VERSION 1 CAPS

GRADE 10
MATHEMATICAL LITERACY

WRITTEN BY VOLUNTEERS

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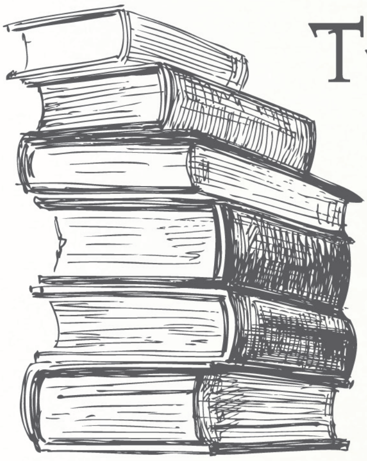

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OLD MUTUAL

EVERYTHING MATHS

GRADE 10 MATHEMATICAL LITERACY

TEACHERS' GUIDE

VERSION 1 CAPS

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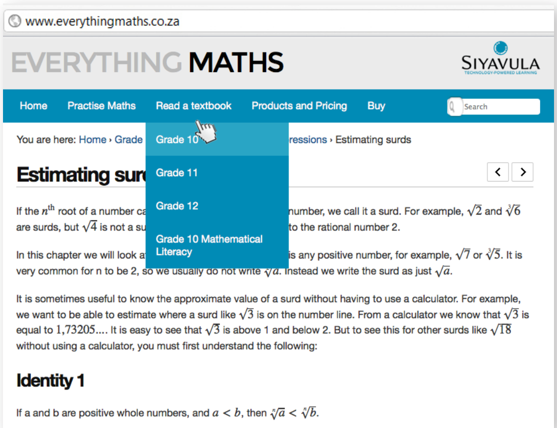

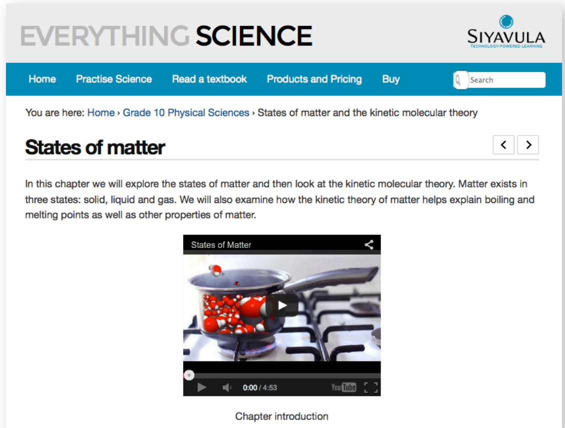

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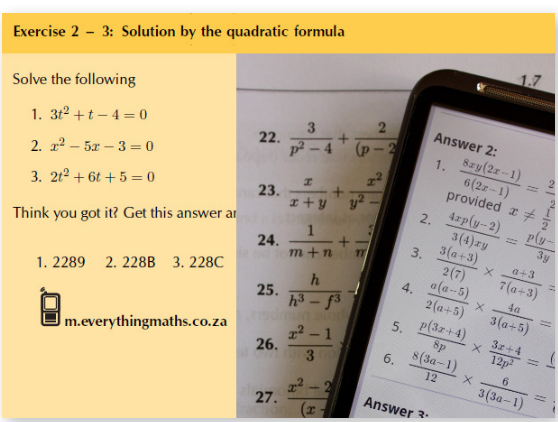

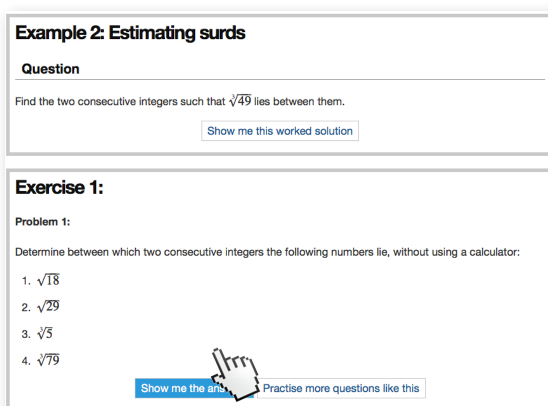

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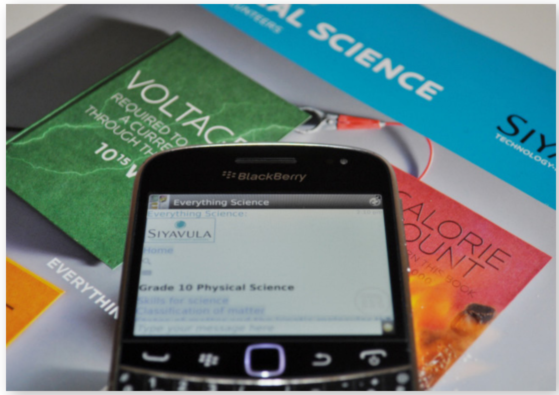

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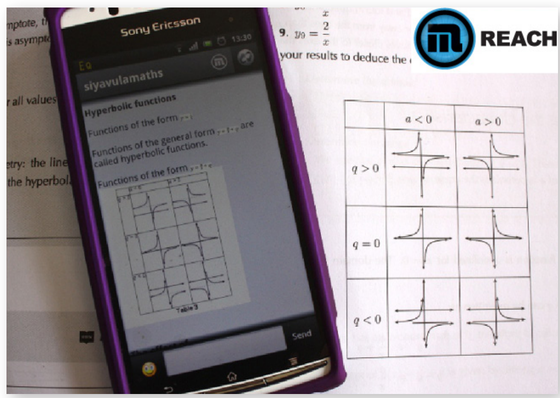

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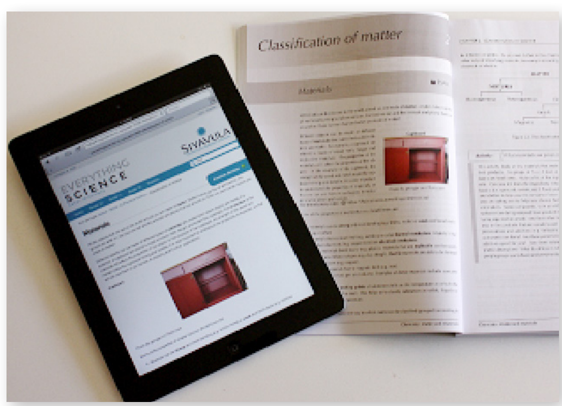

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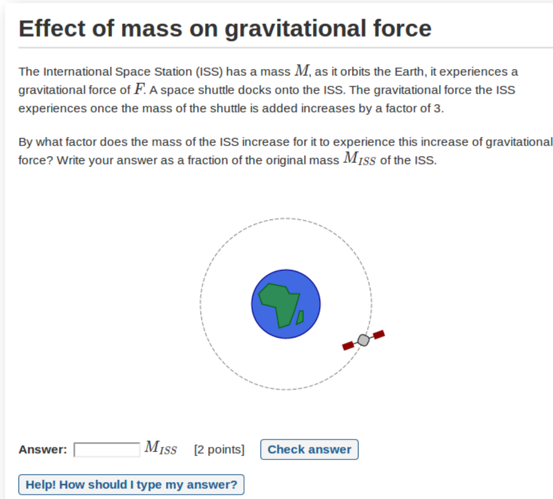

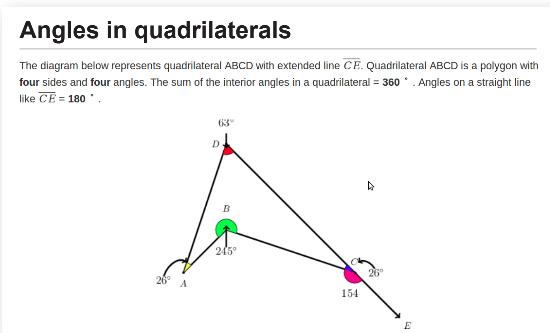

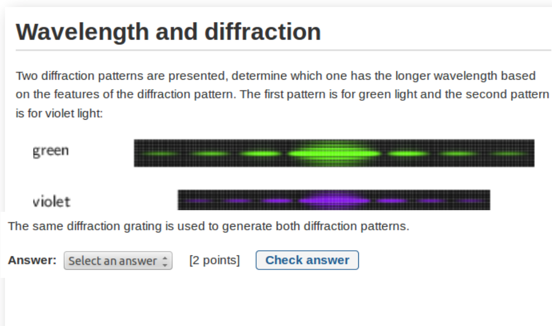

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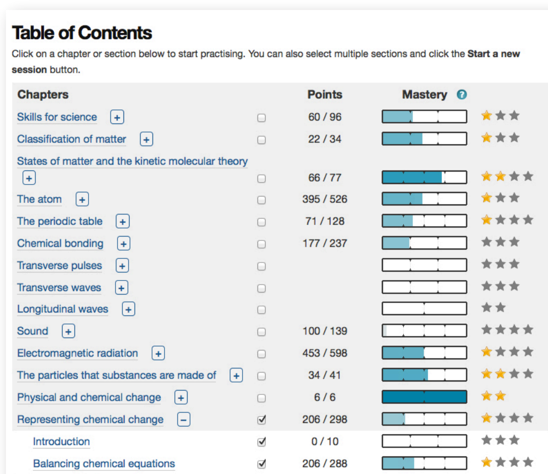

EVERYTHING MATHS

Mathematics is commonly thought of as being about numbers but mathematics is actually a language! Mathematics is the language that nature speaks to us in. As we learn to understand and speak this language, we can discover many of nature's secrets. Just as understanding someone's language is necessary to learn more about them, mathematics is required to learn about all aspects of the world – whether it is physical sciences, life sciences or even finance and economics.

The great writers and poets of the world have the ability to draw on words and put them together in ways that can tell beautiful or inspiring stories. In a similar way, one can draw on mathematics to explain and create new things. Many of the modern technologies that have enriched our lives are greatly dependent on mathematics. DVDs, Google searches, bank cards with PIN numbers are just some examples. And just as words were not created specifically to tell a story but their existence enabled stories to be told, so the mathematics used to create these technologies was not developed for its own sake, but was available to be drawn on when the time for its application was right.

There is in fact not an area of life that is not affected by mathematics. Many of the most sought after careers depend on the use of mathematics. Civil engineers use mathematics to determine how to best design new structures; economists use mathematics to describe and predict how the economy will react to certain changes; investors use mathematics to price certain types of shares or calculate how risky particular investments are; software developers use mathematics for many of the algorithms (such as Google searches and data security) that make programmes useful.

But, even in our daily lives mathematics is everywhere – in our use of distance, time and money. Mathematics is even present in art, design and music as it informs proportions and musical tones. The greater our ability to understand mathematics, the greater our ability to appreciate beauty and everything in nature. Far from being just a cold and abstract discipline, mathematics embodies logic, symmetry, harmony and technological progress. More than any other language, mathematics is everywhere and universal in its application.

Contents

CHAPTER 1

Front matter

1.1 Introduction

Much of the introductory material in this guide is derived directly from the 2012 CAPS document issued by the Department of Basic Education. In accordance with the curriculum statement, basic skills topics are revised in Chapters 1 and 2 and then integrated wherever possible throughout later chapters. The application topics of finance, measurement and scale and maps, are split across several chapters in the learners' book, so as to follow the teaching order suggested in CAPS. Wherever possible in the learners' textbook we have tried to provide authentic resources. In the Afrikaans textbook, some of these resources remain in English. This is because learners' are most likely to encounter these documents in English and need to be able to work with them in the format in which they most commonly occur in real life. This guide includes full solutions for all activity questions in the learners' textbook. The suggested assignments given in CAPS are mostly covered either by worked examples or activities in the learners' book.

1.2 Support for educators

Maths literacy education is about more than solving mathematical problems in real world contexts... It's about learning to think and to apply knowledge, which are valuable skills that can be applied through all spheres of life. Teaching these skills to our next generation is crucial in the current global environment where methodologies, technology and tools are rapidly evolving. Education should benefit from these fast moving developments. In our simplified model there are three layers to how technology can significantly influence your teaching and teaching environment.

First Layer: educator collaboration

There are many tools that help educators collaborate more effectively. We know that communities of practice are powerful tools for the refinement of methodology, content and knowledge and are also superb for providing support to educators. One of the challenges facing community formation is the time and space to have sufficient meetings to build real communities and exchange practices, content and learnings effectively. Technology allows us to streamline this very effectively by transcending space and time. It is now possible to collaborate over large distances (transcending space) and when it is most appropriate for each individual (transcending time) by working virtually (email, mobile, online etc.).

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Second Layer: classroom engagement

In spite of the impressive array of rich media open educational resources available freely online (such as videos, simulations, exercises and presentations), only a small number of educators actively make use of them. Our investigations revealed that the overwhelming quantity, the predominant international context, and difficulty in correctly aligning them with the local curriculum level acts as deterrents. The opportunity here is that, if used correctly, they can make the classroom environment more engaging.

Presentations can be a first step to bringing material to life in ways that are more compelling than are possible with just a blackboard and chalk. There are opportunities to:

- create more graphical representations of the content;
- control timing of presented content more effectively;
- allow learners to relive the lesson later if constructed well;
- supplement the slides with notes for later use;
- embed key assessment items in advance to promote discussion; and
- embed other rich media like videos.

Videos have been shown to be potentially both engaging and effective. They provide opportunities to:

- present an alternative explanation;
- challenge misconceptions without challenging an individual in the class; and
- show an environment or experiment that cannot be replicated in the class which could be far away, too expensive or too dangerous.

Simulations are also very useful and can allow learners to:

- have increased freedom to explore, rather than reproduce a fixed experiment or process;
- explore expensive or dangerous environments more effectively; and
- overcome implicit misconceptions.

Third Layer: beyond the classroom

The internet has provided many opportunities for self-learning and participation which were never before possible. There are huge stand-alone archives of videos like the Khan Academy (which covers most Mathematics for Grades 1 - 12 and Science topics required in FET). These videos, if not used in class, provide opportunities for the learners to:

- look up content themselves;
- get ahead of class;
- independently revise and consolidate their foundation; and
- explore a subject to see if they find it interesting.

