in a program and correcting them • unambiguous – not open to more than one interpretation	

INTRODUCTION

In this chapter, learners will briefly look at all the concepts they were taught in Grade 10 and Grade 11. Learners will need to create five new programs, which include a statistical simulator, a fake virus application, and a word clock. Encourage learners to work carefully to complete these programs and the units in this chapter.

UNIT 1.1

Problem solving

Discuss the procedure for problem solving and relate it to various examples in the learners' everyday lives and to IT. Read and discuss the Did you know and Take note boxes. Access the QR codes that enrich the material. Ensure learners understand the concept before moving on to the activity.

Example 1.1

Assist learners to create a detailed implementation plan.

Procedures and functions in the Delphi runtime libraries

Revise Delphi coding with learners and add onto this foundation with this unit. Read and discuss the Did you know boxes. Access the QR codes that enrich the material. Ensure learners understand the concept before moving on to the activity.

Example 1.2

Assist learners to create the code for the Word Clock. For this application, you only needed to use the timer's OnTimer event. The code below gives one possible method for solving this problem, although there are many other solutions that would also work.

```
procedure TfrmWordClock.tmrTimerTimer(Sender: TObject);
var
  tTime : TDateTime;
  sTimeOfDay : String;
  iHours : Integer;
begin
  lblSeconds.Caption := FormatDateTime('s', Now) + ' seconds and';
  lblMinutes.Caption := FormatDateTime('n', Now) + ' minutes past';
  tTime := Now - Date;

  if tTime < 0.5 then
    sTimeOfDay := ' in the morning';
  if (tTime >= 0.5) and (tTime < 0.75) then
    sTimeOfDay := ' in the afternoon';
  if tTime >= 0.75 then
    sTimeOfDay := ' in the evening';

  iHours := StrToInt(FormatDateTime('h', tTime)) mod 12;
  if iHours = 0 then
    iHours := 12;

  lblHours.Caption := IntToStr(iHours) + sTimeOfDay;
end;
```

Activity 1.1 Memorandum

1.1.1 The methods and syntax are as follows:

a.

```
iNumber := StrToInt(sNumber);
```

b.

```
iRemainder := iNumber1 MOD iNumber2;
```

c

```
iAnswer := Round(rNumber);
```

d.

```
sPartString := Copy(sString, iStart, iNumCharacters);
```

e.

```
iYear := YearOf(tDate);
```

f.

```
bLeapYear := IsLeapYear(iYear);
```

g.

```
aNumbers := Array [1..5] of Integer;
```

h.

```
lName := TList<Type>.Create;
```

i.

```
iIndex := TList.IndexOf(Item);
```

j.

```
Append(tFile);
```

1.1.2 Append Used to add text onto an existing text file leaving the original text intact
Reset Prepares a text file for reading and places the cursor at the start of the text file
ReWrite Overwrites any existing content in a text file. It will also create a new text file if one with the given name does not exist

1.1.3 Generics.Collections

Activity 1.2 Memorandum

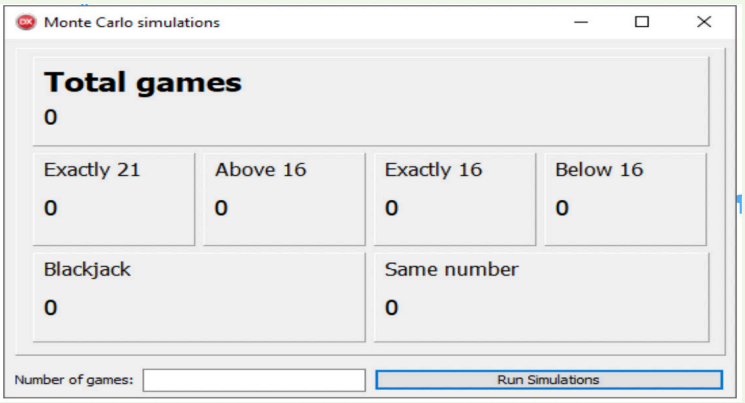
The coded solution can be found in the 01 - Word Clock folder.

Example 1.3

Assist learners to create a Monte Carlo simulator by following the steps provided.

To create this program, you needed to complete a number of tasks. For each of these tasks, there is more than one possible solution, so the code below will simply show one way to create the Monte Carlo simulator.

The first step is to create the user interface. The user interface below simply shows the different criteria as well as the number of draws that matched these criteria.



Create a deck of cards.

In this solution, a list is used to create a deck of cards since the list functions could be useful to add or delete cards from the list. However, an array can also be used.

```
lCards := TList<Integer>.Create;
for i := 1 to 52 do
begin
  iCardValue := i mod 13;
  if iCardValue = 0 then
    iCardValue := 13;
  lCards.Add(iCardValue)
end;
```

The FOR-loop runs 52 times, once for each card in the deck. By calculating the remainder of “i mod 13”, the loop ensures that all the values are between 1 to 13 (ace to king). These values are then added to the “lCards” list. Create the loop that will run a specific number of times. This loop is shown below.

```
iSimulations := StrToInt(edtNumberOfGames.Text);
for j := 1 to iSimulations do
begin
  // Select two random cards
  // Calculate the value of the two cards
  // Categorise the cards based on their values
end;
```

Example 1.3

Once you have your game loop, select two cards inside the loop. The code below shows how these cards are selected.

```
iRandom1 := Random(52);
iRandom2 := Random(52);
while iRandom1 = iRandom2 do
  iRandom2 := Random(52);

aSelectedCard[1] := lCards[iRandom1];
aSelectedCard[2] := lCards[iRandom2];
```

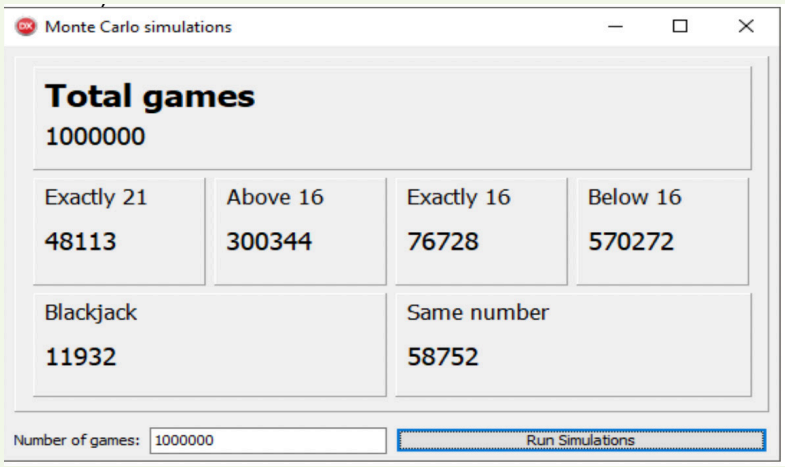
The code starts by selecting two random numbers between 0 and 51. These numbers will be used to draw cards from the list of cards. Since the same card cannot be drawn twice, a while-loop will repeat until "iRandom1" and "iRandom2" have different values. Once you have two unique integers, they are used to select two cards from the "lCards" list and assign it to the "aSelectedCard[1]" and "aSelectedCard[2]" array elements.

The cards selected at this stage have a value of 1 (ace) to 13 (king). However, not all cards have the same value as their number. Specifically, cards with the number 11, 12 and 13 (jack, queen and king) have a value of 10, while cards with the number 1 (ace) have a value of 11.

The next step is to store the values of the two selected cards.

```
for i := 1 to 2 do
begin
  Case aSelectedCard[i] of
    1 : aCardValue[i] := 11;
    2..10 : aCardValue[i] := aSelectedCard[i];
    11..13 : aCardValue[i] := 10;
  end;
end;
iTotalValue := aCardValue[1] + aCardValue[2];
```

In this code, a FOR-loop is used to assign values to both the selected cards. Inside the FOR-loop, a case statement looks at the selected card's number and assigns an appropriate value to the "aCardValue[1]" and "aCardValue[2]" array elements. Once the values for the two cards has been assigned, they can be added together to obtain the total value.



Procedures and functions

Give learners the opportunity to try follow the procedures independently and guide them when necessary.

Example 1.4

The coded solution can be found in the 01 - Copy File folder.

Activity 1.3 Memorandum

1.4.1 A custom function that accepts a number and an exponent and calculates the solution:

```
Function Power (rNumber: Real; iExponent: Integer): Real;
Var
i: Integer;
rAnswer: Real;
begin
  rAnswer := 0;
  for i  := 1 to iExponent do
    rAnswer := rAnswer + rNumber;
  Result := rAnswer;
end;
```

1.4.2 A function that returns only the largest value from an array:

```
type TNumbers = array[1..10] of Integer;
Function FindLargest (aNumbers: TNumbers): Integer;
Var
i, iHighest: Integer;
begin
iHighest := 0;
for i  := 1 to 10 do
  begin
     If (aNumbers[i] > iHighest) then
           iHighest := aNumbers[i];
   end;
   Result := iHighest;
end;
```

1.4.3 A function that returns *n*-th largest value from an array, where *n* is provided by the user:

```
type TNumbers = array[1..10] of Integer;
Function FindnTHLargest (aNumbers: TNumbers; n: Integer): Integer;
Var
i, j, iTemp: Integer;
begin
for i  := 1 to 9 do
    for j  := i  + 1 to 10 do
   begin
       If (aNumbers[j] > aNumbers[i]) then
              Begin
                  iTemp := aNumbers[i];
                  aNumbers[i] := aNumbers[j];
                  aNumbers[j] := iTemp;
              End;
   end;
Result := aNumbers[n];
end;
```

User interface design

Read and discuss the Take note box and the examples on user interface design. Access the QR codes that enrich the material. Ensure learners understand the concept before moving on to the activity.

Example 1.5

The coded solution can be found in the 01 - Friend Book Login folder.

Example 1.6

Assist learners to link forms from the project FriendBookLogin_p from the 01 - Friend Book Login folder.

Example 1.7

The coded solution can be found in the 01 - Photo Bomb folder.

Activity 1.4 Memorandum

1.4.1 Four principles of user interface design:

- Put users in control - users should be able use the application and complete tasks in ways that feel intuitive to them.
- Minimise the effort - you should not ask users to enter the same information more than once, not use unfamiliar jargon or strange terms, make the transition to the next step obvious, help users to provide the correct information, and protect users work so that they never accidentally lose work.
- Eliminate useless items - visual elements that are not helping users should be eliminated or hidden until needed. In this way, users are not overwhelmed by all the options and it is clear to users what they are expected to do. Similarly, you should also eliminate steps or tasks that are irrelevant to the solution of the problem.
- Give visual cues - help users to understand where they are in your application, what they are doing, how the application works and what you expect them to do next. Popular visual cues include colours, photos, arrows, icons, animations or a single larger component.
- Give feedback - users should receive an acknowledgement when they interact with your application. This can include a progress bar, a message, a loading animation, a button changing colours or sound. By providing user with immediate feedback, they never have to worry that their action was not recorded.
- Be consistent - users who have used some parts of your application should be able to predict how other parts of your application will work. Similarly, items should generally remain in the same place, be the same size and have the same colour across your screens.

1.4.2 The three steps needed to create a multi-form application:

- create the second form
- open the second form
- pass data between the forms

1.4.3 Five common properties that should be set when dynamically creating a label:

PROPERTY	COMPONENTS	PARAMETERS	DESCRIPTION
Parent	All	Form	All components must be assigned to a parent form. The component will be closed once the parent is closed.
Left	All	Integer	The number pixels of pixels the component is moved from the left of the form.
Top	All	Integer	The number pixels of pixels the component is moved from the top of the form.
Width	All	Integer	The width of the component in pixels.
Height	All	Integer	The height of the component in pixels.
Caption	Label, Button	String	The text shown by labels and buttons.
Text	Edit	String	The text shown by text boxes.
Bitmap.CreateFromFile	Image	String	A string of the file path of the image that will be displayed.
Items.Add	ListBox, ComboBox, RadioGroup	String	The string that will be shown on one line of a list box, combo box or radio group.
Lines.Add	RichEdit, Memo	String	The string that will be shown on one line of a rich edit of memo.