Online resources

General blogs

- Teachers Monthly - Education News and Resources
  - "We eat, breathe and live education!"
  - "Perhaps the most remarkable yet overlooked aspect of the South African teaching community is its enthusiastic, passionate spirit. Every day, thousands of talented, hardworking teachers gain new insight from their work and come up with brilliant, inventive and exciting ideas. Teacher's Monthly aims to bring teachers closer and help them share knowledge and resources."
  - "Our aim is twofold...
    - To keep South African teachers, parents and pupils updated and informed with the latest news and resources.
    - To give teachers, parents and pupils the opportunity to express their views on education."
  - http://www.teachersmonthly.com
- Head Thoughts – Personal Reflections of a School Headmaster
  - blog by Arthur Preston
  - "Arthur is the principal of an independent school in Table View in Cape Town, South Africa. His approach to primary education is progressive and he believes in integrating 21st century skills into the classroom. Before moving to Table View at the end of 2010, Arthur served as the headmaster of a growing independent school in Worcester, in the Western Cape province of South Africa where he led the school through an era of development and change."
  - http://headthoughts.co.za/

Maths blogs and Maths Literacy resources

- Khan Academy
  - The Khan Academy is an organization on a mission. We're a not-for-profit with the goal of changing education for the better by providing a free world-class education for anyone anywhere. All of the site's resources are available to anyone. It doesn't matter if you are a student, teacher, home-schooler, principal, adult returning to the classroom after 20 years, or a friendly alien just trying to get a leg up in earthly biology. The Khan Academy's materials and resources are available to you completely free of charge.
  - http://www.khanacademy.org/math/arithmetic
- Vi Hart
  - "Recreational mathematics and inspirational videos by resident mathemusician Vi Hart."
  - http://vihart.com/
  - http://www.khanacademy.org/math/vi-hart
- Education Activist
  - blog by Robyn Clark
  - "This is where I write my thoughts on Maths, my class, my school and education in South Africa... I'm a teacher. I'm an inspirer."
  - http://clarkformaths.tumblr.com/
- Let's Play Maths
  - "Math is a game, playing with ideas. This blog is about learning, teaching, and playing around with mathematics from preschool to pre-calculus. What an adventure!"
  - http://letsplaymath.net/
- Mindset Learn
  - Videos and content specifically created for the South African Mathematical Literacy curriculum.
  - http://www.mindset.co.za/learn/s25
- Virtual School, South African Maths Videos
  - The virtual school videos for South African learners in the category "maths". The fun way to learn maths!
  - "We aim to provide access to comprehensive world-class secondary education, free of charge, around the world."
  - http://www.youtube.com/course?list=ECDEA76090EA3CDE0B&feature=plcp

Tell us how to improve the book

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1.3 Curriculum overview

Before 1994 there existed a number of education departments and subsequent curriculum according to the segregation that was so evident during the apartheid years. As a result, the curriculum itself became one of the political icons of freedom or suppression. Since then the government and political leaders have sought to try and develop one curriculum that is aligned with our national agenda of democratic freedom and equality for all, in fore-grounding the knowledge, skills and values our country believes our learners need to acquire and apply, in order to participate meaningfully in society as citizens of a free country. The National Curriculum Statement (NCS) of Grades R – 12 (DBE, 2012) therefore serves the purposes of:

- equipping learners, irrespective of their socio-economic background, race, gender, physical ability or intellectual ability, with the knowledge, skills and values necessary for self-fulfilment, and meaningful participation in society as citizens of a free country;
- providing access to higher education;
- facilitating the transition of learners from education institutions to the workplace; and
- providing employers with a sufficient profile of a learner's competencies.

Although elevated to the status of political icon, the curriculum remains a tool that requires the skill of an educator in interpreting and operationalising this tool within the classroom. The curriculum itself cannot accomplish the purposes outlined above without the community of curriculum specialists, material developers, educators and assessors contributing to and supporting the process, of the intended curriculum becoming the implemented curriculum. A curriculum can succeed or fail, depending on its implementation, despite its intended principles or potential on paper. It is therefore important that stakeholders of the curriculum are familiar with and aligned to the following principles that the NCS is based on:

This guide is intended to add value and insight to the existing National Curriculum for Grade 10 Mathematical Literacy, in line with its purposes and principles. It is hoped that this will assist you as the educator in optimising the implementation of the intended curriculum.

The main objectives of the curriculum relate to the learners that emerge from our educational system. While educators are the most important stakeholders in the implementation of the intended curriculum, the quality of learner coming through this curriculum will be evidence of the actual attained curriculum from what was intended and then implemented.

These purposes and principles aim to produce learners that are able to:

- identify and solve problems and make decisions using critical and creative thinking;
- work effectively as individuals and with others as members of a team;
- organise and manage themselves and their activities responsibly and effectively;
- collect, analyse, organise and critically evaluate information;
- communicate effectively using visual, symbolic and/or language skills in various modes;
- use science and technology effectively and critically showing responsibility towards the environment and the health of others; and
- demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation.

The above points can be summarised as an independent learner who can think critically and analytically, while also being able to work effectively with members of a team and identify and solve problems through effective decision making. This is also the outcome of what educational research terms the "reformed" approach rather than the "traditional" approach many educators are more accustomed to. Traditional practices have their role and cannot be totally abandoned in favour of only reform practices. However, in order to produce more independent and mathematical thinkers, the reform ideology needs to be more embraced by educators within their instructional behaviour. Here is a table that can guide you to identify your dominant instructional practice and try to assist you in adjusting it (if necessary) to be more balanced and in line with the reform approach being suggested by the NCS.

	Traditional Versus Reform Practices
Values	**Traditional** – values content, correctness of learners' responses and mathematical validity of methods. **Reform** – values finding patterns, making connections, communicating mathematically and problem-solving.
Teaching Methods	**Traditional** – expository, transmission, lots of drill and practice, step by step mastery of algorithms. **Reform** – hands-on guided discovery methods, exploration, modelling. High level reasoning processes are central.
Grouping Learners	**Traditional** – dominantly same grouping approaches. **Reform** – dominantly mixed grouping and abilities.

1.4 Mathematical Literacy

What is Mathematical Literacy?

The competencies developed through Mathematical Literacy allow individuals to make sense of, participate in and contribute to the twenty-first century world — a world characterised by numbers, numerically based arguments and data represented and misrepresented in a number of different ways. Such competencies include the ability to reason, make decisions, solve problems, manage resources, interpret information, schedule events and use and apply technology. Learners must be exposed to both mathematical content and real-life contexts to develop these competencies. Mathematical content is needed to make sense of real-life contexts; on the other hand, contexts determine the content that is needed.

The subject Mathematical Literacy should enable the learner to become a self-managing person, a contributing worker and a participating citizen in a developing democracy. The teaching and learning of Mathematical Literacy should thus provide opportunities to analyse problems and devise ways to work mathematically in solving such problems. Opportunities to engage mathematically in this way will also assist learners to become astute consumers of the mathematics reflected in the media.

There are five key elements of Mathematical Literacy.

1. **Mathematical Literacy involves the use of elementary mathematical content.**

   The mathematical content of Mathematical Literacy is limited to those elementary mathematical concepts and skills that are relevant to making sense of numerically and statistically based scenarios faced in the everyday lives of individuals (self-managing individuals) and the workplace (contributing workers), and to participating as critical citizens in social and political discussions. In general, the focus is not on abstract mathematical concepts. As a rule of thumb, if the required calculations cannot be performed using a basic four-function calculator, then the calculation is in all likelihood not appropriate for Mathematical Literacy. Furthermore, since the focus in Mathematical Literacy is on making sense of real-life contexts and scenarios, in the Mathematical Literacy classroom mathematical content should not be taught in the absence of context.

2. **Mathematical Literacy involves authentic real-life contexts.**

   In exploring and solving real-world problems, it is essential that the contexts learners are exposed to in this subject are authentic (i.e. are drawn from genuine and reaslitic situations) and relevant, and relate to daily life, the workplace and the wider social, political and global environments. Wherever possible, learners must be able to work with actual real-life problems and resources, rather than with problems developed around constructed, semi-real, contrived and/ or fictitious scenarios. E.g. learners must be exposed to real accounts containing complex and "messy" figures rather than contrived and constructed replicas containing only clean and rounded figures.

   Alongside using mathematical knowledge and skills to explore and solve problems related to authentic real-life contexts, learners should also be expected to draw on non-mathematical skills and considerations in making sense of those contexts. E.g. although calculations may reveal that a 10 kg bag of maize meal is the most cost-effective, consideration of the context may dictate that the 5 kg bag will have to be bought because the 10 kg bag cannot fit inside the taxi and/or the buyer does not have enough money to buy the 10 kg bag and/or the buyer has no use for 10 kg, etc. In other words, mathematical content is simply one of many tools that learners must draw on in order to explore and make sense of appropriate contexts.

3. **Mathematical Literacy involves solving familiar and unfamiliar problems.**

   It is unrealistic to expect that in the teaching of Mathematical Literacy learners will always be exposed to contexts that are specifically relevant to their lives, and that they will be exposed to all of the contexts that they will one day encounter in the world. Rather, the purpose of this subject is to equip learners with the necessary knowledge and skills to be able to solve problems in any context that they may encounter in daily life and in the workplace, irrespective of whether the context is specifically relevant to their lives or whether the context is familiar. Learners who are mathematically literate should have the capacity and confidence to interpret any real-life context that they encounter, and be able to identify and perform the techniques, calculations and/or other considerations needed to make sense of the context. In this sense Mathematical Literacy develops a general set of skills needed to deal with a particular range of problems.

   If Mathematical Literacy is seen in this way, then a primary aim in this subject is to equip learners with a set of skills that transcends both the mathematical content used in solving problems and the context in which the problem is situated. In other words, both the mathematical content and the context are simply tools: the mathematical content provides learners with a means through which to explore contexts; and the contexts add meaning to the mathematical content. But what is more important is that learners develop the ability to devise and apply both mathematical and non-mathematical techniques and considerations in order to explore and make sense of any context, whether the context is familiar or not.

4. **Mathematical Literacy involves decision making and communication.**

   A mathematically literate individual is able to weigh up options by comparing solutions, make decisions regarding the most appropriate choice for a given set of conditions, and communicate decisions using terminology (both mathematical and non-mathematical) appropriate to the context. In the teaching of Mathematical Literacy, teachers should provide learners with opportunities to develop and practise decision-making and communication skills.

5. **Mathematical Literacy involves the use of integrated content and/or skills in solving problems.**

   The content, skills and contexts in this document are organised and categorised according to topics. However, problems encountered in everyday contexts are never structured according to individual content topics. Rather, the solving of real-life problems commonly involves the use of content and/or skills drawn from a range of topics, and so, being able to solve problems based in real-life contexts requires the ability to identify and use a wide variety of techniques and skills integrated from across a range of content topics.

Progression in Mathematical Literacy

Progression refers to the process of developing more advanced and complex knowledge and skills. In Mathematical Literacy, progression occurs on three levels:

Content

One of the ways in which Mathematical Literacy develops across the grades is in terms of mathematical concepts/ skills. E.g. in Grade 10 learners are expected to be able to work with one graph on a set of axes; in Grade 11 two graphs; and in Grade 12 two or more graphs on the same set of axes. This is not the case for all topics, though, and there are some instances where there is no new content in Grade 12 compared to Grades 10 and 11. In such cases progression may occur in relation to contexts and/or problem-solving processes.

Contexts

Progression also occurs in relation to the nature, familiarity and complexity of the context in which problems are encountered. Moving from Grade 10 to Grade 12, the contexts become less familiar and more removed from the experience of the learner and, hence, less accessible and more demanding. There are some topics in which the focus in Grade 10 is on contexts relating to the personal lives of learners and/or household issues (e.g. personal finance $\rightarrow$ cell-phone accounts; household budget), in Grade 11 on contexts relating to the workplace and/or business environment (e.g. business finance $\rightarrow$ payslips; taxation), and in Grade 12 on contexts relating to scenarios encompassing wider social and political contexts incorporating national and global issues (e.g. exchange rates and inflation). While these broad categories of contexts work well to define progression for certain topics, for other topics, such as measurement, map work and probability, these categories do not provide a useful indication of progression. In such cases progression may occur in relation to content and/or problem-solving processes.

Confidence in solving problems

One of the key characteristics of a mathematically literate individual is the ability to identify and apply appropriate mathematical and non-mathematical techniques needed to solve problems encountered in both familiar and unfamiliar contexts. However, this ability to solve problems without guidance is not something that develops naturally, but rather should be demonstrated and nurtured from Grade 10 to Grade 12. One of the key distinctions between Grade 10, 11 and 12 learners is the confidence with which learners are able to identify and utilise appropriate mathematical content, techniques and other non-mathematical considerations in order to explore authentic real-life contexts without guidance and/or scaffolding.

This progression in the development of confidence in solving problems can be linked directly to the Mathematical Literacy assessment taxonomy (see section 4.3 Mathematical Literacy assessment taxonomy and Appendix 1 below for a discussion and description of the taxonomy levels). In Grade 10, while learners are expected to answer questions involving multi-step procedures, scaffolded questions involving single-step (knowledge and/or routine procedure) calculations will often be provided to help learners to understand the context in which the problem is encountered or as precursors to the questions requiring multi-step procedures. The number of steps required in such multi-step calculations is also limited to two or three steps.

In Grade 12, in contrast, it is expected that learners will be able to perform multi-step calculations involving numerous and complex calculations with confidence and without guidance or scaffolded questions involving single-step calculations. There is also a greater expectation that Grade 12 learners will be able to identify and utilise appropriate mathematical content and other non-mathematical considerations needed to solve problems.

Overview and weighting of topics

The content, skills and contexts appropriate to Mathematical Literacy are presented in topics in this document.

A more detailed overview of each topic will be provided at the beginning of each chapter in this guide.

The topics have been separated into *Basic Skills Topics* comprising:

- Interpreting and communicating answers and calculations
- Numbers and calculations with numbers
- Patterns, relationships and representations

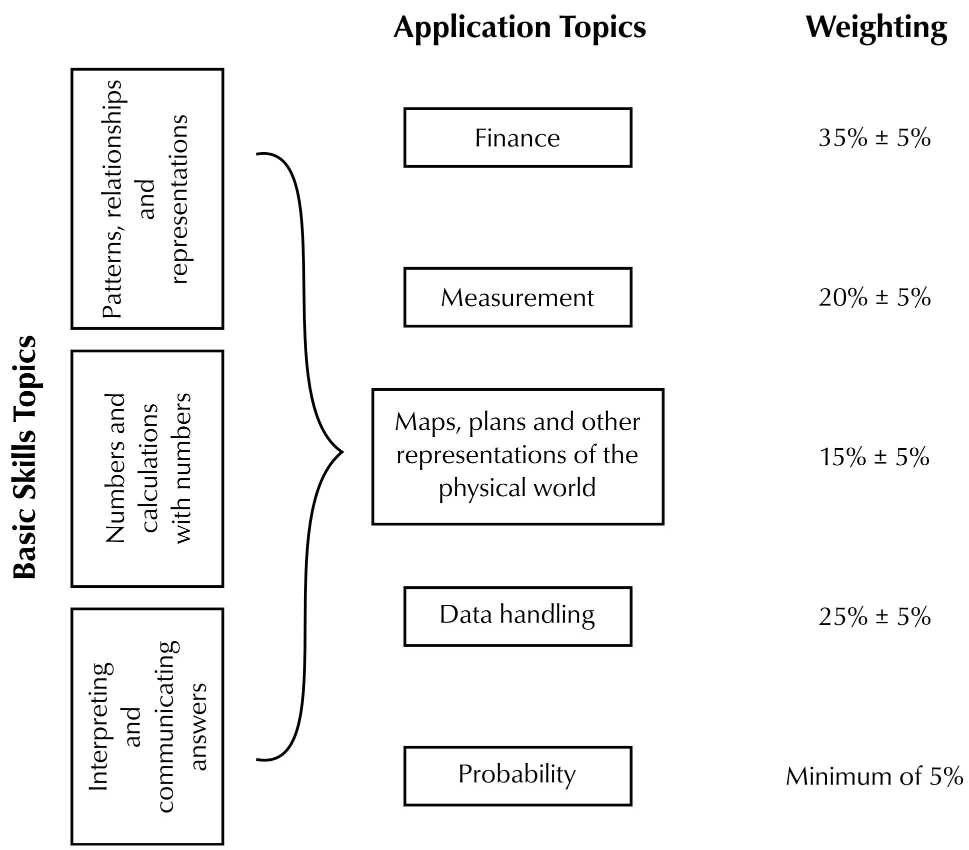
and *Application Topics* comprising:

- Finance
- Measurement
- Maps, plans and other representations of the physical world
- Data handling
- Probability

Much of the content in the *Basic Skills Topics* comprises elementary mathematical content and skills that learners have already been exposed to in Grade 9 (e.g. different number formats and conventions, calculating percentages, drawing graphs from tables of values, and so on). The inclusion of this content in this document provides teachers with the opportunity to revise these important concepts and provide learners with the opportunity to explore these concepts in contexts. It is expected that a firm grasp of the concepts in the *Basic Skills Topics* is necessary for making sense of the content and contexts outlined in the *Application Topics*.

The *Application Topics* contain the contexts related to scenarios involving daily life, workplace and business environments, and wider social, national and global issues that learners are expected to make sense of, and the content and skills needed to make sense of those contexts. It is expected that learners will integrate content/skills from the *Basic Skills Topics* in making sense of the contexts and content outlined in the *Application Topics*.

The figure below shows an overview and weighting of the topics according to which the Mathematical Literacy curriculum has been organised for Grades 10, 11 and 12.



Comments on the structure of topics

The Basic Skills Topics have been included to the left of the other topics to indicate that the content and/skills outlined in these topics permeate all of the other topics in the curriculum. It is expected that learners will integrate the content and/skills from these three topics with confidence in any context and in any other topic in which they have relevance and application. This structure also indicates the way in which the curriculum will be assessed in Mathematical Literacy examinations.

Weighting of topics

Minimum weightings have been indicated for each topic. These minimum weightings stipulate the minimum number of marks in any assessment that must be allocated to each of the topics. The remaining balance of marks can either be equally distributed between the topics or be allocated to the topics that have particular application and relevance in the context(s) being explored in the assessment. This will ensure that there is sufficient coverage of each topic in any examination and will allow for greater flexibility in the nature of contexts that can be explored and the depth to which those contexts can be explored.

It is important to note that no weighting has been provided for the Basic Skills Topics. This is because these topics have to be dealt with in an integrated manner throughout the Application Topics. There is an expectation, though, that the concepts outlined in these Basic Skills Topics will be included in any assessment, but that the extent to which these concepts are included is at the discretion of the teacher and/or examiner.

1.5 Suggested time allocation

Summary of the number of weeks spent on each topic				
		Number of weeks		
		Grade 10	Grade 11	Grade 12
Basic Skills Topics	Numbers and calculations with numbers	5-6		
	Patterns, relationships and representations	3-4	3-4	
Application Topics	Finance	6-7	9-10	8-9
	Measurement	6-7	7-8	5-6
	Maps, plans and other representations of the physical world	5-6	5-6	4-5
	Data handling	4-5	4-5	5-6
	Probability	1-2	1-2	1-2

1.6 Suggested work schedule

Below is a suggested work schedule that outlines estimated time allocations per topic as well as a particular sequence of teaching.

- The topics "Numbers and calculations with numbers" and "Patterns, relationships and representations" have been included in this work schedule to provide teachers with the opportunity to revise the concepts contained in these topics. However, it is essential that these concepts are not taught in the absence of contexts but that learners are exposed to these concepts in realistic scenarios.
- Also note that the topic Interpreting and communicating answers and calculations does not appear in this work schedule. This is because it is expected that the skills outlined in this topic will be integrated and taught throughout all of the other topics.

Grade 10: Term 1		**Week Nommer**
Topics	Contexts focusing on Numbers and calculations with numbers	1-5
	Contexts focusing on Patterns, relationships and representations	6-8
	Contexts focusing on Measurement (Conversions and Time)	9
Assesment	Assignment/Investigation Control test (covering Numbers and calculations with numbers, patterns, relationships and representations and measurement)	

Grade 10: Term 2		Week Number
Topics	Contexts focusing on Finance (Financial Documents and Tariff Systems)	1-2
	Contexts focusing on Measurement (Measuring Length, Weight,Volume,Temperature)	3-4
	Contexts focusing on Maps, plans and other representations of the physical world (Scale and Map work)	5-6
	Contexts focusing on Probability	7-8
	Revision	9
Assesment	Assignment/Investigation Mid-year examinations (2 papers; 1 hour each; 50 marks each) (covering Finance, Measurement, Maps, and Probability integrated with Numbers and Patterns concepts)	

Grade 10: Term 3		Week Number
Topics	Contexts focusing on Finance (Income, expenditure, profit/loss, income-and-expenditure statements and budgets)	1-3
	Contexts focusing on Measurement (Perimeter, area and volume)	4-6
	Contexts focusing on Maps, plans and other representations of the physical world (Models and Plans)	7-9
Assesment	Assignment/Investigation Control test (covering Finance, Measurement and Models and Plans, integrated with Numbers and Patterns concepts)	

Grade 10: Term 4		Week Number
Topics	Contexts focusing on Finance (Interest, Banking and Taxation)	1-2
	Contexts focusing on Data Handling	3-7
	Revision	8-9
Assesment	Assignment/Investigation End-of-year examination (2 papers; 1,5 hours each; 75 marks each) (covering all topics in the Grade 10 curriculum)	

1.7 Assessment

Introduction

Assessment is a continuous planned process of identifying, gathering and interpreting information about the performance of learners, using various forms of assessment. It involves four steps: generating and collecting evidence of achievement; evaluating this evidence; recording the findings and using this information to understand and thereby assist the learner's development in order to improve the process of learning and teaching.

Assessment should be both informal (Assessment for Learning) and formal (Assessment of Learning). In both cases regular feedback should be provided to learners to enhance the learning experience.

In accordance with the aims of the subject Mathematical Literacy assessment in Mathematical Literacy must measure the extent to which learners are able to make sense of scenarios based on authentic and realistic, familiar and unfamiliar real-life contexts by drawing on both mathematical and non-mathematical techniques and/or considerations. As such, assessment tasks should:

- be based on authentic real-life contexts and use real-life data;
- require learners to select and use appropriate mathematical content in order to explore contexts;
- require learners to take into account possible non-mathematical considerations that may have a bearing on the desired outcome to a problem.

Some assessment tasks might more explicitly give learners the opportunity to demonstrate their understanding of specific mathematical content and/or skills (e.g. the ability to 'solve equations' or 'calculate statistics such as mean, median and mode for different sets of data'), while other assessment tasks might be less focused on specific mathematical content and rather draw on a range of content and/or skills from a variety of content topics to explore and make sense of an authentic context.

Teachers need to design assessment tasks that provide learners with the opportunity to demonstrate both competence in mathematical content and the ability to use a variety of both mathematical and non-mathematical techniques and/ or considerations to make sense of real-life, everyday, meaningful problems.

Assessment in Mathematical Literacy is specifically focused on the Application Topics of Finance, Measurement, Maps, plans and other representations of the physical world, Data handling and Probability. It is expected that the Basic Skills Topics of Interpreting and communicating answers and calculations, Numbers and calculations with numbers and Patterns, relationships and representations will be integrated throughout all topics.

Although teachers may choose to use assignments, investigations and tests to exclusively test specific concepts and/ or skills relating to the Basic Skills Topics, in examinations it is not expected that a whole question will be dedicated to assessing the Basic Skills Topics in isolation from the "Application Topic". Rather, the examinations will focus on assessing the learners' ability to solve problems and explore contexts relating to the topics of Finance, Measurement, Maps, plans and other representations of the physical world, Data handling and Probability, and their ability to use number concepts and equations, tables and graphs in an integrated way in order to make sense of those contexts.

Informal or daily assessment

Assessment for learning has the purpose of continuously collecting information on learners' achievement that can be used to improve their learning.

Informal assessment is a daily monitoring of learners' progress. This is done through observations, discussions, practical demonstrations, learner-teacher conferences, informal classroom interactions, etc. Informal assessment may be as simple as stopping during the lesson to observe learners or to discuss with learners how learning is progressing. Informal assessment should be used to provide feedback to the learners and to inform planning for teaching, but need not be recorded. It should not be seen as separate from learning activities taking place in the classroom. Learners or teachers can mark these assessment tasks.

Self-assessment and peer assessment actively involves learners in assessment. This is important as it allows learners to learn from and reflect on their own performance. The results of the informal daily assessment tasks are not formally recorded unless the teacher wishes to do so. The results of daily assessment tasks are not taken into account for promotion and certification purposes.

Formal assessment

All assessment tasks that make up a formal programme of assessment for the year are regarded as Formal Assessment. Formal assessment tasks are marked and formally recorded by the teacher for progression and certification purposes. All Formal Assessment tasks are subject to moderation for the purpose of quality assurance and to ensure that appropriate standards are maintained.

Formal assessment provides teachers with a systematic way of evaluating how well learners are progressing in a grade and in a particular subject. Examples of formal assessments include tests, examinations, assignments, investigations, practical tasks, demonstrations, etc. Formal assessment tasks form part of a year-long formal Programme of Assessment in each grade and subject.

The forms of assessment used should be age and development level appropriate. The design of these tasks should cover the content of the subject and include a variety of tasks designed to achieve the objectives of the subject. Formal assessments must cater for a range of cognitive levels and abilities of learners. The levels appropriate to Mathematical Literacy are described below.

Assessment can be pitched at different levels of cognitive demand. At one end of the spectrum are tasks that require the simple reproduction of facts, while at the other end of the spectrum tasks require detailed analysis and the use of varied and complex methods and approaches.

Complexity in Mathematical Literacy is structured around the following assessment taxonomy framework:

- Level 1: Knowing
- Level 2: Applying routine procedures in familiar contexts
- Level 3: Applying multi-step procedures in a variety of contexts
- Level 4: Reasoning and reflecting.

When designing assignments, investigations, and especially tests and examinations, teachers should use the following guideline for deciding on the number of marks to be allocated to questions at each of the levels of the taxonomy.

Levels of the Mathematical Literacy assessment taxonomy	Percentage of marks allocated to each level in an assessment
Level 1: Knowing	30% (± 5%)
Level 2: Applying routine procedures in familiar contexts	30% (± 5%)
Level 3: Applying multi-step procedures in a variety of contexts	20% (± 5%)
Level 4: Reasoning and reflecting	20% (± 5%)

It is important to point out that in order to promote the vision that Mathematical Literacy involves the use of both mathematical and non-mathematical techniques and considerations in exploring and understanding of authentic reallife scenarios, this taxonomy should not be seen as being associated exclusively with different levels of mathematical calculations and/or complexity. In determining the level of complexity and cognitive demand of a task, consideration should also be given to the extent to which the task requires the use of integrated content and skills drawn from different topics, the complexity of the context in which the problem is posed, the influence of non-mathematical considerations on the problem, and the extent to which the learner is required to make sense of the problem without guidance or assistance.

Programme of assessment

The Programme of Assessment is designed to spread formal assessment tasks in all subjects in a school throughout a term.

The Programme of Assessment for Mathematical Literacy in Grades 10 and 11 consists of eight tasks which are internally assessed:

- Seven of the eight tasks are completed during the school year and make up 25% of the total mark for Mathematical Literacy
- The end-of-year examination is the eighth task and makes up the remaining 75%.

The table below illustrates one possible Programme of Assessment for Mathematical Literacy for Grade 10.

	Continuous Assessment (25%)				Examination (75%)
	Term 1	Term 2	Term 3	Term 4	
Grade 10	Assignment/ Investigation* (10%)	Assignment/ Investigation* (10%)	Assignment/ Investigation* (10%)	Assignment/ Investigation* (10%)	Examination
	Control Test (15%)	Examination (30%)	Control Test (15%)		

* Teachers can choose to evaluate either an assignment or an investigation completed by the learners during each term. By the end of the year learners should have completed two assignments and two investigations.

The suggested Programme of Assessment assumes that:

- all the topics and sections are addressed throughout the year;
- the topics are weighted in accordance with the suggested minimum weightings for each topic outlined above;
- content and/or skills are integrated across a variety of topics throughout teaching and learning, and in the assessment activities.

Description of assessment tasks in Mathematical Literacy

The different tasks listed in the Programme of Assessment are described as follows:

Control test

Control tests assess content under controlled examination or test conditions. Control tests are essential to prepare learners for examinations and, as such, should resemble the examinations in terms of structure and the conditions under which they are administered. Learners are expected to prepare for these tests and the content that will be tested is explicitly communicated to learners timeously, well before the test.. All information required in the test, including any real-life resources around which questions have been posed, will be provided by the teacher.

Assignment

In the context of Mathematical Literacy, an assignment is a well-structured task with clear guidelines and a well-defined outcome. An assignment could provide learners with the opportunity to consolidate a topic or section that has been covered in class, or to apply an approach or method studied in class to a new context, or to revise for tests and/or examinations. Both the content and contexts of the assignment are likely to be familiar to the learner. While the teacher may allocate classroom time to an assignment and supervise the completion, parts of an assignment should also be completed by the learner in his or her own time and/or with the assistance of other learners.

Investigation

In the context of Mathematical Literacy, an investigation involves a guided discovery, where learners are led through a process of discovering a particular concept or idea through leading questions. This guided discovery may include the collection of data and/or information to solve a problem.