(Note that the learners may provide other options depending on the component they are considering.)

1.4.4 The syntax for an OnClick event declaration used with a dynamically created button:

```
procedure ButtonCLick (Sender: TObject);
```

Activity 1.5 Memorandum

The coded solution can be found in the 01 - Value Swop folder.

Databases

Read and discuss the Take note boxes and the examples on database design. Access the QR codes that enrich the material. Ensure learners understand the concept before moving on to the next example or activity.

Example 1.8

Assist learners to follow the steps to create a database.

Example 1.9

Assist learners to follow the steps to add a data module.

Example 1.10

Assist learners to follow the steps to add database connection components.

Example 1.11

Assist learners to follow the steps to use a grid component.

Example 1.12

The coded solution can be found in the 01 - Big Bucks folder.

Example 1.13

The coded solution can be found in the 01 - Big Bucks folder.

Activity 1.6 Memorandum

1.6.1 TADOConnection, TADOTable

1.6.2 TDBGrid

1.6.3 The Delphi commands are as follows:

a. tblName.Next;

b. tblName['Name'] := 'Kagiso';

c. if tblName['Number'] = 7 then

d. tblName.Post;

e.

```
dbmData.tblName.First;
while not dbmData.tblName.Eof do
begin
  sValue := dbmData.tblName['fieldName'];
  dbmData.tblName.Next;
end;
```

QUESTION 1

The coded solution can be found in the 01 - Question 1 folder.

QUESTION 2

The coded solution can be found in the 01 - Question 2 folder.

QUESTION 3

The coded solution can be found in the 01 - Question 3 folder.

QUESTION 4

The coded solution can be found in the 01 - Question 4 folder.

QUESTION 5

5.1 b.

5.2

EXAMPLE	TYPE
TButton	Object
Top	Property
Caption	Property
OnClick	Event
TADOConnection	Object

5.3 blsValid: Boolean

5.4 Test each small sub-program as you go. To do this, you can use the debugging techniques such as trace-tables, variable watches, error catching and trace printing to find errors.

5.5 Here is a sample answer:

```
Get code
Set Valid to False
If first character of Code is in the set ‘A’ to ‘Z’ then
    Set Valid to True
    For counter = 2 to 4 do
           If character at counter NOT in the set ‘0’..’9’ then
                    Set Valid to False
                     Exit loop
           End If
    End For
End If
If Valid = True then
    Display ‘Valid code’
Else
   Display ‘Code not valid’
```

CHAPTER 5

COMPUTER MANAGEMENT

CHAPTER OVERVIEW

Unit 5.1 Factors influencing computer management

The following learning outcomes are covered by this chapter:

- discuss factors that influence computer management
- recommend management tasks for general housekeeping and to maintain data integrity and protect the system.

GRADE: 12 DATE: TEACHING TIME: 2 hours

Resources	Each learner should have access to: • IT 12 Theory Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher

INTRODUCTION

Ensure learners understand computer management before moving on to the activity.

Activity 5.1 Memorandum

1. Refers to the copying into an archive file of computer data so it may be used to restore the original after a data loss event.
2. Automatically or manually
3.
   - Start by setting up a backup schedule to determine how regularly you will create a backup.
   - Purchase an external hard drive to use for the backup.
   - On the scheduled backup day, connect the external hard drive to your computer.
   - Select the files or folders you would like to back up and copy them using the Copy command.
   - Create a folder on the external hard drive with the correct date in the name.
   - Paste all the copied files and folders into this folder.
   - Disconnect the external hard drive and store it in a safe location.
   - Repeat these steps on each scheduled backup day.

4. Any software intentionally designed to cause damage to a computer, server or computer network
5.
   - Open the Start menu
   - Search for 'Windows Defender' and open the Windows Defender Security Centre application.
   - Click on the shield icon in left bar to open the Virus & threat protection screen.
   - Click on the Scan now button to scan your computer for malware.
6. To improve the performance, stability and security of the applications that run on your computer

Factors influencing computer management

Read and discuss the Take note box and the notes. Access the QR codes that enrich the material. Ensure learners understand the concept before moving on to the next example or activity.

Activity 5.1 Memorandum

5.1.1 1. – A, 2. – E, 3. – G, 4. – B, 5. – D, 6. – F, 7. – C

Note to teacher: Please advise learners to add File management tasks as G in column B.

5.1.2 **Disk clean-up:** Disk clean-up is a computer maintenance utility designed to free up storage space on a computing device. It safely identifies and removes temporary files that are no longer needed in order to free up storage.

Scheduling and updating: You can use a task scheduler to create and manage common tasks that your computer will carry out automatically at a time you specify, for example, you can schedule your computer to run a software update or make a backup at a specific time.

Archive and backing up: Archiving is the process of moving data that is no longer actively used to a separate storage device for long-term retention. These files are, however, not duplicated. Archived data consists of old data that remains important and is retained for future reference.

Compression and decompression: File compression refers to the process that makes use of advanced algorithms and mathematical formulas to decrease the amount of disc space used by big files. Decompressing a file is the method of extracting the compressed file back to its original form using the same algorithms or mathematical formulas.

Security features: A firewall is a network utility that prevents unauthorised network connections to and from your computer. This means that only the applications you allow on your computing device can send or receive data from and to the Internet.

Installing and uninstalling software: All installed applications used on your computing device are managed by the operating system. These applications may be used to view images, play videos or run tasks on your computing device. There are different ways of installing software.

Organising your files: To help you to find your files as quickly and easily as possible, you need to organise your files. In this section, you will learn more about the organisation of files on a computer.

Teacher discretion needed for the following questions: Which tasks do you use on your computer or school computer? Which task do you think is the most important? Explain.

5.1.3 It is the assurance of the accuracy and consistency of, data over its entire lifecycle, and is a critical aspect to the design, implementation and usage of any system which stores, processes or retrieves data

1. 1. – D, 2. – H, 3. – J, 4. – B, 5. – E, 6. – A, 7. – C, 8. – F, 9. – G, 10. – I
2. a. False. To make sure that your computer is protected against viruses, you should not install more than one virus scanner.
   b. False. The two biggest ways to pick-up malware is by downloading unreliable applications without reading all the instructions carefully and by inserting other people's flash disks into your computer.
   c. False. You should clean your computer once a week to check for viruses and/or malware.
   d. True
   e. True
   f. False. It is important that you also organise files within an logical folder structure.
   g. False. You cannot always recover a file that has been permanently deleted.
   h. False. To regularly uninstall unused applications will free up disk space as well as memory and decrease Internet use.
   i. True
   j. True
3. Instruct and supervise learners to:
   a. Update software
   b. Scan for viruses
   c. Physically clean the computer
   d. Back up the data on the computer using copy and paste.
   e. Back up the data using Backup and Restore
   f. Manually back up files on Google Drive
   g. Automatically back up files to Google Drive
   h. Organise your files
   i. Free disk space by using the Disk Clean-up tool
   j. Manually delete files
   k. Uninstall unused programs
   l. Run a SMART scan
   m. Run a disk check
4. Installing software is downloading it onto the device and uninstalling software is deleting it from the device
5. A custom installation will allow you to see and select parts of the software you want to install.
   A full installation will select all parts of the software and install it on your computing device.
   Product keys and activation codes: Some applications may give you a unique product key or activation code once you purchase the application. The installer will then request this product key before allowing you to install the application.
6. Installing too many applications may use up a computer's resources and cause the computer to slow down, while out-of-date software may contain bugs or security problems. Viruses are also a form of software and are often installed with other software applications.
7. Teacher discretion, learners need to support with a reason
8. Teacher discretion
9. Instruct and supervise learners to:
   Install new software onto your computer.
   Uninstall software from your computer.
10. a: It is large.
11. d: Applications you installed
12. b: Updating the program
13. a: Using Windows Backup
14. a: He needs to install its drivers manually AND b: He needs to free up space on his computer.

TERM 2

CHAPTER 6

SOFTWARE

CHAPTER OVERVIEW	
Unit 6.1	Cloud computing
Unit 6.2	Virtual Reality
Unit 6.3	Augmented Reality
Unit 6.4	Virtualisation

The following learning outcomes are covered by this chapter:

- describe cloud computing
- describe the effects on hardware needs for cloud computing
- explain Software as a service (SaaS)
- describe virtual reality, the requirements and advantages
- describe augmented reality, the requirements and advantages
- describe virtualisation and the benefits.

GRADE: 12 DATE: TEACHING TIME: 4 hours

Resources	Each learner should have access to: • IT 12 Theory Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher
Vocabulary	Learners will need to understand the following terms for this chapter: • GUI (or graphical user interface) – a visual way in which users can interact with a computer (including windows, buttons, menus, images and text)

INTRODUCTION

Read and discuss the New word and the notes. Ensure learners understand the concept before moving on to the next example or activity

UNIT 6.1

Cloud Computing

Read and discuss the Did you know boxes and the case study. Access the QR codes to further enrich the information. Ensure learners understand the concept before moving on to the next example or activity.

Case Study

Read and discuss the case study on page 75 of the Theory Book.

Allow learners to work in small groups of four or five learners to discuss the case study, then ask each group to provide some feedback on their discussions.

Activity 6.1 Memorandum

6.1.1

- Scalable: Cloud computing is perfectly scalable, which means that the capacity of your virtual machine will grow automatically as your requirements increase.
- Affordable: A single virtual machine is affordable, and it only becomes expensive once you need to rent large numbers of virtual machines.
- Reliable: Many cloud computing companies guarantee that the machine will be available to users always.
- Fast: Cloud computers and the internet connection to these computers can be incredibly fast.
- Maintained: The servers used for cloud computing are maintained by an expert team who ensure they continue running efficiently.

6.1.2 Divide the class into two teams, one team will debate for cloud computing and the other against cloud computing. Explain to the learners the process of a debate and how to write augmentative statements that are supported with research. Provide learners with resources on cloud computing so they can develop their argument. Hold the debate.

6.1.3

a. SaaS (or Software as a Service) refers to applications that are hosted on the cloud and that users pay a monthly subscription to access.

b. This service might be to provide entertainment (like Netflix), increase productivity (like Office 365) or improve communication (like Skype or Slack).

c. Cloud computers, web browsers

d. No to minimal setup required, no or minimal initial cost, software is updated automatically on the cloud computers, new features are regularly added, can be used from any computer with an internet connection, easier to collaborate or share information with other users

Ensure learners understand the concept before moving on to the next example or activity.

Activity 6.2 Memorandum

6.2.1 Complete the table on virtual reality.
Definition: Virtual reality is an artificial environment that is created with software.

BENEFITS	LIMITATIONS
Used as a training tool in many areas of life	Hardware and software needed can be expensive
Can provide remote access	Maintenance can be expensive and cause downtime which will affect the output
Provides learning experiences that one cannot get from reading books as it immerses you in that world	Software for that particular virtual reality is limited and inflexible as it cannot go out of that scope, it cannot simulate a real classroom where learning fluctuates
Eliminate the language barrier	Can be addictive and detrimental to social connections

6.2.2 Have the following article available for the learners: https://www.pcmag.com/article/342537/the-best-virtual-reality-vr-headsets. In small groups, learners discuss the different types of headsets and their preference. Learners must support their answers.

6.2.3 Have the following YouTube video available for the learners: https://www.youtube.com/channel/UCzuqhhs6NWbgTzMuM09WKDQ. In small groups, learners discuss what impressed you the most about VR and their preference. Learners must support their answers. Learners explain how the VR videos could benefit society.

Ensure learners understand the concept before moving on to the next example or activity.

Activity 6.3 Memorandum

6.3.1 Augmented Reality provides a composite view unlike virtual reality that provides full immersion.

6.3.2 Definition: Augmented reality technology superimposes a computer-generated image onto a user's view of the real world.