Summary of the formal assesment tasks listed in CAPS

GRADE 10			
Topic	**Section**	**Assessment Type and Title**	**Page Reference (in CAPS)**
Numbers and calculations with numbers	Rounding	Assignment: Exploring the impact of rounding	31
	Proportion	Investigation: Comparing direct and indirect proportion	32
	Rates	Assignment: Comparing prices	33
	Percentages	Assignment: Comparing actual and relative size	34
Patterns, relationships and representations	Representations of relationships in tables, graphs and equations	Investigation: Identifying and representing a relationship in daily life	42
		Assignment: Representing electricity costs graphically	42
Finance	Financial documents	Assignment: Making sense of a household bill	49
Measurement	Income, expenditure, profit/loss, income-and-expenditure statements and budgets	Assignment: Developing a household budget	51
	Measuring length and distance	Assignment: Measuring accurately	63
	Perimeter, area and volume	Assignment: Designing and costing a small vegetable garden	69
	Time	Assignment: Baking a cake	71
Maps, plans and other representations of the physical world	Scale	Investigation: What happens if you resize a map or plan?	73
	Maps	Assignment: Finding your way	75
	Plans	Assignment: Writing instructions	76
		Assignment: Assembling an object	76
Data handling	All sections	Assignment: Electricity usage	88
Probability	All sections	Assignment: Unfair play	94

Examinations for Grade 10

Examination papers for Grades 10 (and 11) will be internally set, marked and moderated, unless otherwise instructed by provincial departments of education.

The table below shows the number of and stipulated mark and time allocations for examination papers (and control tests) for Grade 10.

Term 1	Control Test	
Term 2	Paper 1: 1 hour (50 marks)	Paper 2: 1 hour (50 marks)
Term 3	Control Test	
Term 4	Paper 1: 1.5 hours (75 marks)	Paper 2: 1.5 hours (75 marks)

Additional information regarding examination papers

For each examination in Grades 10, 11 and 12 there are two examination papers. These papers assess the same content but are differentiated according to intention, cognitive demand and the nature of contexts included in the examinations.

Paper 1: A "skills" paper working with familiar contexts

Overview:

This examination paper assesses basic mathematical skills and competency, and primarily contains questions at the knowing (Level 1) and routine procedures (Level 2) levels. The examination also contains a small number of multistep procedures (Level 3) questions, which will allow for more in-depth analysis of contexts and/or problems. The contexts included in this paper are limited to those specified in the curriculum outline section of this CAPS document.

Intention:

The intention of this paper is to assess understanding of the core content and/or skills outlined in the CAPS document in the context of authentic real-life problems. Although questions will be contextualised, the focus is primarily on assessing proficiency in a range of content topics, techniques and/or skills.

Structure and scope of content:

A Mathematical Literacy Paper 1 examination will typically consist of five questions:

- Each question will be contextualised and may focus on more than one context
- Each question will contain sub-questions.
- The first four questions will be focused on each of the topics:
  - Finance
  - Measurement
  - Maps, plans and other representations of the physical world
  - Data handling

with the content and/or skills outlined in the following topics integrated throughout each question:

- - Interpreting and communicating answers and calculations
  - Numbers and operations with numbers
  - Patterns, relationships and representations.

- The fifth question will integrate concepts and/or skills from across all the topics in the curriculum.
- The topic of Probability will be assessed in the context of one or more of these questions rather than as a question on its own.

Scope of contexts:

Contexts used in the Paper 1 examination will be limited to those specified in the Curriculum Outline section of the CAPS document thus the contexts used in this examination will be familiar to the learners.

Distribution of marks according to the taxonomy levels:

A Paper 1 examination should include questions at the different levels of the taxonomy according to the following mark distribution:

- 60% (±5%) of the marks at Level 1 (knowing);
- 35% (±5%) of the marks at Level 2 (applying routine procedures in familiar contexts);
- 5% (minimum) of the marks at Level 3 (applying multi-step procedures in a variety of contexts)

Comments on mark allocation:

Given the nature of this subject where there is very little recall and/or emphasis on the memorisation of facts, it is not anticipated that one-mark questions will be included in the examination. Even in situations where all that is required is for information to be read straight from a table, the information in the table has to be interpreted and the appropriate information located and identified. This process involves two steps and should be awarded two marks. It is also envisioned that a mark will be allocated for each step of working required in a calculation.

Paper 2: An "applications" paper, using both familiar and unfamiliar contexts

This examination paper is an "applications" paper and primarily contains multi-step procedures (Level 3) and reasoning and reflecting (Level 4) questions, and a small number of routine procedures (Level 2) questions. The purpose of the Level 2 questions in this paper is to provide learners with greater access to the contexts in which problems are situated.

Intention:

The intention of this examination paper is to assess the ability to identify and use a variety of mathematical and nonmathematical techniques and/or considerations to understand and explore both familiar and unfamiliar authentic contexts.

Structure and scope of content:

A Mathematical Literacy Paper 2 examination will typically consist of four or five questions:

- Each question will contain sub-questions.
- Each question will explore one or more contexts, drawing on content and/skills from two or more of the following
  - Finance
  - Measurement
  - Maps, plans and other representations of the physical world
  - Data handling

with the content and/or skills outlined in the following topics integrated throughout each question:

- - Interpreting and communicating answers and calculations
  - Interpreting and communicating answers and calculations
  - Numbers and operations with numbers
  - Patterns, relationships and representations.
- The topic of Probability will be assessed in the context of one or more of these questions and not as a question on its own.
- Each question will include sub-questions consisting of a small number of questions at the routine procedures (Level 2) levels, and a greater number at the multi-step procedures (Level 3) and reasoning and reflecting (Level 4) levels.
- The focus of each question will be on assessing the ability to explore and understand a context(s) rather than on mathematical proficiency.

Scope of contexts:

Contexts used in a Paper 2 examination will include both familiar and unfamiliar contexts and are not limited to those specified in the Curriculum Outline section of the CAPS document.

Distribution of marks according to the taxonomy levels:

A Paper 2 examination should include questions at the different levels of the taxonomy according to the following mark distribution:

- 25% of the marks at Level 2 (applying routine procedures in familiar contexts);
- 35% of the marks at Level 3 (applying multi-step procedures in a variety of contexts);
- 40% of the marks at Level 4 (reasoning and reflecting).

Contexts

In order to achieve the aim of Mathematical Literacy to help learners develop the ability to use a variety of mathematical and non-mathematical techniques and/or considerations to explore and understand both familiar and unfamiliar real-life contexts, it is essential that assessment items and examinations draw on realistic and authentic contexts. Learners should be asked to interpret newspaper articles, real bank statements, real plans and other authentic resources, rather than contrived problems containing only a semblance of reality.

Weightings of topics

The following weightings are stipulated for each topic in examinations:

	Topic	**Weighting** (%)
Basic Skills Topics	Interpreting and communicating answers and calculations	No weighting is provided for these topics. Rather, they will be assessed in an integrated way in the Application Topics.
	Numbers and calculations with numbers	
	Patterns, relationships and representations	
Application Topics	Finance	35% (±5%)
	Measurement	20% (±5%)
	Maps, plans and other representations of the physical world	15% (±5%)
	Data handling	25% (±5%)
	Probability	Minimum of 5%

Distribution of marks according to the taxonomy levels

The table below illustrates the percentage of marks to be allocated to the different taxonomy levels for Grade 10 (and Grades 11 and 12).

The four levels of the Mathematical Literacy assessment taxonomy	**Grades 10, 11 and 12**		
	Paper 1	**Paper 2**	**Overall allocation**
Level 1: Knowing	60% (±5%)		30% (±5%)
Level 2: Applying routine procedures in familiar contexts	35% (±5%)	25% (±5%)	30% (±5%)
Level 3: Applying multi-step procedures in a variety of contexts	5% minimum	35% (±5%)	20% (±5%)
Level 4: Reasoning and reflecting		40% (±5%)	20% (±5%)

Additional information on the mid-year examinations

Much of the information relating to the structure of the examinations provided above relies on the whole curriculum having been covered and so relates primarily to examinations that take place at the end of the year. Clearly this will not be the case for the mid-year examinations, which will focus on assessing content covered in Terms 1 and 2.

It is not the intention of this document to prescribe the contents and the weighting of the various topics covered in these mid-year examinaitions. However, the following guidelines are suggested:

- Two examinations papers: Paper 1 (Basic Skills Paper) and Paper 2 (Applications Paper).
- The structure of the questions in these papers should follow the structure suggested above for Paper 1 and Paper 2 examinations
- The examinations should include questions on all of the topics covered in Terms 1 and 2:
  - This means that in Grade 10 teachers can choose to include questions that assess the content, skills and contexts covered in the Basic Skills topics of Numbers and calculations with numbers and Patterns, relationships and representations (both of which designated to be taught in Term 1 in the work schedule provided at the beginning of this document).
  - In Grade 11 teachers can choose to include questions that assess the content, skills and contexts covered in the Basic Skills topic of Patterns, relationships and representations (which is designated to be taught in Term 1 according to the work schedule provided at the beginning of this document).
- Teachers can decide on an appropriate weighting of the topics assessed in the examination, possibly as determined by the amount of content included in a topic or section and the amount of time taken to teach the topic or section. The table below shows an example of a possible weighting of topics for a Grade 10 mid-year examination (across both Paper 1 and Paper 2).

Recording and reporting

Recording is a process in which the teacher documents the level of a learner's performance in a specific assessment task. It indicates learner progress towards the achievement of the knowledge as prescribed in the Curriculum and Assessment Policy Statements. Records of learner performance should provide evidence of the learner's conceptual progression within a grade and her / his readiness to progress or to be promoted to the next grade. Records of learner performance should also be used to verify the progress made by teachers and learners in the teaching and learning process.

Reporting is a process of communicating learner performance to learners, parents, schools, and other stakeholders. Learner performance can be reported in a number of ways which include report cards, parents' meetings, school visitation days, parent-teacher conferences, phone calls, letters, class or school newsletters, etc. Teachers in all grades report in percentages against the subject. Seven levels of competence have been described for each subject listed for Grades R-12. The various achievement levels and their corresponding percentage bands are as shown in the Table below.

Rating Code	Description of Competence	Percentage
7	Outstanding achievement	80 - 100%
6	Meritorious achievement	70 - 79%
5	Substantial achievement	60 - 69%
4	Adequate achievement	50 - 59%
3	Moderate achievement	40 - 49%
2	Elementary achievement	30 - 39%
1	Not achieved	0 - 29%

Note: The seven point scale should have clear descriptors that give detailed information for each level.

Teachers will record actual marks against the task by using a record sheet; and report percentages against the subject on the learners' report cards.

Moderation of Assessment

Moderation refers to the process which ensures that the assessment tasks are fair, valid and reliable. Moderation should be implemented at school, district, provincial and national levels. Comprehensive and appropriate moderation practices must be in place for the quality assurance of all subject assessments.

In Mathematical Literacy:

- Grade 10 and 11 tasks are internally moderated. The subject advisor will moderate a sample of these tasks during school visits to verify the standard of the internal moderation.
- Grade 12 tasks are moderated by the provincial subject advisor. This process will be managed by the provincial education department.

1.8 Chapter overviews

Chapter 1: Numbers and calculations with numbers

This chapter covers the first two basic skills topics as defined in the curriculum statement. Content includes number formats and conventions; operations using numbers and calculator skills (including order of operations, BODMAS, grouping, fractions, decimals and positive and negative numbers); squares and cubes; rounding up and rounding down; ratios, rates and proportion and percentages. Interpreting and communicating answers and calculations is integrated into this and all later chapters.

Chapter 2: Patterns, relationships and representations

Chapter 2 deals with patterns, representations and relationships in tables and in graphs. The chapter begins with an introduction to basic interpretation of graphs, in real world contexts. Continuous and discontinuous graphs are dealt with, as are independent and dependent variables. Linear patterns, relationships and graphs (including interpreting and plotting these patterns) are covered in this chapter, along with inverse proportion, relationships and graphs. Patterns and finding the general formula or nth term in a sequence are also dealt with.

Chapter 3: Conversions and time

Chapter 3 (the first "Measurement" chapter) introduces conversions for measurement. Metric conversions (which should be memorized by the learners) are covered for length, weight, and volume. Conversions using a given conversion factor are integrated with cooking and baking activities. Conversions between the 24-hour and 12-hour clock are dealt with, as are calculations involving units of time and elapsed time. The section on time also includes calendars and timetables.

Chapter 4: Financial documents and tariff systems

Chapter 4 (the first "Finance" chapter) covers financial documents (including municipal, store and telephone accounts, and till slips) and municipal, telephone and transport tariff systems. The learners' book includes a wide variety of authentic documents for analysis and interpretation. For the Afrikaans learners' book, these documents remain in English, because that is the language in which learners' are most likely to encounter these documents in the real world.

Chapter 5: Measuring length, weight, volume and temperature

Chapter 5 (the second "Measurement" chapter) expands on the basic conversions from Chapter 3 to include cost and rate calculations. The measurement of length, weight and volume is covered in more detail (including the different instruments used for measuring) and the measurement of temperature is introduced.

Chapter 6: Scale, maps and plans

Chapter 6 (the first "Maps, Plans and Other Representations of the World" chapter) covers scale, maps, directions and seating and floor plans. The number and bar scale are introduced to learners, and examples and activities deal with using a scale and a map to calculate actual distance and with how to draw scaled diagrams when actual dimensions (and the scale) are known. This content is extended and integrated with seating plans (e.g. of a cinema and rugby stadium), floor plans (e.g. of a shopping mall) and directional navigation.

Chapter 7: Probability

Chapter 7 introduces the concepts involved in the field of probabilty. Learners are not required to work with mathematical formulae in this chapter. The chapter includes prediction and the probabilty scale; fair and unfair games; the difference between single and combined outcomes; using tree diagrams and two-way tables; and weather predictions.

Chapter 8: Personal income, expenditure and budgets

Chapter 8 (the second "Finance" chapter) aims to clarify the difference between personal income and expenditure. This is extended to include budgets and income/expenditure statements, and the differences between them. The importance of financial planning (generally or for specific events), balancing a budget (i.e. not spending more than you have) and the importance of saving are explained and emphasised.

Chapter 9: Measuring perimeter and area

(the third and final "Measurement" chapter) Chapter 9 covers the estimation of perimeter and area (using a ruler, a square grid, or a piece of string) and the use of formulae to calculate perimeter and area. The content in this chapter integrates earlier content including cost and rate calculations.

Chapter 10: Assembly diagrams, floorplans and packaging

Chapter 10 (the second and final "Maps, Plans and Other Representations of the World" chapter) builds on the content from Chapter 6. This chapter includes the interpretation of assembly diagrams and assembly instructions; and floor plans (including symbols and layout). It also deals with packaging problems and different packaging models.

Chapter 11: Banking, interest and taxation

Chapter 11 (the third and final "Finance" chapter) covers banking concepts and documents, including bank accounts, banking fees and banking statements. Interest rates and interest values are dealt with (in an accessible manner that does not involve complex formulae at this level) and Value Added Tax (which has already been encountered in the earlier Finance chapters) is recapped.

Chapter 12: Data handling

Chapter 12 deals with data handling. The data cycle is covered in detail and the content includes data collection, classification and representation methods, as well as analytical tools for identifying trends and answering a research question.

CHAPTER 1

Numbers and calculations with numbers

1.2 Number formats and conventions

Numbers in different situations

Activity 1 – 1: Different number formats

1. The numbers below are printed in a American magazine. Write them using our South African conventions:
   a) This new laptop computer can be bought for $1,678.75.
   b) The latest figure for the loss of income is $3,988,620.12.
   c) The population of the country is 42,000,199.
   d) The mass of the new compound is 62.178 g.

   Solution:

   a) $1678,75
   b) $3 988 620,12
   c) 42 000 199
   d) 62,178 g
2. Write these numbers with spaces to group them correctly:
   a) 53211
   b) 167890
   c) 90001
   d) 1123456
   e) 4879120

   Solution:

   a) 53 211
   b) 167 890
   c) 90 001
   d) 1 123 456
   e) 4 879 120
3. Explain why it does not make sense to use a number such as a telephone number in a calculation.

   Solution:

   A telephone number does not represent a value, rather, it is a unique label. We can only calculate with numbers that represent values.

4. Using three or four old magazines or newspapers, cut out examples of different uses of numbers. Stick each example onto a poster, and next to it, write down what the format of the number is, and what the use of that particular number is.

Solution:

Learner-dependent answer.

5. Choose one of the following numbering systems and find out more about how the system works, what kinds of numbers are allowed, what the numbers represent, and anything special about the number system. Write two or three paragraphs about what you find out:

    a) the sell-by dates on items in shops.
    b) the South African identity number system.
    c) personal identification numbers (PINs) for cell phones.
    d) the serial number on a cell phone.
    e) the tennis scoring system.

Solution:

a) Learner-dependent answer.
b) Learner-dependent answer.
c) Learner-dependent answer.
d) Learner-dependent answer.
e) Learner-dependent answer.

Arranging numbers in order

Activity 1 – 2: Place value and ordering numbers

1. Write out each number in words:

    a) 12 341
    b) 202 082 003
    c) 1 000 010

Solution:

a) Twelve thousand, three hundred and forty-one.
b) Two hundred and two million, eighty-two thousand and three.
c) One million and ten.

2. Write the following words as numbers:

    a) Four hundred and sixty thousand, five-hundred and forty-two.

b) Fourteen million, sixteen thousand and seven.

c) Three billion, eight-hundred and three thousand.

Solution:

a) 460 542

b) 14 160 007

c) 3 000 803 000

3. Write the following numbers in order from biggest to smallest:

a) 161 280; 600 765; 1 653 232; 1 694 212; 612 005

b) 888 024; 188 765; 1 808 765; 818 123; 82 364

c) 315 672; 333 289; 3 233 987; 3 402 987; 3 325 999

Solution:

a) 1 694 212; 1 653 232; 612 005; 600 765; 161 280

b) 1 808 765; 888 024; 818 123; 188 765; 82 364

c) 3 402 987; 3 325 999; 3 233 987; 333 289; 315 672

1.3 Operations using numbers and calculator skills

Estimating

Estimating answers to calculations is a very important step. Learners can often do calculations without understanding a problem, and estimation guides them to understand the problem thoroughly before using their calculators. It also gives them a way to check their answers thoroughly. Estimating is good practice for mental calculation skills. With practice, learners can estimate quickly.

Activity 1 – 3: Practise using your calculator

1. Does your calculator have keys that are not shown on the calculator above? If so, find out what they do and write this down.

   Solution:

   Learner-dependent answer.

2. What is the highest number you can display on your calculator? Write it out in words.

   Solution:

   This depends on how many digits can be viewed on the screen, but usually it's 9 999 999 999 - or nine billion, nine hundred and ninety-nine million, nine hundred and ninety-nine thousand, nine hundred and ninety-nine

3. Explore the difference between the “clear” keys on your own calculator.

   Solution:

   Learner-dependent answer - different calculators have different variations on the “clear” keys. Generally, the “C” key clears everything that is not saved to the calculator’s memory and “CE” clears the last step only.

4. Which of the following keys does your calculator have: [AC]; [CE]; [C] [ON/C] ?

   Solution:

   Learner-dependent answer.

5. Press 9 [+] 5 . Then press [CE]. Now press [+] 1 [×] 100 [=]. Write down your answer.

   Solution:

   1000

6. Press 9 [+] 5. Then press the ordinary clear key [C], or [ON/C] or [ON]. Now press [+] 1 [×] 100 [=]. Write down your answer.

   Solution:

   100

7. Why do you get different answers for the previous two questions?

   Solution:

   The [C] key has cleared everything, while the [CE] key cleared the last input only.

8. If there are other clear keys on your calculator, find out how they work by following the same steps.

   Solution:

   Learner-dependent answer.

9. Which of these key sequences do not give you −1000 on the display?

   a) [−] 2000 [+] 1000 [=]
   b) 1000 [+] 2000 [±] [=]
   c) 10 [×] 100 [±] [=]
   d) [±] 10 [×] 100 [=]
   e) 1000 [−] 2000 [=]
   f) 1000 [±] [−] 2000 [±] [=]
   g) 4000 [± [+] 3000 [=]
   h) 4000 [± [+] 3000 [±] [=]

   Solution:

   a) Does give −1000.
   b) Does give −1000.
   c) Does not give −1000.
   d) Does give −1000.
   e) Does give −1000.
   f) Does not give −1000.
   g) Does give −1000.
   h) Does not give −1000.

Activity 1 – 4: Using various methods to simplify calculations

1. Solve the following, using grouping and brackets to make your calculations easier:

   a) 113×35
   b) 16×71
   c) 40×42
   d) 98×25
   e) 105×31
   f) 32×84

   Solution:

   a) 3955
   b) 1136
   c) 1680
   d) 2450
   e) 3255
   f) 2688

2. Solve the following, using breaking down and grouping to make your calculations easier:

   a) $145 + 193 + 55$
   b) $67 + 143 + 123$
   c) $264 + 1003 + 136$
   d) 48×250
   e) 125×72
   f) 35×200

   Solution:

   a) 393
   b) 333
   c) 1390
   d) 12 000
   e) 9000
   f) 7000

3. Calculate the following, using BODMAS:

   a) $14 + (80 - 17) \times 10 + 1$
   b) $9 + 4 \times 6 - 2$
   c) $2 + 3 + 100 - 7 \times 7$
   d) $15 + 2(26 \div 2) - 20$

Solution:

a) 645
b) 31
c) 56
d) 21

4. Rewrite these calculations with brackets, in order to make the answers correct:

a) $8 + 6 \times 5 = 70$
b) $8 + 6 \times 5 = 38$
c) $8 + 3 \times 8 - 2 = 66$
d) $8 + 3 \times 8 - 2 = 30$
e) $15 + 2 \times 5 - 2 = 23$
f) $15 + 2 \times 5 - 2 = 51$
g) $15 + 2 \times 5 - 2 = 21$

Solution:

a) $(8 + 6) \times 5 = 70$
b) $8 + (6 \times 5) = 38$
c) $(8 + 3) \times (8 - 2) = 66$
d) $8 + (3 \times 8) - 2 = 30$
e) $15 + (2 \times 5) - 2 = 23$
f) $(15 + 2) \times (5 - 2) = 51$
g) $15 + 2 \times (5 - 2) = 21$

5. Multiply each of the following numbers by i. 10, ii. 100 and iii. 1000:

a) 14
b) 609
c) 210
d) 10 001

Solution:

a) i. 140 ii. 1400 iii. 14 000
b) i. 6090 ii. 60 900 iii. 609 000
c) i. 2100 ii. 21 000 iii. 210 000
d) i. 100 010 ii. 1 000 100 iii. 10 001 000

Activity 1 – 5: Working with decimal fractions

1. Write the following decimal numbers under the correct heading in the columns below:

   a) 1456,3
   b) 4601,91
   c) 8,05
   d) 31,7
   e) 456,2

	Thousands	Hundreds	Tens	Units	tenths	hundredths
a)						
b)						
c)						
d)						
e)						

Solution:

	Thousands	Hundreds	Tens	Units	tenths	hundredths
a)	1	4	5	6	3	
b)	4	6	0	1	9	1
c)				8	0	5
d)			3	1	7	
e)		4	5	6	2	

2. Carefully consider the value of each digit and use the correct sign $<$, $=$ or $>$ to compare the following:

   a) 1,5____1,7
   b) 45,9 ____ 62,3
   c) 6,3 ____ 6,1
   d) −13,2 ____ 8,6
   e) 24,7 ____ 42,3
   f) −57,5 ____ −58,2

Solution:

a) $<$
b) $<$
c) $>$
d) $<$
e) $<$
f) $>$

3. Circle the largest number: 43,7; 41,9; 43,1; 49,1; 41,5

   Solution:

   49,1

4. Write down the number that is:

   a) one more than 9,9
   b) 0,1 less than 7,1
   c) 0,1 more than 5,3
   d) 0,1 less than 99,0
   e) 0,1 less than 63,3
   f) 0,1 more than −5,8
   g) 0,1 less than −8,3
   h) 0,1 less than 10

   Solution:

   a) 10,9
   b) 7,0
   c) 5,2
   d) 89,9
   e) 63,2
   f) −5,7
   g) −8,4
   h) 9,99

5. Do the following calculations without using a calculator:

   a) 42,5 + 83,4
   b) 52,5 + 75,35
   c) 26,4 − 25,1
   d) 72,9 − 65,6
   e) 2,3 × 0,2
   f) 1,2 × 100
   g) 3,4 × 1000
   h) 324,3 × 10
   i) 724,3 × 100
   j) 5,298 × 100
   k) 375,86 ÷ 1000
   l) 274,57 ÷ 100
   m) 62,5 ÷ 1000

   Solution:

   a) 125,9
   b) 127,85

c) 1,3
d) 6,3
e) 0,46
f) 120
g) 3400
h) 3243
i) 72 430
j) 0,05298
k) 0,37586
l) 2,7457
m) 0,0625

Activity 1 – 6: Converting between fractions and decimal fractions

1. **Using a calculator**, write each of these as decimal fractions.

   a) $\frac{3}{4} = 3 \div 4 =$
   b) $\frac{2}{5} = 2 \div 5 =$
   c) $\frac{3}{5} =$
   d) $\frac{4}{5} =$
   e) $\frac{5}{5} =$
   f) $\frac{1}{4} =$

   Solution:

   a) 0,75
   b) 0,4
   c) 0,6
   d) 0,8
   e) 1
   f) 0,25

2. Convert one-third into a decimal: $\frac{1}{3} = 1 \div 3 =$ ____

   Solution:

   0,333...

3. **Without a calculator**, write down equivalent fractions for each of the following and then write them as decimal fractions:

Fraction	Fraction as tenths	Decimal fraction
two-thirds	Can't	
one-quarter		
three-quarters		
one-fifth		
two-fifths		
three-fifths		
four-fifths		
one-sixth	Can't	
one-eighth		

(Some of the above have more than one decimal place but it is good to know about them.)

Solution:

Fraction	Fraction as tenths	Decimal fraction
two-thirds	Can't	0,6666666
one-quarter	Can't	0,25
three-quarters	Can't	0,75
one-fifth	$\frac{2}{10}$	0,2
two-fifths	$\frac{4}{10}$	0,4
three-fifths	$\frac{6}{10}$	0,6
four-fifths	$\frac{8}{10}$	0,8
one-sixth	Can't	0,166666666
one-eighth	Can't	0,128

Positive and negative numbers

Activity 1 – 7: Fractions, decimal fractions and positive and negative numbers

1. Share 11 sausage rolls equally among 10 learners. How much sausage roll will each learner receive?

   Solution:

   $1\frac{1}{10}$

2. Share 12 sausage rolls equally among 10 learners. How much sausage roll will each learner receive?

   Solution:

   $1\frac{1}{5}$

3. Mike drinks $1\frac{1}{2}$ mugs of milk at breakfast. His sister, Sharon, drinks $\frac{3}{4}$ of a mug of milk. How much milk do they drink altogether?

   Solution:

   $1\frac{1}{2} = \frac{6}{4} = \frac{3}{4} + \frac{6}{4} = \frac{9}{4}$.

4. Write the following numbers in a place value table:

   a) 64,8
   b) 341,2
   c) 6909,9

   Solution:

Thousands	Hundreds	Tens	Units	tenths $\frac{1}{10}$
		6	4	8
	3	4	1	2
6	9	0	9	9

5. Write as decimals:

   a) Three and four-fifths =
   b) One and three-tenths =
   c) Five and one-quarter =
   d) $4\frac{1}{2} =$

   Solution:

   a) 3,8
   b) 1,3
   c) 5,25
   d) 4,5

6. From $<$; $>$; = write down the correct sign to make the following true:

   a) 2,4 ____ 4,2
   b) 1,7 ____ 2,1
   c) $-10,6$ ____ $-9,2$
   d) $-2,34$ ____ $-5,4$

   Solution:

   a) $<$
   b) $<$
   c) $<$
   d) $>$

7. Write down the number that is:

   a) one tenth more than 45,9
   b) one tenth less than 10

   Solution:

   a) 46,0
   b) 9,99

8. Funeka's bank balance is −R 2000. Then she deposits her monthly salary into the account. Her new balance is R 4000. How much is her salary?

   Solution:

   R 4000 − (− R 2000) = R 6000

Activity 1 – 8: Squares, square roots and cubes

1. Use you calculator to work out the following squares:

   a) 200^2
   b) 413^2
   c) 3100^2
   d) 2567^2

   Solution:

   a) 40 000
   b) 170 569
   c) 9 610 000
   d) 6 589 489

2. A tile shop has tiles of various sizes for sale. Calculate the length of the sides of square tiles with the following areas:

   a) 121 cm^2
   b) 625 cm^2
   c) 400 cm^2
   d) 14 400 mm^2

   Solution:

   a) 11 cm
   b) 25 cm
   c) 20 cm
   d) 120 mm

3. Calculate the volumes of cubes which have sides of these lengths:

   a) 14 mm
   b) 28 mm
   c) 105 mm
   d) 81 cm

   Solution:

   a) $14^3 = 2744$ mm^3
   b) $28^3 = 21\ 952$ mm^3
   c) $105^3 = 1\ 157\ 625$ mm^3
   d) $81^3 = 531\ 441$ cm^3

Activity 1 – 9: Rounding off in real-life situations

1. Michael needs 1245 tiles to tile a bathroom. He can only buy tiles in packs of 75.

   a) Should he round the number of tiles up or down to see how many he should buy? Explain.

   b) How many packs should he buy?