BENEFITS	LIMITATIONS
Enables learners to become active participants in an improved learning environment	Issues about privacy as AR systems collect and analyse data about each user, this data can be used or redistributed illegally
Communication and interaction are more interactive as distanced communication is supplemented by graphic images overlaid in front of the participants to aid verbal communication e.g. Instagram and Snapchat have used AR to make sharing videos and photos more visually appealing	Reality modification can be dangerous as digital elements are overlaid on the natural environment, this masks real-world dangers and can make users less cautious about the real world. Users can lose touch with reality and become unsure of what is real and what is not
Business improvements	Developing and implementing an AR system is both costly and technologically taxing for businesses or education centres
Navigation and tourism improvements	
Gaming can be more interactive as AR provides additional input-output features	

6.3.3 Product developers can see and experience the mock-up design of a product before its completion or it can be used to improve workplace environments

6.3.4 Teacher discretion, this is subjective, learners need to support their answers

6.3.5 Hardware requirements for augmented reality include: battery life of device; connectivity shall support person to person communication and be wireless; field of view will provide a 3D view; on-board storage; on-board operating system to support the software; environmental as it should adjust brightness to the environment to be easily readable; inputs/outputs e.g. eye tracking, microphone and GPS and safety.
Software requirements for augmented reality include: authoring to allow the user to use API links to other databases and websites to display information. AR content generation tool should have a user interface that can be learnt by non-software literate personnel; create 3D content; deployment of AR content and Internet of Things

Access the Animation to enrich the information. Ensure learners understand the concept before moving on to the next example or activity.

Activity 6.4 Memorandum

6.4.1
a. D. All of the above
b. A. Multithreading
c. B. Multiprocessing
d. C. Virtualisation is the software, while cloud computing is based on the idea that many software applications present a service to users.
e. Virtualisation is one of the core technologies used in cloud computing.

6.4.2 Testing different operating systems and software, clone computers and allow multiple people to use the same computer at the same time

1. Divide the class into two teams, one team will debate for virtual reality and the other for augmented reality. Explain to the learners the process of a debate and how to write augmentative statements that are supported with research. Provide learners with resources on the two types of Reality so they can develop their argument. Hold he debate.
2. Teacher discretion as there are many examples

	VIRTUAL REALITY	AUGMENTED REALITY	DIFFERENCES
Medical	Used for doctors and nurses to learn new skills e.g. Surgery simulation, phobia treatment, robotic surgery and skills training	Operating MRI equipment, performing complex surgeries and learning anatomy using an AR headset to delve into the human body in an interactive 3D format	AR provides a composite view unlike virtual reality that provides full immersion
Military	Used for training simulation so soldiers can train for combat situations	A transparent display is positioned directly in the fighter pilot's view. Data typically displayed to the pilot includes altitude, airspeed and the horizon line in addition to other critical data. The term "heads-up" name applies because the pilot does not have to look down at the aircraft's instrumentation to get the data he needs. The Head-Mounted Display (HMD) is used by ground troops. Critical data such as enemy location can be presented to the soldier within their line of sight. This technology is also used for simulations for training purposes.	AR provides a composite view unlike virtual reality that provides full immersion
Education	Large groups of students can interact in a virtual classroom with supporting data	Animated content in classroom lessons, AR educational apps	AR provides a composite view unlike virtual reality that provides full immersion
Entertainment	Interactive theme parks, virtual museums and theatre	AR marketing lets the audience build deeper bonds with their movie characters and get to know the created world	AR provides a composite view unlike virtual reality that provides full immersion

2. *continued...*

	VIRTUAL REALITY	AUGMENTED REALITY	DIFFERENCES
Fashion	Avatars are used to help with clothing design and virtual stores can be created	AR helps professionals to step into their design to visualise their final products during the creative process. Urban planners can even model how entire city layouts might look using AR headset visualisation	AR provides a composite view unlike virtual reality that provides full immersion

SOCIAL IMPLICATIONS

CHAPTER 7

CHAPTER OVERVIEW	
Unit 7.1	Computer criminals
Unit 7.2	Types of cyber crimes
Unit 7.3	Effects of crime
Unit 7.4	Computer crimes
Unit 7.5	Safeguards agains computer crimes, threats and criminals

The following learning outcomes are covered by this chapter:

- discuss different types of computer criminals and cyber crimes
- protect yourself from online threats

GRADE:	12	DATE:	TEACHING TIME:	2 hours

Resources	Each learner should have access to: • IT 12 Theory Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher

INTRODUCTION

Ensure learners understand the concept before moving on to the next example or activity.

UNIT 7.1

Computer criminals

Introduce this unit by sharing the following Case Study with you learners.

Case Study

Case study The Morris Worm

Robert Morris was the virus author behind the devastating Morris worm, one of the first viruses on the Internet. While doing his post-graduate studies at Cornell University, Morris wrote a small program that could jump from computer to computer. He hoped this program would help him to calculate the size of the Internet.

When Morris created the worm, he did not expect it to have a noticeable impact on the performance of infected computers. Unfortunately, the virus was able to infect each computer multiple times, with each infection making the computer slower. After enough infections, the computer would completely stop working.

The U.S. Government Accountability Office found that, in less than day, 2 000 computers were infected. These computers became completely useless until the worm was reduced, which took more than one day. Based on these estimates, the U.S. Government Accountability Office estimates that the virus caused between $100 000 and $10 000 000 in damage!

Morris was arrested and convicted for violating the Computer Fraud and Abuse Act. His final sentence was for a fine of $10 050, 3 years of probation and 400 hours of community service. In 2005, Morris was a co-founder of Y Combinator, an investment company that helped services like Airbnb, Stripe and Twitch.tv get started.

Split the class into small groups of four to five and ask them to answer the following questions:

1. Do you believe that Robert Morris meant to create a computer virus?
2. Rather than releasing the virus from his home computer, Morris travelled to MIT (a university he did not study at) to release the virus. Does that change your mind?
3. Based on the damage caused, do you believe Morris's punishment was fair?
4. If the Morris worm was released today, do you believe it would do more or less damage?

Once complete, as groups to share feedback with the rest of the class.

Instruct learners to work through the content on pages 84 - 85 of the Theory Book.

Types of cyber crimes

Ensure learners understand the concept before moving on to the next example or activity.

Activity 7.1 Memorandum

7.1.1 Guide small groups discussion on the types of crimes, the criminals' reasons for committing the crimes and the consequences.

7.1.2 Guide learners to choose one type of cybercrime and research a case study on the crime. Ask your peers questions on the case study in order to gain further knowledge.

Ensure learners understand the concept before moving on to the next example or activity.

Activity 7.2 Memorandum

Guide learners to revisit the case study and questions that they discussed in small groups about a type of cybercrime in Unit 7.1. Learners can revise their answers and share them with the class.

Ensure learners understand the concept before moving on to the next example or activity.

Activity 7.3 Memorandum

7.3.1

a. C. Virus author
b. A. Hacker
c. B. Cracker
d. D. Cyber gang or hacker group
e. B. Remote control
f. D. Internet fraud
g. C. Botnets
h. A. Backdoors
i. C. Information and website hacking
j. D. Bandwidth theft
k. C. Information and website hacking
l. E. Service theft
m. B. Software hacking

7.3.2 **a.**

TYPE	DESCRIPTION
Hacker	A hacker is anyone who uses their computer skills to gain unauthorised access to computer systems or data. They can do this through a combination of exploits, scripts and social engineering. White hat hackers help companies improve their security by trying to hack into their computers, while black hat hackers (or cracker) illegally break into computer systems.
Cracker	The word cracker refers to hackers who use their skills illegally. They may break into computer systems for a variety of reasons, from stealing data to testing their skills to making political statements. The word cracker can also be used to refer to people who write software cracks (tools that allow software to be pirated and used illegally).
Virus author	A virus author is any person who writes a computer virus. Virus authors create viruses for several reasons, including causing damage, showing off their skills, gaining information or money or taking over computers and using them to send spam emails.
Cyber gang or hacker group	A cyber gang, much like a gang in real life, is a group of people who work together to commit crimes. Just like in real life gangs, these gangs can be made up of many loosely organised members (like the group Anonymous) or they can be a small team of specialists (like the group Carbanak which stole more than $1 billion by hacking banks).

b. Cyber gang or hacker group

c.

Remote control	Just like remote control can be used to remotely connect to a computer and control it, a remote-control virus (or remote access trojan) allows the virus author to control the computer it has infected from anywhere in the world. This can be used to spy on users, record usernames and passwords and infect their computers with additional viruses.
Botnets	A botnet refers to several computers infected by the same virus who can work together to perform attacks. These attacks include sending spam emails, mining bitcoins, or performing a distributed denial-of-service (DDoS) attack (in which many computers attempt to use up all the bandwidth of a website, making it inaccessible). Each individual computer in a botnet is known as a zombie. It is estimated that as much as 80% of spam emails are sent from zombie computers.

d. Political, activist sites

e.
- Lost money due to online theft
- Expenses incurred to fix problems from cybercrime
- Expenses incurred to prevent future cybercrime
- Lost time due to problems from cybercrime
- Lost time due to increase cyber security measures
- Loss of reputation due to personal information that is revealed
- Corrupted files due to viruses
- Long-term debt created due to online identity theft
- Poor credit rating due to online identity theft

7.3.3 Teacher discretion as the answer is subjective.

7.3.4 Teacher discretion as the answer is subjective.

7.3.5 Yes, due to the increase of cybercrimes.

7.3.6 Yes, no one is safe from cybercrimes as they have remote access.

1.

TYPE	DESCRIPTION
Hacker	A hacker is anyone who uses their computer skills to gain unauthorised access to computer systems or data. They can do this through a combination of exploits, scripts and social engineering. White hat hackers help companies improve their security by trying to hack into their computers, while black hat hackers (or cracker) illegally break into computer systems.
Cracker	This refers to hackers who e their skills illegally. They may break into computer systems for a variety of reasons, from stealing data to testing their skills to making political statements. The word cracker can also be used to refer to people who write software cracks (tools that allow software to be pirated and used illegally).
Virus author	A virus author is any person who writes a computer virus. Virus authors create viruses for several reasons, including causing damage, showing off their skills, gaining information or money or taking over computers and using them to send spam emails.
Cyber gang or hacker group	This is a group of people who work together to commit crimes. They can be made up of many loosely organised members (like the group Anonymous) or they can be a small team of specialists.

2. Teacher discretion, learners can research the answers and share their findings with the class.

TYPE OF CRIME	DEFINITION	EFFECT ON SOCIETY
Hardware hacking	Hardware hacking refers to attacks aimed at specific pieces of hardware. The goal of these attacks is generally to unlock the hardware or remove artificial limitations placed on the hardware.	For example, hacking game consoles, hackers can remove the software that stops them from playing pirated games. Many smartphones can also be hacked, to give the owner access to features that are normally locked
Software hacking	Software hacking can refer to three different types of hacking: • Finding software exploits • Breaking software protection • Hacking games	This allows people to play pirated games or use pirated software. Software hacking can also refer to game hacking, in which hackers create software that allows gamers to break the rules of the game.
Information and website hacking	Website and information hacking are used for several different reasons: • Steal users' personal information for identity fraud • Steal users' email addresses • Steal users' passwords • Steal users' credit card information • Build a database of common usernames and passwords • Deface the website or place political messages on the website • Reroute traffic from the website to a phishing website	Loss of money trying to rectify the hack

2. *continued...*

TYPE OF CRIME	DEFINITION	EFFECT ON SOCIETY
Bandwidth theft	Bandwidth theft occurs when other one website uses the images stored on and hosted by another website	There are many companies that allow images to be hosted on their website for free. This decreases the need for hotlinking
Service theft	Service theft occurs on the Internet whenever someone illegally uses a username and password to access an online service	Rather than paying for their own Netflix account, the service thief might steal your username and password and use it to watch Netflix for free

3.
- passwords
- firewalls
- encryption

Teacher discretion as the answer is subjective

OBJECT-ORIENTED PROGRAMMING

CHAPTER 2

CHAPTER OVERVIEW

The following learning outcomes are covered by this chapter:

- describe the class as a data type
- discuss the different access specifiers
- describe attributes and methods as part of a class
- define a class
  - add attributes to a class
  - declare and implement methods in a class
- instantiate objects of the class
- use the object in your application.