   Solution:

   a) He should round up. If he rounds down he won't have enough tiles to cover the floor!

   b) $1245 \div 75 = 16,6$. So he should buy 17 packs.

2. A classroom wall is 750 cm long.

   a) How many tables, each 120 cm long, will fit along the wall?

   b) How much space will be left over?

   Solution:

   a) $750 \text{ cm} \div 120 \text{ cm} = 6,25$. So 6 tables will fit along the wall.

   b) $6 \times 120 \text{ cm} = 720 \text{ cm}$, so there will be $750 \text{ cm} - 720 \text{ cm} = 30 \text{ cm}$ left over.

3. There are 231 learners in a Grade 10 group. They each need an exercise book, which are sold in packs of 25.

   a) How many packs of books should be ordered?

   b) How many spare exercise books will there be?

   Solution:

   a) $231 \div 25 = 9,24$. 10 packs should be ordered.

   b) $10 \times 25 = 250$. 250 - 231 = 19 spare books.

4. Julia needs to make 500 hamburgers for a school function. Hamburger patties are sold in packets of 12.

   a) How many packets of patties should she buy?

   b) How many will be left over?

   Solution:

   a) $500 \div 12 = 41,67$. She should buy 42 packs.

   b) $42 \times 12 = 504$. 504 - 500 = 4 spare patties.

5. Car parking spaces should be 2,5 m wide. How many parking spaces should be painted in a car park which is 72 m wide?

   Solution:

   $70 \div 2,5 = 28,8$. So 28 parking spaces can be painted in the car park.

1.6 Ratio, rate and proportion

Activity 1 – 10: Working with ratios

1. Which of these pairs of ratios are equal?

   a) 3 : 4 and 75 : 10
   b) 2 : 3 and 10 : 20
   c) 5 : 1 and 100 : 20
   d) 10 : 1 and 40 : 5

   Solution:

   a) Not equal
   b) Not equal
   c) Equal
   d) Not equal

2. The ratio of female learners to male learners in a class is 3 : 2. If there are 30 female learners in the class, work out:

   a) the number of male learners
   b) the total number of learners in the class

   Solution:

   a) 3 : 2 is equal to 30 : 20 so there are 20 male learners.
   b) 20 + 30 learners = 50 learners

3. A fruit and nut company has the following standards requirement: In a packet of dried fruit and nuts, there must be two hundred grams of fruit for every 50 g of nuts.

   a) Write this as a simple ratio.
   b) What will the amount of fruit be if there are 500 g of nuts?
   c) What will the amount of fruit be if there are 25 g of nuts?

   Solution:

   a) 200 : 50
   b) 200 : 50 is equal to 2000 : 500, so there will be 2000 g of fruit and 500 g of nuts
   c) 200 : 50 is equal to 100 : 25 so there will be 100 g of fruit and 25 g of nuts.

4. Tshepo wants to make orange juice out of concentrated juice. The bottle says that it must be diluted 1 : 7 with water. If he wants to make 2 litres (2000 ml) of juice in total, how many millilitres of water must he mix with how much of the concentrated juice?

   Solution:

   1 plus 7 parts equals 8 parts in total. 2000÷ by 8 is 250 ml. 1 : 7 is equal to 250 : 1750. So he must mix 250 ml of concentrate with 1750 ml of water.

Activity 1 – 11: Working with rates

1. A packet of 6 handmade chocolates costs R 15,95. How much does each chocolate cost?

   Solution:

   R 15,95 $\div$ 6 = R 2,668 . . . rounded off to R 2,67 per chocolate.

2. A truck driver travels 1500 km in 18 hours. What is his average speed?

   Solution:

   1500 km$\div$ 18 h = 83,33. . . km/h. Round off to 83,33 km/h.

3. Nicola is able to input 96 words in 2 minutes on her laptop. Karen times her own typing speed as 314 words in 7 minutes. Work out their speeds to see who is faster.

   Solution:

   Nicola types 96 words $\div$ 2 min = 48 words/min. Karen types 314 words $\div$ 7 min = 44,857. . . words/min. Round off to a whole word: 45 words/min. Nicola is faster.

Activity 1 – 12: Finding unknown values in ratios and rates

1. For the following problems, calculate the unknown values. The letter x indicates an unknown value.

   a) 5 hats are to 4 coats as x hats are to 24 coats.
   b) x cushions are to 2 couches as 24 cushions are to 16 couches.
   c) 1 spacecraft is to 7 astronauts as 5 spacecraft are to x astronauts.
   d) 18 calculators are to 90 calculators as x students are to 150 students.
   e) x TV's are to R 40 000 as 1 TV is to R 1000.

   Solution:

   a) $x = 30$
   b) $x = 3$
   c) $x = 35$
   d) $x = 30$
   e) $x = 40$

2. Indicate whether the following proportions are true or false:

   a) $\frac{3}{16} = \frac{12}{64}$
   b) $\frac{2}{15} = \frac{10}{75}$
   c) $\frac{1}{9} = \frac{3}{30}$
   d) $\frac{\text{6 knives}}{\text{7 forks}} = \frac{\text{12 knives}}{\text{15 forks}}$

e) $\frac{33 \text{ kilometres}}{1 \text{ litre}} = \frac{99 \text{ kilometres}}{3 \text{ litre}}$

f) $\frac{320 \text{ metres}}{5 \text{ seconds}} = \frac{65 \text{ metres}}{1 \text{ second}}$

g) $\frac{35 \text{ students}}{70 \text{ students}} = \frac{1 \text{ class}}{2\text{classes}}$

Solution:

a) True

b) True

c) False

d) False

e) True

f) False

g) True

3. Write the simplified form of the rate "sixteen sentences to two paragraphs."

Solution:

$\frac{8 \text{ sentences}}{1 \text{ paragraph}}$

4. A rectangle has a fixed area of 81 square units.

a) Complete the table to show the inverse proportion relationship between the length and the breadth of the rectangle:

length (cm)	1	3	9	27	81
breadth (cm)				3	

b) If this rectangle is to be used as a serviette, which of the measurements are reasonable?

Solution:

a)

length (cm)	1	3	9	27	81
breadth (cm)	81	27	9	3	1

b) 9×9 units

1.7 Percentages

Activity 1 – 13: Calculating the percentages of amounts

1. Calculate the following without a calculator:

a) 25% of R 124,16

b) 50% of 30 mm

Solution:

a) $25\% = \frac{1}{4}$. $\frac{1}{4}$ of R 124,16 = R 124,16 ÷ 4 = R 31,04

b) $50\% = \frac{1}{2}$. $\frac{1}{2}$ of 30 mm = 30 mm ÷ 2 = 15 mm

2. Using your calculator and calculate:

   a) 15% of R 3500
   b) 12% of 25 litres
   c) 37,5% of 22 kg
   d) 75% of R 16,92
   e) 18% of 105 m
   f) 79% of 840 km

   Solution:

   a) R 525
   b) 3 litres
   c) 8,25 kg
   d) R 12,69
   e) 18,9 m
   f) 663,6 km

3. Calculate what percentage the first amount is of the second amount (you may use your calculator):

   a) 120 of 480
   b) 23 of 276
   c) 3500 ml of 5 litres
   d) 750 g of 2 kg
   e) 4 out of 5 for a test
   f) 2 out of 14 balls

   Solution:

   a) 25%
   b) 8,3%
   c) 70%
   d) 37,5%
   e) 90%
   f) 14,3%

Activity 1 – 14: Discounts and increases

1. The price of a tub of margarine is R 6,99. If the price rises by 10%, how much will it cost?

Solution:

New price is R 6,99 + 10% of R 6,99 = R 6,99 + 70 c (rounded off) = R 7,69 OR New price is (100 + 10)% of R 6,99 = 110% of R 6,99 = $\frac{110}{100} \times \frac{6,99}{1}$ = R 7,69 (rounded off)

2. Top Teenage T-shirts have a 20% discount on all T-shirts. If one of their T-shirts originally cost R 189,90, what will you pay for it now?

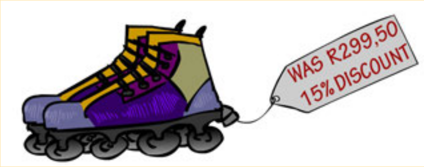
Solution:

You only pay 80% (100% − 20% discount). Thus: $\frac{80}{100} \times 189,901$ = R 151,92 OR 20% of R 189,90 = $\frac{20}{100} \times 189,901$. The discount is thus R 37,98. You pay R 189,90 − R 37,98 = R 151,92.

3. Look at the pictures below. What is the value of each of the following items, in rands?

a)

b)



c)

d)

Solution:

a) R 239,96 − R 59,75 = R 180,21

b) R 299,50 − R 44,925 = R 1254,58

c) R 9875 + R 790 = R 10 665

d) R 15 995 + R 799,75 = R 16 794,75

4. Calculate the percentage discount on each of these items:

a)

b)

Solution:

a) $\frac{\text{R } 1360}{\text{R } 1523} = 89\%$. So discount is $100\% - 89\% = 11\%$

b) $\frac{\text{R } 527{,}40}{\text{R } 586} = 90\%$. So discount is $100\% - 90\% = 10\%$

1.8 End of chapter activity

Activity 1 – 15: End of chapter activity

1. Write the following numbers in order from biggest to smallest:

a) 365 280; 635 765; 6 650 232; 3 695 212; 5 355 005

b) 27,28; 1278; 872; 78,2; 7812; 28,27
c) 8903; 893; 89,30; 89,89; 9988; 3989
d) 12 345; 120 345; 120,54; 542 120; 55 420

Solution:

a) 6 650 232; 5 355 005; 3 695 212; 635 765; 365 280;
b) 7812; 1278; 872; 78,2; 28,27; 27,28;
c) 9988; 8903; 3989; 893; 89,89; 89,30
d) 542 120; 120 345; 55 420; 12 345; 120,54

2. Rewrite the following calculations with brackets to make the answers correct:

a) $23 + 6 \times 5 = 145$
b) $12 + 2 \times 82 = 176$
c) $18 + 3 \times 17 = 69$
d) $18 + 3 \times 17 = 357$
e) $15 + 7 \times 5 = 110$
f) $65 \times 2 + 5 = 455$
g) $115 + 4 \times 12 = 163$

Solution:

a) $(23 + 6) \times 5 = 145$
b) $12 + (2 \times 82) = 176$ OR $12 + 2 \times 82 = 176$ (brackets not needed)
c) $18 + (3 \times 17) = 69$ OR $18 + 3 \times 17 = 69$ (brackets not needed)
d) $(18 + 3) \times 17 = 357$
e) $(15 + 7) \times 5 = 110$
f) $65 \times (2 + 5) = 455$
g) $115 + (4 \times 12) = 163$ OR $115 + 4 \times 12 = 163$ (brackets not needed)

3. For each of the following questions, calculate the answer and then round it up or down depending on the situation. Explain why you rounded the way you did.

a) Liam is packing mushrooms. There are 15 mushrooms in a punnet. He has 275 mushrooms to pack. How many punnets does he need?

b) A car mechanic charges R 200 per hour or part thereof for labour. How much would he charge for a job that takes 270 minutes?

c) An amusement park ride has places for 30 people. 82 people are in the queue for the ride. How many times will the ride need to run?

d) Nokuthula is putting up washing lines in her yard. The distance from one pole to the other is 3,2 m. How many lines can she put up if she has 18 m of washing line?

Solution:

a) $275 \div 15 = 18,33\ldots$ He can only sell full punnets, so he must round down to 18.

b) 270 minutes is 4 hours and 30 minutes, but he rounds up to 5 hours, as he charges "per hour or part thereof". So he charges R 1000.

c) $82 \div 30 = 2$ remainder 22. They cannot turn away customers, so they should round up and run the ride 3 times.

d) $18 \div 3{,}2 = 5{,}625$. She should round down, as she can't put up a fraction of a line, and may need more line for knots and so on. So she can hang 5 lengths of line.

4. How much would a customer pay for each of these totals in a shop?

   a) R 215,67
   b) R 329,29
   c) R 65,33

Solution:

a) R 215,65
b) R 329,25
c) R 65,30

5. For each of the following problems, first write two ratios equal to each other, then find the unknown value:

   a) A recipe calls for $\frac{1}{3}$ cup sugar to 2 cups of flour. How many cups of flour do you need to add to 3 cups of sugar?
   b) A survey shows that 5 : 1 learners in a school have their own cell phone. If there are 1350 learners in the school, how many do not have their own cell phone?

Solution:

a) $\frac{1}{3} : 2 = 1 : 6 = 3 : 18$. So you need to add 18 cups of flour to 3 cups of sugar.

b) There are 6 parts in the ratio, so 1 part $= 1350 \div 6 = 225$ learners do not have their own cell phone.

6. Three litres of milk cost R 29,95 at Shop A and two litres of milk cost R 15,95 at Shop B.

   a) What is the cost per litre at each shop?
   b) Which is the better buy?
   c) How much would five litres of milk cost at each shop?

Solution:

a) Shop: A R $29{,}95 \div 3 =$ R 9,98. Shop B: R $15{,}95 \div 2 =$ R 7,98
b) Shop B.
c) Shop A: R $9{,}98 \times 5 =$ R 49,90. Shop B: R $7{,}98 \times 5 =$ R 39,90

7. Two different sized jars of jam are sold at the following prices: A: 500 g for R 8,50 or B: 750 g for R 11,50. Which size is the better buy?

Solution:

Work out what 100 g costs for each. A: R 8,50 $\div$ 5 $=$ R 1,70 and B: R 11,50 $\div$ 7,5 $=$ R 1,533 ... So jar B is cheaper.

8. Do these calculations without a calculator:

   a) 240,01 $\times$ 100
   b) 364,5 $\times$ 1000
   c) 1865,03 $\times$ 10
   d) 990,13 $\times$ 1000
   e) 5,298 $\times$ 100
   f) 6995,86 $\div$ 1000
   g) 3784,41 $\div$ 100
   h) 788,1 $\div$ 1000

   Solution:

   a) 24 001
   b) 364 500
   c) 18 650,3
   d) 990 130
   e) 529,8
   f) 6,99586
   g) 37,8441
   h) 0,7881

9. The following numbers are not perfect squares. Calculate the square roots of these numbers (using a calculator) and give the answer rounded off to two decimal places if necessary.

   a) 222
   b) 845
   c) 6120
   d) 44 032

   Solution:

   a) 14,90
   b) 29,07
   c) 78,23
   d) 209,84

10. The price of a new car is R 210 000. Mr Simelane is offered a 12% discount. How much will he pay?

    Solution:

    R 210 000 $-$ 12% $=$ R 184 800

11. A packet of rice weighs 1,5 kg when it is bought. Some of the rice has been used and the packet now weighs 15% less. What is the weight of the rice that was used?