GRADE: 12 DATE: TEACHING TIME: 4 hours

Resources	Each learner should have access to: • IT 12 Practical Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher
Vocabulary	Learners will need to understand the following terms for this chapter: • algorithm – an ordered list of steps for carrying out a task or solving a problem • unambiguous – not open to more than one interpretation

INTRODUCTION

Explain to learners that Object-Oriented Programming (OOP) – refers to a type of computer programming (software design) in which programmers define not only the data type of a data structure, but also the types of operations (functions) that can be applied to the data structure. In this chapter they will look at Object-Oriented Programming (OOP) in more detail.

UNIT 2.1

Defining a custom class

Read and discuss the Take note box and the notes. After each activity and example check that learners are confident with the steps and information.

Example 2.1

Learners discuss the algorithm to make a cup of hot chocolate and what to do if it is not exactly to their taste. Learners think and talk to their friend about how their algorithm for making hot chocolate (or coffee or tea) would be different to the one in the example.

Activity 2.1 Memorandum

2.1.1 A class is a file with the definition of an entity that contains its essential properties or attributes and basic functions and procedure (behaviours) linked to the entity.

2.1.2 An object is an instance of an object class that has all its attributes and behaviours.

2.1.3 A variety of answers are possible. Some are TList, TButton, TForm.

2.1.4

```
type
ClassName = class(optional BaseClass)
 Private
//declare attributes and private methods here
 Public
//declare public methods here
 end;
```

2.1.5 Private attributes and methods can only be accessed from inside a class.
Public methods can be accessed in any program where a class is used.

2.1.6 This data hiding ensures that access is only given to class members and protects the integrity of the data. The programmer determines the access to the attributes by using functions and procedures.

2.1.7

```
implementation type //Should be declared before the
                    //implementation section
 className : class(optional BaseClass);
 Private
Attribute1: String;
Method1;//Should be declared in the public section
 Public
Attribute2: Integer; //Should be declared in the private section
Method2;
end; //Missing
```

Case study

Read and discuss the case study. The coded solution can be found in the 02 – sellMyPhone folder.

Activity 2.2 Memorandum

In each case, clearly indicate where in the class unit file the code to declare the class, the attributes and methods should be placed.

Do not implement the methods.

2.2.1

```
unit CarClass;

interface

uses sysUtils;

type
  TCar = class
  private
    brand: string;
    model: string;
    year: string;
    retailPrice: double;
  public
    constructor create; overload;
    constructor create(brand, model, year: string; retailPrice: double);
      overload;
    function getDetailedModel: string;
    procedure setRetailPrice(retailPrice: double);
    function getRetailPrice: double;
    function toString: string;
    function getVATPrice:double;
  end;
```

2.2.2

```
unit SongClass;

interface

uses sysUtils;

type
  TSong = class
  private
    Artist: String;
    Song: String;
    Album: String;
    TrackNumber: Integer;
    Duration: Integer;
  public
    constructor create; overload;
    constructor create(Artist, Song, Album: String;
      TrackNumber, Duration: Integer); overload;
    function getArtist: String;
    function getSong: String;
    function getAlbum: String;
    function getTrackNumber: Integer;
    function getDuration: Integer;
    procedure setArtist(Artist: String);
    procedure setSong(Song: String);
    procedure setAlbum(Album: String);
    procedure setTrackNumber(TrackNumber: Integer);
    procedure setDuration(Duration: Integer);
    function tostring: String;
    function getQuickReference: String;
    function getMinuteDuration: String;
  end;
```

2.2.3

```
unit QuadraticClass;

interface

uses sysUtils, Math;

type
 TQuadratic = class
   private
    a, b, c : Integer;
   function calculateDiscriminant: Integer;
   public
   constructor create; overload;
   constructor create(a,b,c: Integer); overload;
   function hasRealRoots: Boolean;
   function hasRationalRoots: Boolean;
   function calculateRoots: String;
   function tostring:String;
 end;
```

2.2.4

```
Unit ConeClass;

Interface

Uses StrUtils, SysUtils;

Type
  Tcone = Class
  Private
    diameter: Double;
    height: Double;
    Function radius: Double;

  Public
    Constructor Create; Overload;
    Constructor Create(height, diameter: Double); Overload;
    Function slantHeight: Double;
    Function baseRadius: Double;
    Function volume: Double;
    Function surfaceArea: Double;
    Function toString: String;

  end;
```

Activity 2.3 Memorandum

Example answers – the learners may provide more detailed answers.

Learners write down instructions on how to do the following physical activities. Each activity must have at least five steps that are properly explained.

2.3.1 Find the coded solution in the 02 – carPricelist folder.
2.3.2 Find the coded solution in the 02 – myPlaylist folder.
2.3.3 Find the coded solution in the 02 – quadraticEquations folder.
2.3.4 Find the coded solution in the 02 – coneCalculations folder.
2.3.5 Find the coded solution in the 02 – sellMyPhone folder.

Using the class

Read and discuss the Take note box and the notes. After each activity and example check that learners are confident with the steps and information.

Activity 2.4 Memorandum

2.4.1 ObjectName = Classname.create(optional parameters: datatypes);

2.4.2 a. NGO.create('Helping Hand', 23500.00, 50, 'HH007');
No. Should be: NGO := TNGO.create('Helping Hand', 23500.00, 50, 'HH007');

b. NGO := TNGO.create('Helping Hand', 'HH007', 23500.00, 50);
No. Should be: NGO := TNGO.create('Helping Hand', 23500.00, 50, 'HH007');

c. NGO := TNGO.create('Helping Hand', 23500.00, 50, 'HH007');
Yes

d. TNGO := NGO.create('Helping Hand', 23500.00, 50, 'HH007');
No. Should be: NGO := TNGO.create('Helping Hand', 23500.00, 50, 'HH007');

e. NGO := TNGO.create('Helping Hand', 23500.00, 50);
No. Should be: NGO := TNGO.create('Helping Hand', 23500.00, 50, 'HH007');

f. TNGO.create('Helping Hand', 23500.00, 50, 'HH007');
No. Should be: NGO := TNGO.create('Helping Hand', 23500.00, 50, 'HH007');

g. NGO := TNGO.create('Helping Hand', 23500.00, 50.00, 'HH007');
No. Should be: NGO := TNGO.create('Helping Hand', 23500.00, 50, 'HH007');

2.4.3 Uses
NGOClass;

2.4.4 Declare the attribute in the Private section.

2.4.5 The toString method is used to display the state of the class, i.e. displays the values currently held by each of the attributes.

2.4.6 A method from another class is preceded by the name of the object from which you are accessing the method. A method belonging to the class is called by using its name only.

2.4.7 The correct syntax for the signature(header) of a *get-method* is:

a. Procedure methodName(parameter: datatype); Incorrect - must be a function that returns the value in the attribute that is being accessed.

b. Function methodName(parameter: datatype): dataType; Incorrect - the get-method does not require a parameter, it only returns a value.

c. Procedure methodName: dataType; Incorrect - must be a function that returns the value in the attribute that is being accessed. A procedure cannot return a value as shown here.

d. Function methodName: dataType; Correct.

Activity 2.5 Memorandum

2.5.1 Find the coded solution in the 02 – carPricelist folder.

2.5.2 Find the coded solution in the 02 – myPlaylist folder.

2.5.3 Find the coded solution in the 02 – quadraticEquations folder.

2.5.4 Find the coded solution in the 02 – coneCalculations folder.

QUESTION 1

1.1 Encapsulation is the placing of the attributes of an entity or new data type in a class and making the access to them private thereby 'hiding' the attributes. The class also holds all the methods to manage the behaviours of the entity and to control the access to the attributes.

1.2 The constructor creates an instance of a class. This is called instantiation – it generates an object and initialises the attributes of the object.

1.3 The getter will return the value currently stored in an attribute (class variable). If there is no need to change the value in an attribute, then you do not need a setter.

1.4 a) Private attributes and methods can only be accessed from inside a class. Public methods can be accessed in any program where a class is used.

b) calculateAge()

1.5 Object-oriented programming enables programmers to create independent modules that are not influenced by other parts of the program, thus improving the integrity of a program and its data. These independent modules can easily be modified and reused.

QUESTION 2

The coded solution can be found in the 02 - Question 2 folder.

QUESTION 3

The coded solution can be found in the 02 - Question 3 folder.

TWO-DIMENSIONAL ARRAYS

CHAPTER 3

CHAPTER OVERVIEW	
Unit 3.1	2D arrays
Unit 3.2	2D arrays with data
Unit 3.3	Application for two-dimensional arrays

The following learning outcomes are covered by this chapter:

- describe the concept of 2D arrays
- define the structure of 2D arrays
- input data to 2D arrays using different sources
- use the data from 2D arrays
- output the data from 2D arrays using column and row headings.

GRADE: 12 DATE: TEACHING TIME: 4 hours

Resources	Each learner should have access to: • IT 12 Practical Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher
Vocabulary	Learners will need to understand the following terms for this chapter: • algorithm – an ordered list of steps for carrying out a task or solving a problem • unambiguous – not open to more than one interpretation

INTRODUCTION

In this chapter, learners are taught more about 2D arrays and how they can be used in programming.

2D arrays

After each activity and example check that learners are confident with the steps and information.

Activity 3.1 Memorandum

3.1.1 aNumbers: Array[1..10,1..10] of Integer;
3.1.2 aStrings: Array[1..5,1..4] of String;
3.1.3 aNumbers: Array[1..500,1..3] of Real;
3.1.4 aStrings: Array[1..250,1..400] of String;
3.1.5 aMonth: Array[1..5,1..7] of Integer;

Example 3.1

Assist learners to follow the steps to access and use an element in a 2D array.

Example 3.2

Assist learners to follow the steps to assign values to and array element.

Activity 3.2 Memorandum

3.2.1

```
aBoard: Array[1..8,1..8] of String;
```

3.2.2

```
aBoard[2, 2] := 'w_King';
aBoard[2, 3] := 'w_Pawn';
aBoard[2, 4] := 'b_Bishop';
aBoard[4, 1] := 'w_Pawn';
aBoard[4, 5] := 'w_Pawn';
aBoard[5, 3] := 'b_King';
aBoard[5, 4] := 'w_Bishop';
aBoard[5, 5] := 'b_Pawn';
aBoard[6, 2] := 'b_Pawn';
aBoard[6, 6] := 'b_Pawn';
aBoard[7, 1] := 'b_Pawn';
aBoard[7, 3] := 'b_Pawn';
```

3.3.3

```
aBoard[2, 1] := ' ';
aBoard[2, 2] := 'w_King';
```

Example 3.3

Assist learners to follow the steps to use a nested FOR-loop.

Activity 3.3 Memorandum

3.3.1

```
var
  aNumbers: Array[1..6, 1..10] of Integer;
  i, j: Integer;
begin
  for i := 1 to length(aNumbers) do
    for j := 1 to length(aNumbers[1]) do
      aNumbers[i, j] := i * j;
end;
```

3.3.2

```
var
  aNumbers: Array[1..10, 1..3] of Integer;
  i, j: Integer;
begin
  for i := 1 to length(aNumbers) do
    for j := 1 to length(aNumbers[1]) do
      aNumbers[i, j] := Power(i, j);
end;
```

3.3.3

```
var
  aNumbers: Array[1..10, 1..10] of Integer;
  i, j: Integer;
  sLine: String;
begin
  for i := 1 to length(aNumbers) do
    for j := 1 to length(aNumbers[1]) do
      aNumbers[i, j] := Random(900) + 100;

  for i := 1 to length(aNumbers) do
  begin
    sLine := '';
    for j := 1 to length(aNumbers[1]) do
      sLine := sLine + IntToStr(aNumbers[i, j]) + #9;
    memOutput.Lines.Add(sLine);
  end;

  memOutput.Lines.Add('');
  for j := 1 to length(aNumbers[1]) do
     memOutput.Lines.Add(IntToStr(aNumbers[j, j]));
end;
```

Activity 3.4 Memorandum

The coded solution is provided in the 03 - Array Questions folder.

2D arrays with data

After each activity and example check that learners are confident with the steps and information.

Example 3.4

Assist learners to follow the steps to add data to an array, provide the project saved in your 03 - School Marks folder for the learners. The coded solution is provided in the 03 - School Marks folder.

Activity 3.5 Memorandum

3.5.1 The CSVIntoArray procedure reads the data from a .csv file into a 2D array for later use.

3.5.2 Describe the purpose of the following lines:

a. Loop from one for the number of rows in the 2D array.
b. Read a row (or line) from the CSV file into the sData variable.
c. Loop from one for the number of columns in the 2D array.
d. Find the position on the first comma in sData.
e. Copy a substring from sData from character 1, the number of characters represented by one less than the position of the comma. This will exclude the comma from the substring. The substring is converted to an integer and stored in the 2D array in the specified position.
f. Delete a substring from sData from character 1, the number of characters represented by the position of the comma. This will deleted the comma as well.

3.5.3 The value of iComma be equal to 0 when a comma cannot be located in the string.

3.5.4 Why is there a ReadLn function before the loop starts? To move past the column headings that have been included on the first line in the CSV file.

3.5.5 In the TStringlist version, describe the purpose of the following lines:

a. Creates the string list object and assigns it to the variable inList.
b. The list string will be loaded separated by commas. This is useful for loading from a text spreadsheet export.
c. Get the item from the stringlist and assigns it to the 2D array as the stipulated positions.

3.5.6 The first item in the stringlist is in position 0, not 1.

3.5.7 The coded solution is provided in the 03 - School Marks folder.

Example 3.5

Assist learners to follow the steps to find the largest mark in the first row.

Activity 3.6 Memorandum

The coded solution is provided in the 03 - School Marks folder.

Example 3.6

Assist learners to follow the steps to determine the age of the oldest student.

Activity 3.7 Memorandum

The coded solution is provided in the 03 - School Marks folder.

Example 3.7

Assist learners to follow the steps to determine the number of A's scored by the class.

Activity 3.8 Memorandum

The coded solution is provided in the 03 - School Marks folder.

Activity 3.9 Memorandum

The coded solution is provided in the 03 - School Marks folder.

After each activity and example check that learners are confident with the steps and information.

Example 3.8

Provide the project saved in the 03 - Sudoku folder. To create the Sudoku game, you need to start by creating a grid to display the results and an array to store the results. You also need to build the link between the grid and the array, allowing values entered into the grid to be stored in the array. The coded solution is provided in the 03 – Sudoku folder.

Activity 3.10 Memorandum

The coded solution is provided in the 03 – Sudoku folder.

QUESTION 1

1.1 C

1.2

```
aWinLose: Array[1..6,1..15] of Boolean;
```

1.3 a. A nested For-loop.

b.

```
for i := 1 to length(aRainfall) do
begin
  sLine := '';
  for j := 1 to length(aRainfall[1]) do
    sLine := sLine + IntToStr(aRainfall[i, j]) + #9;
  memOutput.Lines.Add(sLine);
end;
```

1.4

```
For iRow = 1 to 4 do
Set iSumItem = 0
    For iCol = 1 to 4 do
        iSumItem = iSumItem + aStock[i, j];
aStock[i, 5] := iSumItem;
```

1.5 a. Passengers and aMonths would be integer arrays, while aStations would contain the station names as strings. A 2D array cannot contain mixed data types.

b. Replace the station names with numeric codes. The stations can then be represented as rows and listed in the first column. The columns from 2 to 13 would represent the months. The 2D array elements could then hold the passenger numbers per month.

QUESTION 2

The coded solution can be found in the 03 - Question 2 folder.

QUESTION 3

The coded solution can be found in the 03 - Question 3 folder.

TERM 3

CHAPTER 8

INTERNET SERVICES TECHNOLOGIES

CHAPTER OVERVIEW	
Unit 8.1	Improve searching
Unit 8.2	Online applications

The following learning outcomes are covered by this chapter:

- discuss improvements in web searching
- explain how online applications work with regards to data storage, running instructions and formatting output.

GRADE: 12 DATE: TEACHING TIME: 2 hours

Resources	Each learner should have access to:
	• IT 12 Theory Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher

INTRODUCTION

Revise internet technologies. Access the QR code to further enrich the information.

Activity 8.1 Memorandum

8.1.1
a. Web 1.0
b. Web 2.0
c. Web 3.0
d. Web applications
e. Semantic web

Access the QR codes in the introduction to further enrich the information. Ensure learners understand the concept before moving on to the next activity.

Activity 8.2 Memorandum

8.2.1
- a. C. Keyword search
- b. A. Semantic search
- c. B. Mediated search
- d. A. Semantic search
- e. B. Mediated search

8.2.2 Teacher discretion for the following questions as they are subjective to the date and research keywords used.
- a. Thabana Ntlenyana 3 482 m
- b. 1 880
- c. Magnus Carlsen is a Norwegian chess grandmaster, 2019
- d. The Eagles have the first and third best-selling albums of all time, with the band's "Hotel California" following "Thriller."
- e. Spider-Man: Far From Home, 2019

8.2.3 Teacher discretion for the following questions as they are subjective to the date and research keywords used.
- a. $754.64
- b. Brenda Fassie – Memeza – 500 000 sold
- c. Kanye
- d. PewDiePie 96 million subscribers

8.2.4 Teacher discretion for the following questions as they are subjective to the date and research keywords used.
- a. Samsung Galaxy S10 Plus Price in South Africa ZAR 22,475, Price for 8GB + 512GB: ZAR 28,750. Stunning design, immaculate fit and finish, super powerful internal hardware and top-rate camera system
- b. Huawei P Smart 2019 Price in South Africa ZAR 6,250
- c. Yes

8.1.5 Teacher discretion, learners need to follow the criteria and support their answers.
Once prepared, present your answers to the rest of the class or submit your report to your teacher.

Online applications

Read and discuss the Did you know box and the notes. Access the QR codes to further enrich the information. Ensure learners understand the concept before moving on to the next activity.

Case Study

Read and discuss the case study on cascading style sheets, the answers are subjective.

Activity 8.3 Memorandum

8.3.1 1. – B, 2. – F. or E, 3. – C, 4. – I, 5. – A, 6. – G, 7. – C, 8. – D, 9. – F. or E, 10. – H

8.3.2 With local (or client-side) scripts, all the code that will be run must be stored in the code of the web page.

8.2.3 Allows you to update or refresh a small part of a web page without reloading the entire page.

1. a. C. Keyword search
   b. A. Web 1.0
   c. A. Web 3.0
   d. B. www.w3.org
   e. Google sheets
   f. B. Secure Sockets Layer
   g. B. HTML
   h. D. User passwords
   i. D. Facebook
   j. C. Your bank details
2. a. False. AJAX allows you to update or refresh a small part of a web page without reloading the entire page.
   b. False. A private key is used to decrypt data that has been encrypted by a public key.
   c. False. In order to do client-side processing, you can use local scripts like JavaScript or PHP script.
   d. True
   e. False. Any sensitive information like credit card details or passwords must be ecrypted when sent over a website.
3. 1. – D, 2. – L, 3. – J, 4. – A, 5. – B, 6. – C, 7. – F, 8. – E, 9. – I, 10. – G
4. Teacher discretion as answers are subjective.
5. CSS determines how a website will look by creating a style sheet. AJAX which allows you to update or refresh a small part of a web page without reloading the entire page. Teacher discretion

TERM 3

CHAPTER 9

NETWORKS

CHAPTER OVERVIEW	
Unit 9.1	Essential parts to link nodes
Unit 9.2	Connecting to the Internet
Unit 9.3	Sharing concepts
Unit 9.4	Remote access

The following learning outcomes are covered by this chapter:

- set up a computer network with internet access
- set up local and online remote access to a computer
- explain how files can be shared locally and online.

GRADE: 12 DATE: TEACHING TIME: 2 hours

Resources	Each learner should have access to:
	• IT 12 Theory Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher

INTRODUCTION

Revise Networks. Ensure learners understand the concept before moving on to the activity.

Activity 9.1 Memorandum

9.1.1 1. – E, 2. – C, 3. – A, 4. – D, 5. – B, 6. – A, 7. – F, 8. – E

Essential parts to link nodes

Read and discuss the notes. Ensure learners understand the concept before moving on to the activity.

Activity 9.2 Memorandum

9.2.1 a. A. Network cable and switch, router or wireless base station

b. B. Router

9.2.2 a. If you are connecting directly to the Internet, you may require a specific cable based on the type of Internet you are using such as a DSL enabled phone cable or a fibre optic cable.

b. Router

9.2.3 a. True

b. False. The image below shows a basic router setup.

Connecting to the Internet

Read and discuss the notes. Ensure learners understand the concept before moving on to the activity

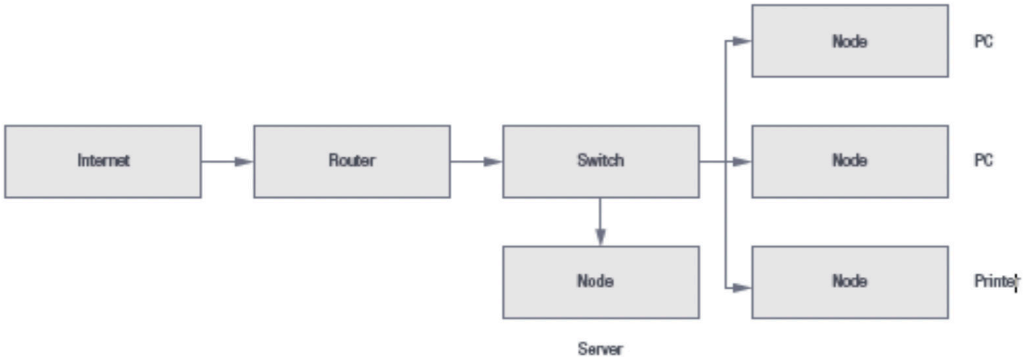
Activity 9.3 Memorandum

9.3.1 a. B. Internet service provider

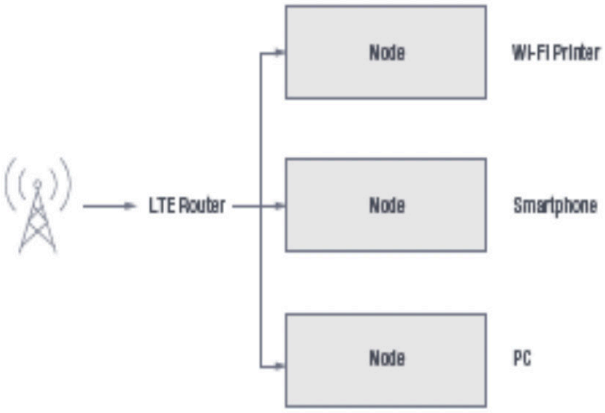
b. A. Any computer or smartphone, router, active fibre connection, ONT device

c. D. Any computer or smartphone, mobile router, USB dongle

9.3.2 A router is connected to the Internet as well as to a local area network's switch. This allows all the computers on the local area network to connect to the Internet.



9.3.3 In this figure, a router connects to the Internet using LTE, and multiple devices (including a smartphone and a PC) connect to the router using Wi-Fi



9.3.4 Another option to connect to the Internet, is to have a contract with an internet service provider (ISP). The ISP will charge you a monthly fee and, in return, allow you to use their network to connect to the Internet. Most ISPs will also help you to set up your internet connection, from making sure you have the correct hardware to installing the telephone lines and setting up you the internet account.

Most ISP's combine a modem and router into one device. This way you can just plug in your computer and be connected to the Internet. The router provides a local IP address to each connected device, but they will all have the same external IP address, which is assigned by your ISP. To connect the switch just put a cable between a LAN port of your router and the switch.

UNIT 9.3

Sharing concepts

Read and discuss the Example and the notes. Ensure learners understand the concept before moving on to the activity.

Example 9.1

Guide the learners through the steps to using online file storage applications.