Solution:

1,5 kg − 15% = 1,275 kg. 1,5 kg − 1,275 kg = 0,225 kg of rice was used.

12. The price of a TV set is R 2786. If a buyer is offered an 11% discount, what does he pay for it?

    Solution:

    R 2786 − 11% = R 2479,54

13. A car was valued at R 175 000 when it was purchased. After three years it was sold for R 82 000. What percentage of its original value did the car lose?

    Solution:

    R 175 000 − R 82 000 = R 93 000. $\frac{93\,000}{175\,000}\%$ = 53,14%

CHAPTER 2

Patterns, relationships and representations

2.2 Making sense of graphs that tell a story

The first section of this chapter is intended to give learners a feeling for how graphs "tell a story", by using a visual representation of the relationship between quantities. We give learners the basic tools to interpret graphs that they see in the media.

This section is particularly useful for learners who have previously been intimidated by graphs and don't understand how representations work, so it is vital to keep this section informal. Do not ask learners to read points off a graph or to work with independent and dependent variables in this section. They will do this in the following sections.

Graphs going up and going down (increasing and decreasing)

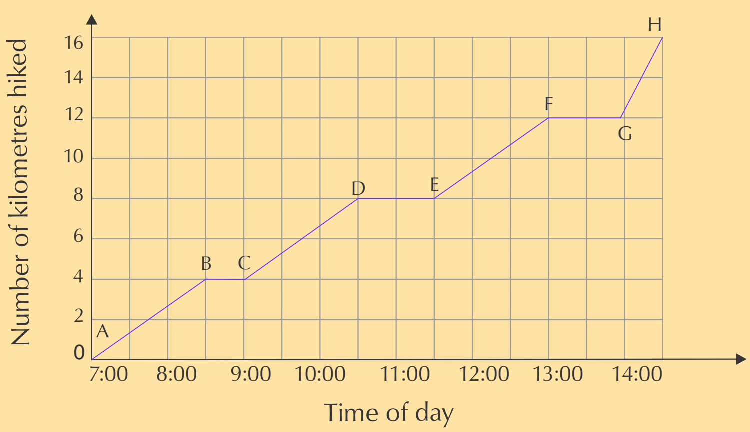
The 2nd worked example in Chapter 2 deals with very important concepts in graph work, which learners need to master at the beginning of Grade 10: increasing, decreasing, constant, gradients, maximum and minimum points. They do not need to use the formal terminology; but they must be able to interpret these features of graphs correctly. Using realistic contexts for these graphs is a good way to check whether learners understand the meaning of the features. The following activity is a good opportunity to assess this informally.

Continuous and discrete graphs

The use of dotted lines in a discrete graph is to help us see the differences between the points and the steepness of the slope between them, rather than indicating a connection between the points.

Activity 2 – 1: Interpreting graphs

1. Lindi and Thabang went on a day hike and drew this graph to show their progress.



a) What was the total distance of the hike and how many hours did it take?

b) Give the times when Lindi and Thabang were resting (where the distance stayed constant).

c) One part of the graph is steeper than the others. Identify this part.

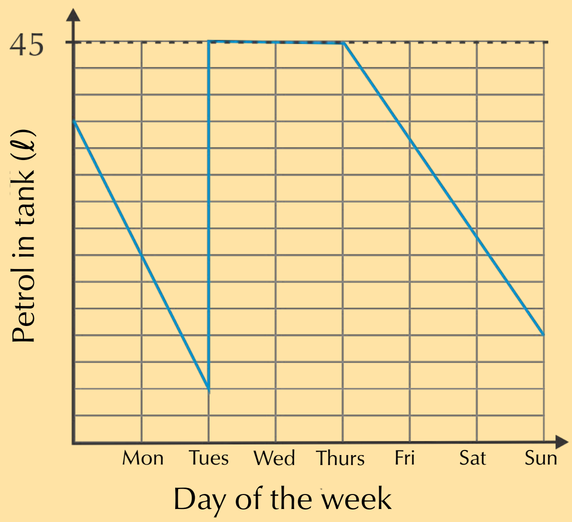
Solution:

a) Total distance is 16 km, Total time is 7 hours, 30 minutes

b) 08:30 - 09:00, 10:30-11:30, 13:00-14:00

c) G to H

2. Pumeza's car takes 45 litres of petrol. The graph below shows the amount of petrol in the tank over one week.



a) Is there any time when her petrol tank is completely empty? How do you know?

b) Pumeza was ill for two days during the week and stayed at home. Identify the two days and explain your answer.

c) How many times does she fill up her car with petrol? Where do you see this on the graph?

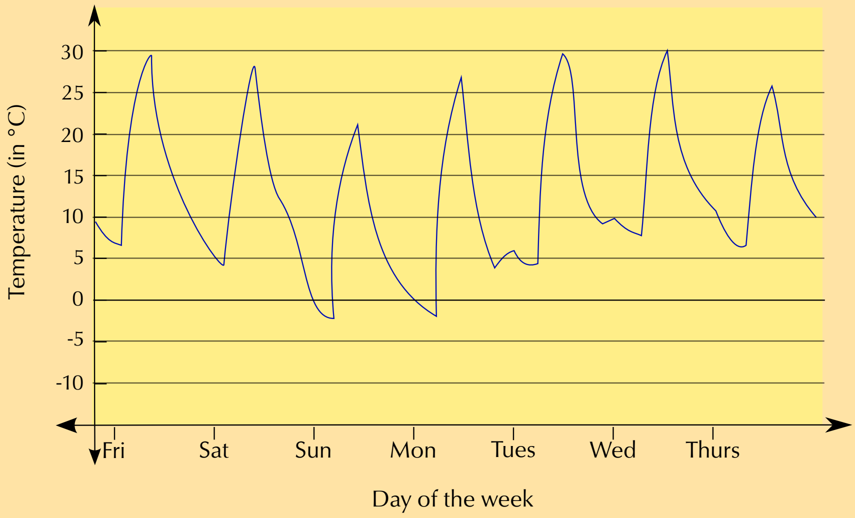
Solution:

a) No. At no point does the graph touch the horizontal axis

b) Tuesday and Wednesday - her petrol consumption did not change at all, this suggests she did not use her car, and was therefore at home.

c) Once, On Tuesday the amount of petrol in the tank spikes suddenly.

3. The graph below shows the temperature in Bloemfontein, measured over one week in September.



a) Is this graph continuous or discrete? Explain.

b) What was the highest temperature recorded during the week? On what day was this?

c) What was the lowest temperature recorded during the week? On what day was this?

d) Write down the maximum and minimum temperatures on Wednesday. Calculate the difference between them.

Solution:

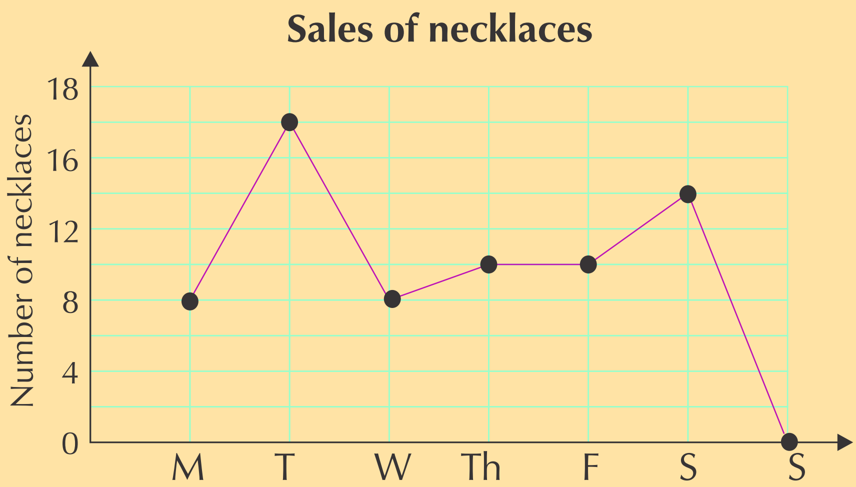
a) Continuous - there are no gaps in the graph, temperature is measured all day, from Friday to Thursday.

b) 30°C, on Wednesday

c) approximately −2°C, on Sunday.

d) Minimum temperature is approximately 7°C maximum is approximately 30°C. 30°C - 7°C = 23°C difference.

4. Naledi makes and sells beaded necklaces. Look at the graph below and answer the questions:



a) Where is the highest point on the graph?

b) On which day were there no sales?

c) Between which two days is the biggest increase in sales? Explain.

d) Between which two days do the sales stay the same?

e) Describe what happens to the sales between Wednesday and Thursday.

f) Why is the graph drawn with a dotted line?

Solution:

a) The highest point is on Tuesday (17 necklaces sold).

b) Sunday.

c) The graph is steepest between Monday and Tuesday, and there is a change from 8 to 17, so the biggest increase is here.

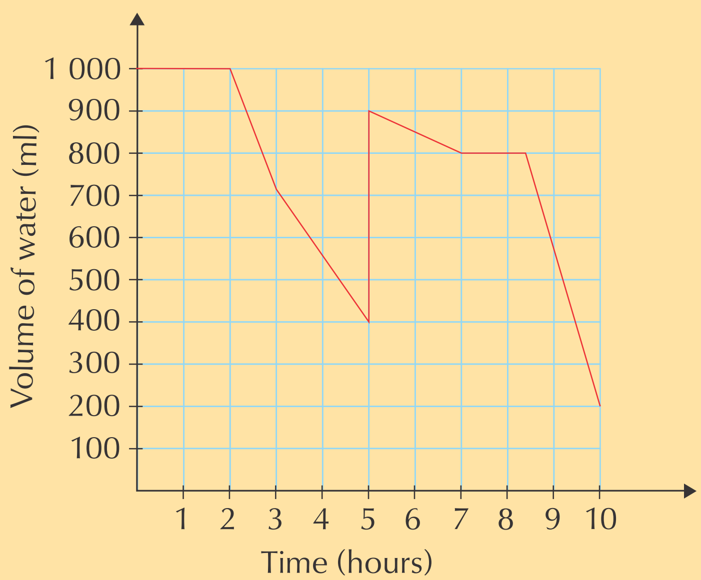
d) Between Thursday and Friday - the graph is constant between these two points.

e) There is a small increase in sales from Wednesday to Thursday - from 8 to 10 necklaces.

f) There is a dotted line to indicate that the graph is not continuous between the plotted points. The sales are discrete points because Naledi only sells a whole number of necklaces each day.

Activity 2 – 2: Reading graphs

Tumelo has a long day at work ahead and takes a one litre bottle of water to work with him. Look at this graph carefully and then answer the questions below.



1. What are the two variables plotted on this graph?

   Solution:

   Time, on the horizontal axis, and the volume of water in Tumelo's bottle, on the vertical axis.

2. Which variable is dependent and which is independent? Explain fully.

Solution:

The volume of water is dependent on time, the independent variable.

3. What happens to the amount of water in the bottle during the first two hours?

   Solution:

   It remains constant.

4. What happens at hour number 5? Explain.

   Solution:

   The amount of water in the bottle increases suddenly. This implies that Tulemo refilled his water bottle.

5. Between which two hours does Tumelo drink his water the fastest?

   Solution:

   Between hour 8 and hour 10.

6. Does he finish all the water in his bottle at any point? How do you know this?

   Solution:

   No. At no point does the graph touch the horizontal axis - i.e. at no point is the volume of water in the bottle 0 ml.

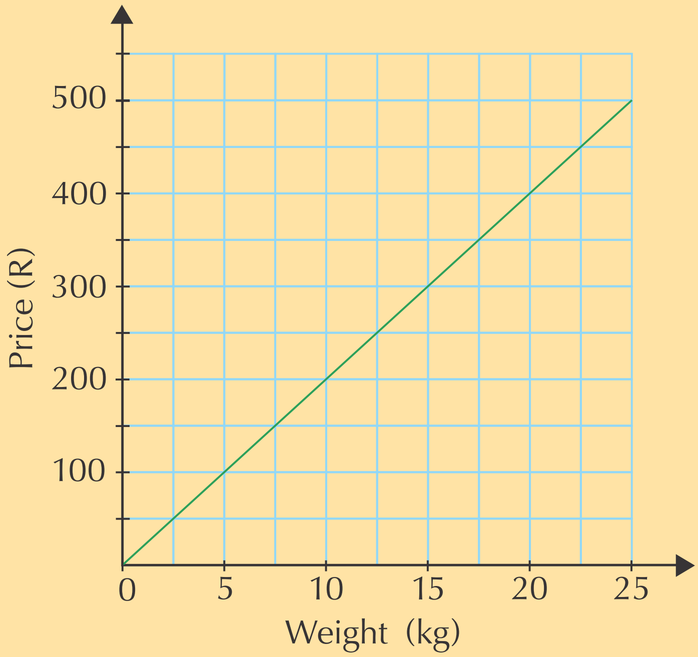
2.3 Linear patterns, relationships and graphs

The second and third sections in Chapter 2 deal with patterns and showing the patterns in both tables and graphs. First let learners practise plotting points on a grid, and make sure that they all understand that the first coordinate is plotted from the horizontal axis and the second coordinate from thevertical axis, as in the first Worked example in this unit.

Linear relationships and graphs

Activity 2 – 3: Linear relationships

1. This graph shows the cost of potatoes per weight.



a) Using the above graph, complete the table showing the same relationship:

Weight of potatoes (kg)	5	10	15	20	25	
Cost (R)	100			400		600

b) What will 7,5 kg of potatoes cost? Read this from the graph.

c) If you spend R 300, what is the weight of potatoes you have bought?

d) Identify the independent and dependent variables on the graph.