Activity 9.4 Memorandum

9.4.1 **a.** The ability to share files and folders on one computer with other computers on the networks. Once shared, people on the network can open and view the files or folders or they can copy the files to their own computers. Depending on the setup, these users might also be allowed to modify the files or delete the files.

b. Risks:

- by sharing files and folders, you make it easier for viruses to infect your computer over the network.
- by allowing users to change your files, they may accidentally or maliciously delete your personal files.
- sharing copyrighted files such as movies or music is illegal.
- you could accidentally give users on the network access to personal files.

c. User rights allow you to set advanced permissions for your shared files, giving different users access to use your files in different ways.

d. The advantages of using user rights are:

- It allows you to specify, in detail, which users have access to your files.
- It allows only specific users to change your files. This decreases the risk of viruses infecting your computer and users deleting your files.

The disadvantages of using user rights are:

- It is more time consuming and difficult to set up.
- It may require you to make changes to the user rights as new users are added.
- It may require you to make changes as user's needs change.
- Some programs on a shared folder will not function if a user does not have full user rights.

9.4.2 **a.** BitTorrent, anyone who downloads a torrent file automatically starts sharing it with other people.

b. Dropbox, Mobile Me and Office 365.

9.4.3 Make those files available to other people, the data used to upload the file is shared between all the users downloading the file. The bandwidth is also shared, allowing users to download the file more quickly. Finally, for websites using torrents to share pirated material, the website itself is not sharing the illegal materials nor the files linking to the illegal materials. This makes it a lot harder to prosecute the website owners for copyright infringement.

9.4.4 What makes torrent files unique is that they do not rely on a single peer sharing a file with lots of peers.

9.4.5 Teacher discretion

9.4.6 This makes it a lot harder to prosecute the website owners for copyright infringement.

9.4.7 The website itself is not sharing the illegal materials nor the files linking to the illegal materials

9.4.8 Teacher discretion, learner needs to have sound reasoning

9.4.9 Teacher discretion, learner needs to have sound reasoning

Remote access

Read and discuss the notes. Ensure learners understand the concept before moving on to the activity.

Activity 9.5 Memorandum

9.5.1 1. – B, 2. – D, 3. – A, 4. – E, 5. – A, 6. – B, 7. – A, 8. – C, 9. – E, 10. – D.

9.5.2 Remote access can be incredibly useful in several different situations:

- Remote access allows you to quickly jump between computers, running and managing different applications on different computers.
- Remote access allows you to log into a computer in a different location and share some of its _ les with yourself.
- Remote access allows you to set up and manage computers operating in different locations.
- Remote access allows you to troubleshoot problems that occur on different computers from your own computer.

9.5.3 Remote access is also commonly used by businesses to:

- Share software that can only be installed on a single computer
- Access a work network (and the resources on a work network) from home
- Set up and manage servers.
- Manage network settings
- Provide technical support from a single location

Teacher discretion for the examples, they must relate to the example.

9.5.4 Advantages: Ensures security to the user, low maintenance cost, ensures flexibility
Disadvantages: Possible hacking, there has to be a network

1. a. A. Desktop PC
   b. A. 4G
   c. A. Modem
   d. A. WAP
2. a. False. A ethernet cable makes use of telephone lines.
   b. True
   c. False. ADSL has the slowest internet speeds.
   d. True
3. 1. – I, 2. – B, 3. – D, 4. – F, 5. – K, 6. – C, 7. – G, 8. – M, 9. – E or H, 10. – J
4. a. i. LAN
      ii. WAN
   b. i. peer-to-peer (p2p) network
      ii. Client-server networks
5. The ability to share files and folders on one computer with other computers on the networks. Once shared, people on the network can open and view the files or folders or they can copy the files to their own computers. Depending on the setup, these users might also be allowed to modify the files or delete the files.
6. For one, the data used to upload the file is shared between all the users downloading the file. The bandwidth is also shared, allowing users to download the file more quickly. Furthermore, since the file is not uploaded to a single website or hosted by a single user, people may continue to share it for years after it was first shared. Finally, for websites using torrents to share pirated material, the website itself is not sharing the illegal materials nor the files linking to the illegal materials. This makes it a lot harder to prosecute the website owners for copyright infringement.
7. a. Laptop
   b. Peer-to-peer (p2p) network, each computer on the network connects directly to the network and the other computers on the network. Peers on this network are visible to each other and can share files and resources with each other
   c. Wireless, easier without cables, quicker speed
   d. 4G & 5G as they will have large data files to download
   e. Computer, internet connection channel, internet communication device
   f. Who can read, write or modify the files
   g. BitTorrent, can be used to share files

TERM 3

CHAPTER 10

E-COMMUNICATIONS

CHAPTER OVERVIEW

Unit 10.1 Overview of security concepts

The following learning outcomes are covered by this chapter:

- explain and compare encryption, SSL, certificates and security and firewalls

GRADE: 12 DATE: TEACHING TIME: 2 hours

Resources	Each learner should have access to: • IT 12 Theory Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher

INTRODUCTION

Revise e-communications. Ensure learners understand the concept before moving on to the case study.

Case Study

Read and discuss the case study on cyber-attacks on government websites.

Overview of security concepts

Access the QR codes and animations to further enrich the information. Ensure learners understand the concept before moving on to the activity.

Activity 10.1 Memorandum

10.1.1 1. – D, 2. – B, 3. – H, 4. – E, 5. – F, 6. – I, 7. – G, 8. – C

10.1.2 Learners' own work. Accept all reasonable answers.

1. a. By adding a password to a computer, only people who know the password can access the computer and its files.
   b.
   - Choose a password that is long (at least 8 characters). Passwords become exponentially harder to crack with each additional character.
   - Include uppercase and lowercase letters, as well as numbers, in your password.
   - Never use personal information such as a birthdate or the name of your favourite sports team as a password.
   - Create a password made up of 3 or 4 random words. This will be easy to remember but hard to crack.
   - Create different passwords for different websites. In this way, if someone hacks your social media account, they cannot use the same password for your online banking.
   - Do not share your passwords with other people and do not write your passwords down.

   c. Firewalls prevent malicious users and viruses from sending data to and receiving data from your computer
   d.
   - Software firewalls that are installed on the user's computer and protects a single computer.
   - Software firewalls that are installed on a server or router that protects all the computers on the network.
   - Hardware firewalls that are installed between a local network and the Internet and protects all the computers on the network.

   e. Encryption is the process of encoding a message or information in such a way that only authorised parties can access it.
   f. By encrypting personal data such as usernames and passwords, websites provide an extra layer of protection for users
2. a. Certificate
   b. SSI
   c. Encryption
   d. Key
3. a. Encryption is the process of encoding a message or information in such a way that only authorised parties can access it.
   b. Websites can use HTTPS to encrypt any traffic sent from the user to the website, and from the website to the user.
   c. Public key and a private key. Anything locked by the public key can only be unlocked by the private key, and anything locked by the private key can only be unlocked by the public key. The public key is public, which means that all the messages you send and all information you submit on the Internet contains this public key. Even though hackers can easily see this public key, they cannot use it to unlock information encrypted with the public key. To unlock this information, they need your private key. Unlike your public key, your private key is kept a secret by your computer and never shared with anyone.
4. a. Secure Sockets Layer
   b. Websites use this certificate to prove their identity.
   c. Any of the following:
   - Choose a password that is long (at least 8 characters). Passwords become exponentially harder to crack with each additional character.
   - Include uppercase and lowercase letters, as well as numbers, in your password.
   - Never use personal information such as a birthdate or the name of your favourite sports team as a password.
   - Create a password made up of 3 or 4 random words. This will be easy to remember but hard to crack.
   - Create different passwords for different websites. In this way, if someone hacks your social media account, they cannot use the same password for your online banking.
   - Do not share your passwords with other people and do not write your passwords down.

5. A firewall is a network security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules.
6. A firewall typically establishes a barrier between a trusted internal network and untrusted external network, such as the Internet
7. There are three basic types of firewalls that are used by companies to protect their data and devices to keep destructive elements out of network, viz. Packet Filters, Stateful Inspection and Proxy Server Firewalls
8. Encryption is the process of encoding a message or information in such a way that only authorized parties can access it and those who are not authorised cannot.
9. If you forget your password, the bank knows the encryption key, it can decrypt the data and verify that you have sent the correct password.

CHAPTER 11

SOCIAL IMPLICATIONS

CHAPTER OVERVIEW	
Unit 11.1	Computers provide solutions to issues of national and international importance
Unit 11.2	The evolution of social networking and the effect on society
Unit 11.3	Privacy and information sharing

The following learning outcomes are covered by this chapter:

- describe the evolution of social networking and the effect on society
- explain how computers provide solutions to issues of national and international importance
- list and discuss issues regarding privacy and information sharing

GRADE:	12	DATE:	TEACHING TIME:	2 hours

Resources	Each learner should have access to: • IT 12 Theory Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher
Vocabulary	Learners will need to understand the following terms for this chapter: • social website – an online platform that allows users to create a public profile and interact with other users on the website • Social engineering – the act of tricking someone into giving information or taking action they usually wouldn't take

INTRODUCTION

Ensure learners understand the concept before moving on to the activity.

Activity 11.1 Memorandum

11.1.1 Allows for collaboration of work, no time constraint, no travel costs, increased productivity

11.1.2 Divide the class into two teams, one team will debate for globalisation and the other against globalisation. Explain to the learners the process of a debate and how to write augmentative statements that are supported with research. Provide learners with resources on globalisation so they can develop their argument. Hold the debate.

Computers provide solutions to issues of national and international importance

Read and discuss the Did you know box and notes. Ensure learners understand the concept before moving on to the activity.

Activity 11.2 Memorandum

11.2.1 1. – A, 2. – B, 3. – A

11.2.2 Teacher discretion as answers are subjective, you can create a class debate on a topic or use the jigsaw method so that all the topics can be discussed and shared with the class. This activity can either be a discussion in class or learners can answer the questions individually in their homework books.

Access the animation to enrich the information. Ensure learners understand the concept before moving on to the activity.

Activity 11.3 Memorandum

Teacher discretion as answers are subjective, you can create a class debate on a topic or use the jigsaw method so that all the topics can be discussed and shared with the class.

This activity can either be a discussion in class or learners can answer the questions individually in their homework books.

Case Study

Read and discuss stalking and social media.

Case Study

Read and discuss Alt-right..

Activity 11.4 Memorandum

Teacher discretion as answers are subjective, you can create a class debate on a topic or use the jigsaw method so that all the topics can be discussed and shared with the class. This activity can either be a discussion in class or learners can answer the questions individually in their homework books.

Activity 11.5 Memorandum

Teacher discretion as answers are subjective, you can create a class debate on a topic or use the jigsaw method so that all the topics can be discussed and shared with the class. This activity can either be a discussion in class or learners can answer the questions individually in their homework books.

Activity 116 Memorandum

Teacher discretion as answers are subjective, you can create a class debate on a topic or use the jigsaw method so that all the topics can be discussed and shared with the class. This activity can either be a discussion in class or learners can answer the questions individually in their homework books.

Activity 11.7 Memorandum

Teacher discretion as answers are subjective, you can create a class debate on a topic or use the jigsaw method so that all the topics can be discussed and shared with the class. This activity can either be a discussion in class or learners can answer the questions individually in their homework books.

Read and discuss the Did you know boxes and notes. Access the QR code to further enrich the information. Ensure learners understand the concept before moving on to the activity.

Activity 11.3 Memorandum

Teacher discretion as answers are subjective, you can create a class debate on a topic or use the jigsaw method so that all the topics can be discussed and shared with the class.

CONSOLIDATION

Chapter 11: Social implications

Divide the class into two teams, one team will debate for the topic and the other against the topic. Explain to the learners the process of a debate and how to write augmentative statements that are supported with research. Provide learners with resources on the topic so they can develop their argument. Hold the debate.

DATABASES AND SQL

CHAPTER 4

CHAPTER OVERVIEW	
Unit 4.1	Select and sort columns
Unit 4.2	Select columns and rows
Unit 4.3	Calculated columns
Unit 4.4	Aggregate functions
Unit 4.5	Data maintenance
Unit 4.6	Querying two tables
Unit 4.7	Database applications

The following learning outcomes are covered by this chapter:

- select columns and calculated fields
- select columns and rows using conditions
- use functions and aggregate functions when selecting data
- update, add and delete data using SQL statements
- query one or two tables using SQL statements
- use the data from an SQL statement in a Delphi application.

GRADE: 12 DATE: TEACHING TIME: 8 hours

Resources	Each learner should have access to: • IT 12 Practical Book • QR Code Reader • Computer with Delphi IDE loaded onto it • Data files for the learners and solution folders for the teacher
Vocabulary	Learners will need to understand the following terms for this chapter: • algorithm – an ordered list of steps for carrying out a task or solving a problem • unambiguous – not open to more than one interpretation

UNIT 4.1

Select and sort columns

Discuss the Did you know boxes and examples as they will help with the activities. After each activity check that learners are confident with the steps and information.

Example 4.1

Guide the learners through the example to run SQL queries in the testSQL app.

Example 4.2

Guide the learners through the example to run SQL queries in the testSQL app.

Activity 4.1 Memorandum

4.1.1 1) 100 2) 10 3) 100

4.1.2 The same.

4.1.3 The statement will choose the specified fields from a specific table and display all the records in the table.

4.1.4 The release_date and title columns will be swopped.

4.1.5 Suggested answers:

a. Incorrect. It should read: SELECT title, genre, income FROM tblMovies;

b. Incorrect. It should read: SELECT title, genre, income FROM tblMovies;

c. Incorrect. It should read: SELECT title, genre, income, FROM tblMovies;

d. Correct, however the order of the fields will be swopped.

4.1.6 SQL queries to select the data.

a. SELECT GeneralName, NumAdults FROM tblCarnivores;

b. SELECT ScientificName, GeneralName FROM tblCarnivores;

c. SELECT VisitDate, ReasonForVisit FROM tblVetVisits;

d. SELECT GeneralName, NumAdults, NumYoung, EnclosureSize FROM tblCarnivores;

e. SELECT ReasonForVisit, FollowUp FROM tblVetVisits;

Example 4.3

Work through the example and check that learners are confident with the SQL steps and information.

Example 4.4

Work through the example and check that learners are confident with the SQL steps and information.

Activity 4.2 Memorandum

4.2.1 Suggested answers

a. SELECT DISTINCT ReasonForVisit FROM tblVetVisits;

b. SELECT DISTINCT EnclosureNo FROM tblVetVisits;

4.2.2 SELECT DISTINCT FamilyName FROM tblCarnivores;

4.2.3 SELECT DISTINCT ReasonForVisit FROM tblVetVisits;

4.2.4 SELECT DISTINCT EnclosureNo FROM tblVetVisits;

4.2.5 8

Example 4.5

Work through the example and check that learners are confident with the query steps and information.

Example 4.6

Work through the example and check that learners are confident with the SQL steps and information.

Activity 4.3 Memorandum

4.3.1 SELECT GeneralName FROM tblCarnivores ORDER BY GeneralName;
4.3.2 SELECT * FROM tblVetVisits ORDER BY VisitDate ORDER BY DESC;
4.3.3 SELECT ScientificName FROM tblCarnivores ORDER BY ScientificName;
4.3.4 SELECT FamilyName, ScientificName FROM tblCarnivores ORDER BY FamilyName ASC, ScientificName DESC;

Activity 4.4 Memorandum

4.4.1 SELECT income, score, title FROM tblMovies;
4.4.2 SELECT name, city, province FROM tblStudios;
4.4.3 SELECT title, score FROM tblMovies ORDER BY score DESC;
4.4.4 SELECT title, income, release_date FROM tblMovies ORDER BY release_date;
4.4.5 SELECT DISTINCT city FROM tblStudios table;
4.4.6 SELECT * FROM tblMovies ORDER BY genre, title;
4.4.7 SELECT * FROM tblMovies ORDER BY score DESC, release_date ASC;
4.4.8 SELECT * FROM tblMovies ORDER BY genre ASC, income DESC;
4.4.9 SELECT * FROM tblMovies ORDER BY studio_id ASC, score DESC;

Select columns and rows

Discuss the Take note and Did you know boxes and examples as they will help with the activities. After each activity check that learners are confident with the steps and information.

Example 4.7

Guide learners to create a query with WHERE and one CONDITION.

Example 4.8

Guide learners to create a query with WHERE and one CONDITION.

Activity 4.5 Memorandum

4.5.1 SELECT * FROM tblMovies WHERE genre = 'Fantasy';
4.5.2 SELECT title, release_date FROM tblMovies WHERE income < 12000000000;
4.5.3 SELECT genre FROM tblMovies WHERE score >= 80;
4.5.4 SELECT name, city, province FROM tblStudios WHERE country = 'United States';
4.5.5 SELECT ScientificName FROM tblCarnivores WHERE Endangered = 'VU';
4.5.6 SELECT GeneralName FROM tblCarnivores WHERE EnclosureNo = 'ZC2';
4.5.7 SELECT * FROM tblCarnivores WHERE NumAdults > 5;
4.5.8 SELECT * FROM tblMovies WHERE studio_id = 2 ORDER BY genre ASC, income; DESC

Example 4.9

Guide the learners through the Example to create a query with WHERE and a CONDITION using LIKE with wildcards

Example 4.10

Guide the learners through the Example to create a query with WHERE and a CONDITION using LIKE with wildcards

Activity 4.6 Memorandum

4.6.1 SELECT * FROM tblMovies WHERE title LIKE '%out';
4.6.2 SELECT * FROM tblMovies WHERE score LIKE '8_';
4.6.3 SELECT * FROM tblMovies WHERE title = ' Spider-Man 2 ';
4.6.4 SELECT * FROM tblMovies WHERE title LIKE 'Harry%e';
4.6.5 SELECT * FROM tblMovies WHERE title LIKE '%man';
4.6.6 SELECT * FROM tblCarnivores WHERE GeneralName LIKE '% mongoose';
4.6.7 SELECT * FROM tblVetVisits WHERE ReasonForVisit LIKE '%injur%';
4.6.8 SELECT * FROM tblVetVisits WHERE ReasonForVisit LIKE '%ear%'; OR
SELECT * FROM tblVetVisits WHERE ReasonForVisit LIKE 'Ear%';

Example 4.11

Guide the learners through the Example to create a query with WHERE and compound CONDITIONS

Example 4.12

Guide the learners through the Example to create a query with WHERE and compound CONDITIONS

Activity 4.7 Memorandum

4.7.1 This will not always be the case. There could be other types of drama, for example, Horror drama. In this case the two statements will not produce the same records. The first will produce more than the second one.

4.7.2 D

4.7.3 SELECT * FROM tblMovies WHERE genre = 'Animated' AND score > 85; OR
SELECT * FROM tblMovies WHERE genre = 'Animated' OR score > 85;

4.7.4 SELECT * FROM tblMovies WHERE genre = ' Fantasy ' OR studio_id = 4;

4.7.5 SELECT * FROM tblMovies WHERE NOT (genre=' Superhero ' or genre='Action');

4.7.6 SELECT * FROM tblMovies WHERE genre = 'Action' AND (score < 50 OR score > 60);

4.7.7 SELECT * FROM tblCarnivores WHERE NumAdults > 5 AND NOT FamilyName = ' Viverridae';

Example 4.13

Guide the learners through the Example to create a query with BETWEEN

Example 4.14

Guide the learners through the Example to create a query with IN commands

Example 4.15

Guide the learners through the Example to create a query with IN commands

Activity 4.8 Memorandum

4.8.1 SELECT title, studio_id FROM tblMovies WHERE studio_id IN (1, 4, 5, 9);

4.8.2 SELECT title, genre FROM tblMovies WHERE income BETWEEN 12000000000 AND 18000000000;

4.8.3 SELECT title, release_date, score FROM tblMovies WHERE release_date IS NULL;

4.8.4 SELECT title, genre FROM tblMovies WHERE NOT genre IN ('action', 'adventure', 'fantasy', 'superhero');

4.8.5 SELECT title FROM tblMovies WHERE genre = 'superhero' AND score BETWEEN 60 AND 80;

4.8.6 SELECT generalName, EnclosureSize FROM tblCarnivores WHERE EnclosureSize BETWEEN 31 AND 39;

Example 4.16

Guide the learners through the example to use Date functions.

Activity 4.9 Memorandum

4.9.1 SELECT * FROM tblMovies WHERE release_date <= #1994/01/01#;
4.9.2 SELECT * FROM tblMovies WHERE release_date >= #2016/06/10#;
4.9.3 SELECT * FROM tblMovies WHERE release_date BETWEEN #2000/01/01# and #2005/12/31#;
4.9.4 SELECT * FROM tblMovies WHERE DAY(release_date) = 1;
4.9.5 SELECT * FROM tblMovies WHERE MONTH(release_date) BETWEEN 10 AND 12;
4.9.6 SELECT * FROM tblMovies WHERE year(release_date) = 2009;

Activity 4.10 Memorandum

4.10.1 SELECT title, score FROM tblMovies WHERE genre = 'Fantasy';
4.10.2 SELECT * FROM tblMovies WHERE studio_id = 2;
4.10.3 SELECT * FROM tblMovies WHERE income < 13000000000 AND score < 50;
4.10.4 SELECT * FROM tblMovies WHERE score > 90 AND NOT genre = 'Animated';
4.10.5 SELECT * FROM tblMovies WHERE genre IN ('Superhero', 'Fantasy', 'Science fiction');
4.10.6 SELECT * FROM tblMovies WHERE release_date IS NULL;
4.10.7 SELECT * FROM tblMovies WHERE title LIKE '%me%';
4.10.8 SELECT * FROM tblMovies WHERE year(release_date) < 1999;

UNIT 4.3

Calculated columns

After each activity check that learners are confident with the steps and information.

Example 4.17

Guide the learners through the example to calculate a field example.

Activity 4.11 Memorandum

4.11.1 SELECT title, score - 10 AS lower_score FROM tblMovies;
4.11.2 SELECT title, income/1000000000 AS income_in_billions FROM tblMovies;

Example 4.18

Guide the learners through the example with number functions.

Activity 4.12 Memorandum

4.12.1 Changes it to a whole number, discarding any decimal value.
4.12.2 '00.00' will force a two digits followed by a point and two decimals so that 1.2 displays as 01.20. With '##.##' the digits are optional. In this case 1.2 will display as 1.2.
4.12.3 The output will force two decimal places. For example, 1.2 will display as 1.20 and 5.24 will display as is.
4.12.4 SELECT title, INT(income) AS rounded_income FROM tblMovies;
4.12.5 SELECT title, ROUND(income, 1) AS rounded_income FROM tblMovies;
4.12.6 SELECT title, FORMAT(score/100, '0%') AS score_perc FROM tblMovies;
4.12.7 SELECT FORMAT(release_date, 'dd/mm/yyyy') AS rearranged_date FROM tblMovies;
4.12.8 SELECT title, FORMAT(income, 'currency') AS income_rand, FORMAT(score/100, '0%') AS score_perc FROM tblMovies;

Example 4.19

Guide the learners through the example with Date functions.

Activity 4.13 Memorandum

4.13.1 SELECT title, release_date, YEAR(release_date) AS year_released FROM tblMovies;
4.13.2 SELECT * FROM tblMovies WHERE DAY(release_date) = 1;
4.13.3 SELECT * FROM tblMovies WHERE MONTH(release_date) BETWEEN 10 AND 12;
4.13.4 SELECT * FROM tblMovies WHERE year(release_date) = 2009;
4.13.5 SELECT release_date, (DATE() - release_date) AS age_in_days FROM tblMovies;
4.13.6 SELECT release_date, INT((DATE() - release_date)/30) AS age_in_months FROM tblMovies;

Example 4.20

Guide the learners through the example on string functions.

Activity 4.14 Memorandum

4.14.1 SELECT MID(City,2,3) AS City_Code FROM tblStudios;
4.14.2 SELECT title, LEN(title) AS title_length FROM tblMovies;
4.14.3 SELECT LEFT(name, 1) + RIGHT(name, 1) AS Studio_Code FROM tblStudios;
4.14.4 SELECT LEFT(EnclosureNo, 2) AS Enclosure_types FROM tblCarnivores;

Example 4.21

Guide the learners through the example.

Activity 4.15 Memorandum

4.15.1 SELECT title, STR(income/1000000000) + 'bn' AS income_in_billions FROM tblMovies;
4.15.2 SELECT name, city + ', ' + province + ', '+country AS location FROM tblStudios;
4.15.3 SELECT Animal_ID, ReasonForVisit + ', no follow up required' AS Status FROM tblVetVisits
WHERE FollowUp = False;

Activity 4.16 Memorandum

4.16.1 SELECT title, release_date, YEAR(DATE()) - YEAR(release_date) AS age FROM tblMovies;
4.16.2 SELECT Animal_ID, MONTH(VisitDate) AS VisitMonth, DAY(VisitDate) AS VisitDay FROM tblVetVisits;
4.16.3 SELECT * FROM tblMovies WHERE DAY(release_date) = 12;
4.16.4 SELECT title, income/1.15 AS ExVATIncome FROM tblMovies;
OR
SELECT title, FORMAT(income/1.15,'Currency') AS ExVATIncome FROM tblMovies;
4.16.5 SELECT title, YEAR(release_date) AS ReleaseYear, Month(release_date) AS ReleaseMonth, DAY(release_date) AS ReleaseDay FROM tblMovies;
4.16.6 SELECT title, LEFT(title,2) + RIGHT(title,2) AS title_code FROM tblMovies;

UNIT 4.4

Aggregate functions

After each activity check that learners are confident with the steps and information.

Example 4.22

Guide the learners through the example on the aggregate function.

Example 4.23

Guide the learners through the example on the aggregate function.

Example 4.24

Guide the learners through the example on the aggregate function.

Example 4.25

Guide the learners through the example on the aggregate function.

Activity 4.17 Memorandum

4.17.1 SELECT COUNT(*) AS score_below50 FROM tblMovies WHERE score < 50;
4.17.2 SELECT MAX(income) AS highest_income FROM tblMovies;
4.17.3 SELECT MIN(score) AS animated_lowest_score FROM tblMovies WHERE genre = 'Animated';
4.17.4 SELECT SUM(income) AS total_income FROM tblMovies WHERE title LIKE '%Harry Potter%';
4.17.5 SELECT AVG(score) AS average_score FROM tblMovies WHERE studio_id = 2;

Example 4.26

Guide the learners through the example on the GROUP BY clause.

Activity 4.18 Memorandum

4.18.1 SELECT genre, COUNT(title) AS number_of_titles FROM tblMovies GROUP BY genre;
4.18.2 SELECT studio_id, SUM(income) AS income_per_studio FROM tblMovies GROUP BY studio_id;
4.18.3 SELECT studio_id, MAX(release_date) AS most_recent FROM tblMovies GROUP BY studio_id;
4.18.4 SELECT genre, AVG(score) AS average_score FROM tblMovies WHERE income > 14000000000 GROUP BY genre;
OR
SELECT genre, ROUND(AVG(score),1) AS average_score FROM tblMovies WHERE income > 14000000000 GROUP BY genre;
4.18.5 SELECT studio_id, COUNT(studio_id) AS number_high_earners FROM tblMovies WHERE income > 14000000000 GROUP BY studio_id;

Example 4.27

Guide the learners through the example on the HAVING clause.

Activity 4.19 Memorandum

4.19.1 SELECT studio_ID, COUNT(*) AS num_of_Movies FROM TblMovies GROUP BY studio_ID HAVING COUNT(*) >= 10;

4.19.2 SELECT studio_ID, SUM(income) AS total_income FROM TblMovies GROUP BY studio_ID HAVING SUM(income) > 150000000000;

4.19.3 SELECT genre, AVG(score) AS average_score FROM TblMovies GROUP BY genre HAVING COUNT(*) >= 5;

Activity 4.20 Memorandum

4.20.1 SELECT MIN(release_date) AS earliest_release_date FROM tblMovies;

4.20.2 SELECT ROUND(AVG(score),2) AS average_score FROM tblMovies;

4.20.3 SELECT FORMAT(MAX(income), 'currency') AS animated_highest_income FROM tblMovies WHERE genre = 'Animated';

4.20.4 SELECT COUNT(*) AS income_above15bn FROM tblMovies WHERE income > 15000000000;

4.20.5 SELECT FORMAT(AVG(income),'currency') AS average_income FROM tblMovies WHERE score > 90;

4.20.6 SELECT FORMAT(AVG(income),'currency') AS average_income_genre FROM tblMovies GROUP BY genre;

4.20.7 SELECT studio_ID, MAX(score) AS maximum_score FROM tblMovies GROUP BY studio_ID;

4.20.8 SELECT YEAR(release_date) AS release_year, MIN(score) AS minimum_score FROM tblMovies GROUP BY YEAR(release_date);

4.20.9 SELECT genre, FORMAT(SUM(income),'currency') AS total_income FROM tblMovies GROUP BY genre HAVING SUM(income) > 100000000000;

4.20.10 SELECT studio_ID, ROUND(AVG(score),1) AS average_score FROM tblMovies GROUP BY studio_ID HAVING AVG(score) > 70;

Data maintenance

After each activity check that learners are confident with the steps and information.

Example 4.28

Guide the learners through the query to add the movie "Aquaman" to the tblMovies table.

Activity 4.21 Memorandum

4.21.1
```
INSERT INTO tblmovies (id, title, studio_id, income, release_date, score, genre)
VALUES (102, "Bohemian Rhapsody", 3, 10846000000, #2018/11/02#, 49, "Musical");

INSERT INTO tblmovies (id, title, studio_id, income, release_date, score, genre)
VALUES (103, " Fantastic Beasts: The Crimes of Grindelwald", 4, 9069000000, #2018/11/16#,
52, " Fantasy");

INSERT INTO tblmovies (id, title, studio_id, income, release_date, score, genre)
VALUES (104, " Ant-Man and the Wasp", 2, 8718000000, , 70, " Superhero");
```

4.21.2
```
INSERT INTO tblStudios (studio_ID, name, city, province, country)
VALUES (11, "Polybona Films", "Beijing", "Hebei", "China");
```

Example 4.29

Guide the learners through the code and example.

Example 4.30

Guide the learners to add values to the fields.

Activity 4.22 Memorandum

4.22.1
```
UPDATE tblMovies SET income = 11444000000 WHERE title = 'Independence Day';
```

4.22.2
```
UPDATE tblMovies SET income = income * 1.1 WHERE YEAR(release_date) < 2000;
```

Example 4.31

Guide the learners to delete values from the fields.

Activity 4.23 Memorandum

4.23.1
```
DELETE FROM tblMovies WHERE release_date = #2017/05/05#;
```

4.23.2
```
DELETE FROM tblMovies WHERE title = 'Despicable Me 2';
```

4.23.3
```
DELETE FROM tblMovies WHERE genre = 'Superhero';
```

4.23.4
```
DELETE FROM tblMovies WHERE title LIKE '%Star Wars%';
```

4.23.5
```
DELETE FROM tblMovies WHERE DAY(release_date) < 5;
```

4.23.6
```
DELETE FROM tblMovies WHERE score < 60 AND income < 14000000000;
```

Activity 4.24 Memorandum

4.24.1 INSERT INTO tblStudios (studio_ID, name, fullname, city, province, country)
VALUES (12," CTFS", "Cape Town Film Studios", "Cape Town", "Western Cape", "South Africa");

4.24.2 INSERT INTO tblmovies (id, title, studio_id, income, release_date, score, genre)
VALUES (105, "Ready Player One", 3, , #2018/07/20#, 64, "Science Fiction"), (106, "The Meg", 3, 7423000000, #2018/08/10#, ,), (107, "Mamma Mia! Here We Go Again", 5, 5526000000, ,60 , "Musical");

4.24.3 UPDATE tblMovies SET score = 106 WHERE ID = 46;

4.24.4 UPDATE tblMovies SET genre = 'Science-Fiction' WHERE genre = 'Science fiction';

4.24.5 DELETE FROM tblMovies WHERE YEAR(release_date) < 2000;

4.24.6 DELETE FROM tblMovies WHERE NOT Country = ' United States';

UNIT 4.6

Querying two tables

After each activity check that learners are confident with the steps and information.

Example 4.32

Guide the learners through the example on a query.

Activity 4.25 Memorandum

4.25.1 SELECT tblMovies.title, tblMovies.release_date, tblStudios.name FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id;

4.25.2 SELECT tblMovies.title, tblMovies.score, tblMovies.income, tblStudios.city, tblStudios.province FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id;

4.25.3 SELECT tblMovies.title, tblMovies.score, tblMovies.income, tblStudios.name FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id AND tblMovies.score < 40;

4.25.4 SELECT tblMovies.title, tblStudios.name FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id AND tblStudios.city = 'Los Angeles';

4.25.5 SELECT tblMovies.title, tblMovies.score, tblMovies.income, tblStudios.name FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id AND tblMovies.income > 15000000000;

Activity 4.26 Memorandum

4.26.1 SELECT tblMovies.title, tblMovies.score, tblStudios.name FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id;

4.26.2 SELECT tblMovies.title, YEAR(tblMovies.release_date) AS release_year, tblStudios.city FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id;

4.26.3 SELECT tblMovies.*, tblStudios.* FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id;

4.26.4 SELECT tblMovies.* FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id AND tblMovies.score > 90 AND NOT tblStudios.city = 'Hollywood';

4.26.5 SELECT tblMovies.title, tblStudios.name FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id AND tblStudios.name = 'Disney' AND tblMovies.genre = 'Superhero';

4.26.6 SELECT tblStudios.name, ROUND(AVG(tblMovies.score),1) AS average_score FROM tblMovies, tblStudios WHERE tblMovies.studio_id = tblStudios.studio_id GROUP BY tblStudios.name;

4.26.7 a. SELECT provinces.largest_city_id, cities.city_name, provinces.province, cities.ID FROM provinces, cities WHERE provinces.province_ID = cities.province_id AND provinces.province='Mpumalanga' AND cities. ID=provinces.largest_city_id;

b. SELECT cities.city_name, provinces.province FROM provinces, cities WHERE provinces.province_ID = cities.province_id AND cities.city_name = 'Allemansvlei';

c. SELECT cities.city_name, cities.longitude, cities.latitude, provinces.province FROM provinces, cities WHERE provinces.province_ID = cities.province_id AND cities.ID = provinces.capital_city_id AND provinces.province = 'Kwazulu Natal';

d. SELECT cities.city_name, provinces.province, provinces.population FROM provinces, cities WHERE provinces.province_ID = cities.province_id AND cities.city_name = 'Nkwali';

e. SELECT provinces.largest_city_id, provinces.capital_city_id, cities.city_name, provinces.province FROM provinces, cities WHERE provinces.province_ID = cities.province_id AND provinces.population > 6000000 AND (provinces.largest_city_id = cities.ID OR provinces.capital_city_id = cities.ID);

Example 4.29

The coded solution can be found in the 04 - Music Searcher folder.

After each activity check that learners are confident with the steps and information.

Activity 4.27 Memorandum

The coded solution can be found in the 04 - Music Searcher folder.

Activity 4.28 Memorandum

The coded solution can be found in the 04 - Cities in South Africa folder.

Activity 4.29 Memorandum

The coded solution can be found in the 04 - Cities in South Africa folder.

QUESTION 1

1.1 a. SELECT * FROM students ORDER BY [student number];

b. SELECT DISTINCT course FROM students;

c. SELECT name, surname, average FROM students WHERE name LIKE '%a%' OR surname LIKE '%a%';

1.2 a. SELECT product FROM Appliances WHERE price > 2000;

b. SELECT FORMAT(SUM(price * [total units]), 'Currency') AS TotalValue FROM Appliances;

QUESTION 2

The coded solution can be found in the 04 - Question 2 folder.

QUESTION 3

The coded solution can be found in the 04 - Question 3 folder.