Solution:

a)

Weight of potatoes (kg)	5	10	15	20	25	30
Cost (R)	100	200	300	400	500	600

b) R 150

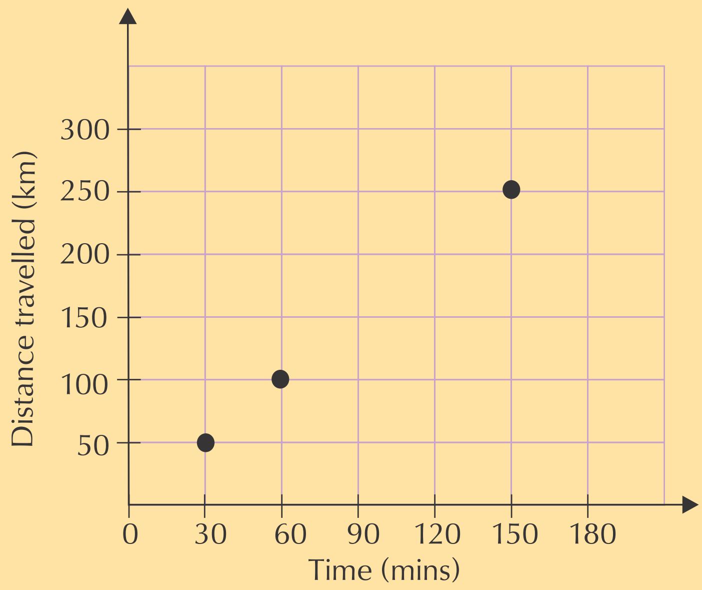
c) 15 kg

d) Weight is the independent variable. Price is the dependent variable.

2. The relationship between the distance that a car travels and the time it takes is shown in the table below.

Distance travelled (km)	0	50	100	150	200	250	300
Time (minutes)	0	30	60	90	120	150	180

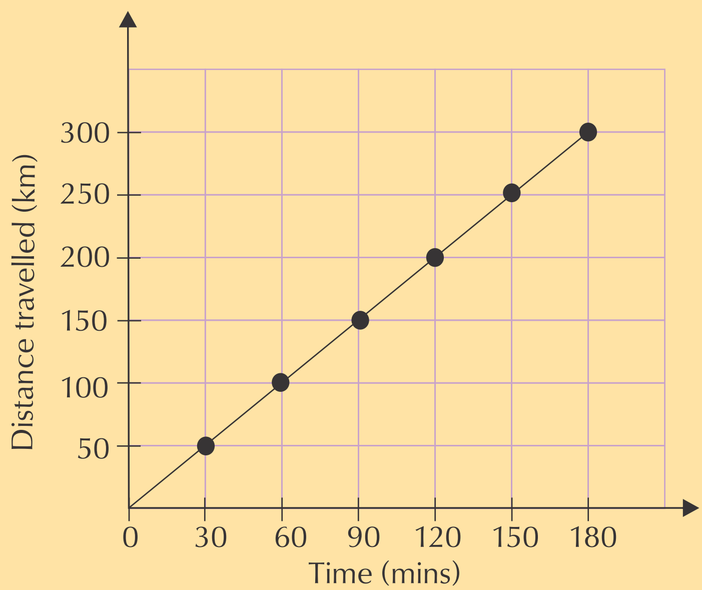
a) Copy and complete the graph of distance travelled against time, using the values in the table.



b) Write down the speed of the car in kilometres per hour.

Solution:

a)



b) 100 km per hour.

3. This table shows the amount of money that a municipality charges for the amount of electricity that a household uses.

Number of units of electricity	0	100	200	300	400	500	600
Cost (cents)	0	110	220	330	440	550	660

a) Where will the graph start? Explain how you know this.

b) Plot a graph using these values.

c) Why is this graph continuous (there are no gaps between the points)?

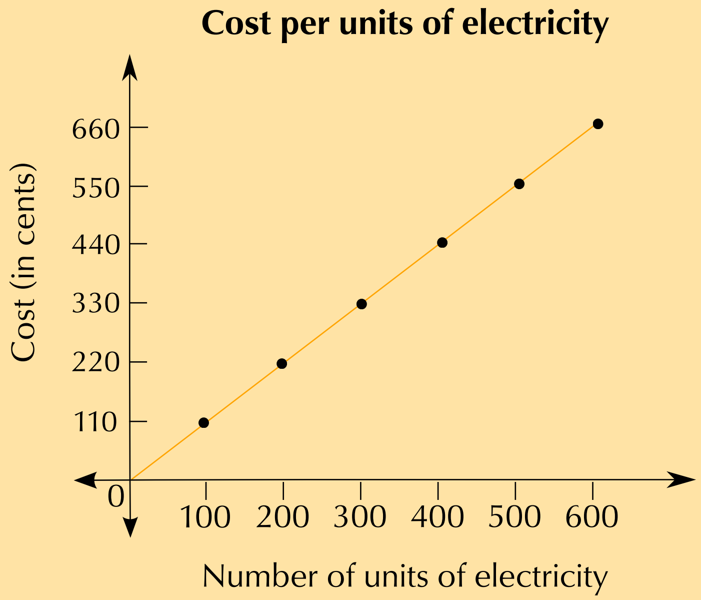
d) We say that the cost depends on the number of units of electricity used. Explain why this is. What pattern do you see in the table?

e) Is this graph going up (increasing), going down (decreasing) or staying the same (constant)? Give a reason for your answer.

Solution:

a) at 0 units and 0 cents, at the intersection of the horizontal and vertical axes. We know this because we are given the minimum values, where both variables are equal to zero.

b)



c) Because every number of units of electricity used will be charged for. There is no quantity of electricity usage which does not have cost.

d) Cost increases as the number of units of electricity increases. The more electricity is used, the more you have to pay.

e) The graph is increasing. It has an upward slope, that indicates that the cost per unit increases as the number of units used increases.

2.4 Inverse proportion patterns, relationships and graphs

Activity 2 – 4: Inverse proportion patterns

1. Lerato decides to get a group of friends together to play a lucky draw game. The bigger the group, the more tickets they can buy, but if they win, they will have to share the prize among more people. The total amount of money is R 2000.

   a) If they win the prize money, how much will they have to share?

   b) How will the number in the group affect the amount each person receives?

   c) What kind of relationship is this?

   d) Copy and complete the table below including the first column which is the headings for the independent and dependent variables.

Number of people	1	2	3	4	8	10	50
Share of the prize money	2000	1000					

   e) Plot a graph of these points to show the relationship.

Solution:

a) R 2000

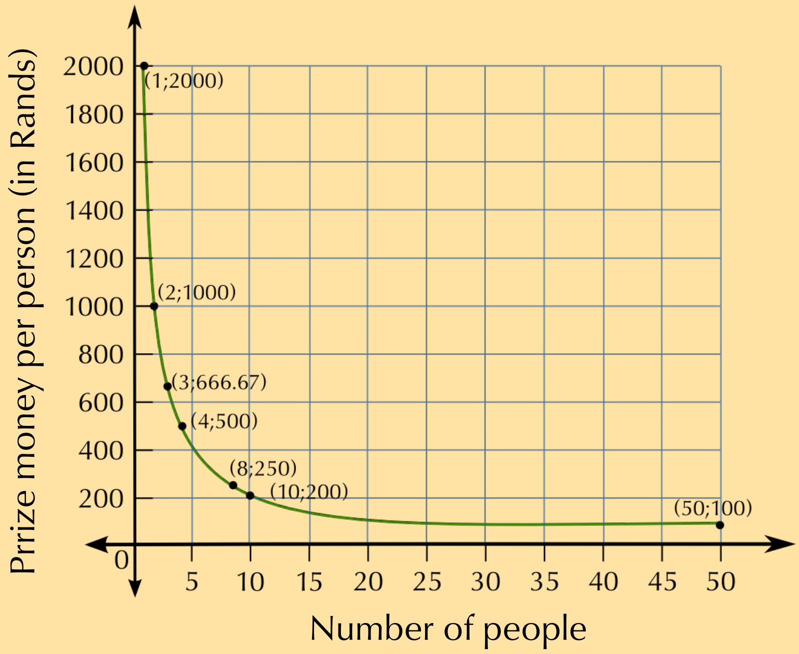
b) The larger the number of people in the group, the smaller the shared amount that each person will receive.

c) An inverse proportional relationship.

d)

Number of people	1	2	3	4	8	10	50
Share of the prize money	2000	1000	666,67	500	250	200	100

e)



2. Meryl wants to make a garden bed with an area of 16 m^2.

a) Draw up a table to show a few possible length and breadth measurements of the garden bed.

b) Do the measurements have to be whole numbers? Explain.

c) Draw a graph to show the relationship between the length and the breadth of the garden bed.

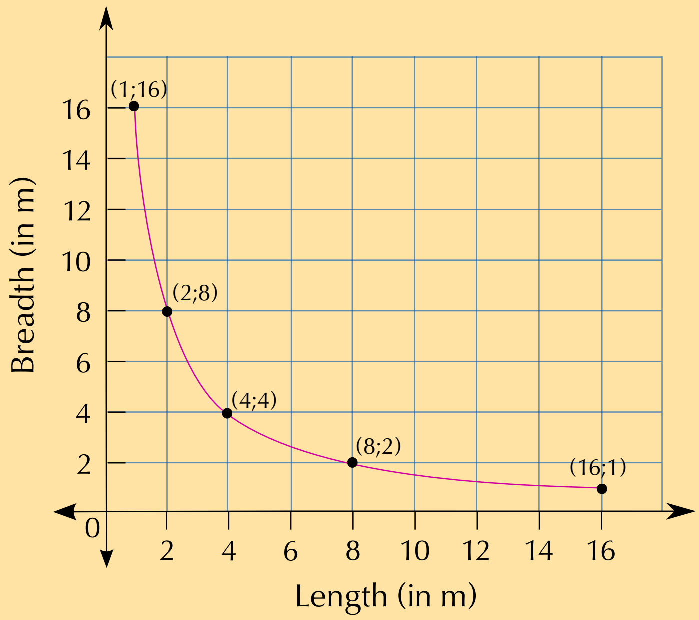
Solution:

a)

Breadth (m)	1	2	4	8	16
Length (m)	16	8	4	2	1

b) No. Any two numbers whose product is 16 can be used, because length and breadth are continuous variables. Whole numbers will be easier to calculate and plot on a graph, however.

c)



2.5 Finding the rule or formula

Activity 2 – 5: Describing patterns

1. Describe each of these patterns in words, and then write three more terms in each sequence:

   a) 2; 4; 8; 16;. . .

   b) 1; 5; 9; 13;. . .

   c) 3; 6; 9; 12;. . .

   d) 5; 10; 15; 20;. . .

   Solution:

   a) This number sequence starts at 2 and each term is multiplied by 2 to get the next term.

   b) This number sequence starts at 1 and 4 is added to each term to get the next term.

   c) This number sequence starts at 3 and 3 is added to each term to get the next term.

   d) This number sequence starts at 5 and 5 is added to each term to get the next term.

2. Write down the first four terms of the pattern for each of the following descriptions:

   a) This number sequence starts at 1 and 20 is added each time to get the next term.

b) This number sequence starts at 1 and each term is multiplied by 4 to get the next term.

c) This number sequence starts at 20 000 and each term is multiplied by 2 to get the next term.

Solution:

a) 1; 21; 41; 61;. . .

b) 1; 4; 16; 64;. . .

c) 20 000; 40 000; 80 000; 160 000;. . .

3. Complete the table for the following sequence and use the information to work out the general formula and the value of the 20th term: 5; 14; 23; 32; 41; 50;. . .

Position of term (n)	1				6	20
Value of term	5	14	32	41	50	

Solution:

Position of term (n)	1	2	4	5	6	20
Value of term	5	14	32	41	50	174

Number sentence: $(n \times 9) - 4$. So 20th term $= (20 \times 9) - 4 = 176$.

4. Kepa sells pies at a roadside stall. He earns a basic salary of R 250 per day and a commission of 40 c on each pie he sells.

a) Write an equation for calculating how much he earns at an event.

b) Use your equation to complete the table:

Number of pies	20	40	60	80	100
Money earned (R)					

c) Plot the data points from your table and draw a graph.

d) Should Kepa use the table, the graph or the equation to work out how much money he earns at the end of the day? Explain your answer.

Solution:

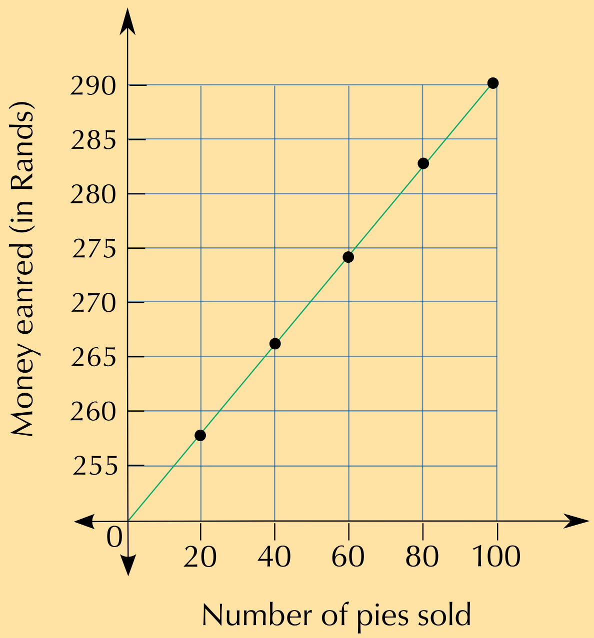
a) Earnings = R 250 + (40 c $\times$ n), where n is number of pies he sells

b)

Number of pies	20	40	60	80	100
Money earned (R)	258	266	274	282	290

c)

Money earned per number of pies sold

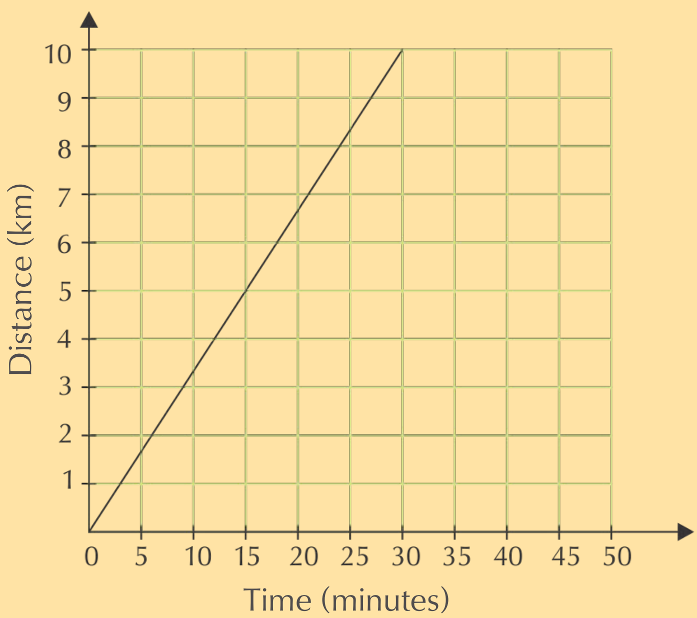


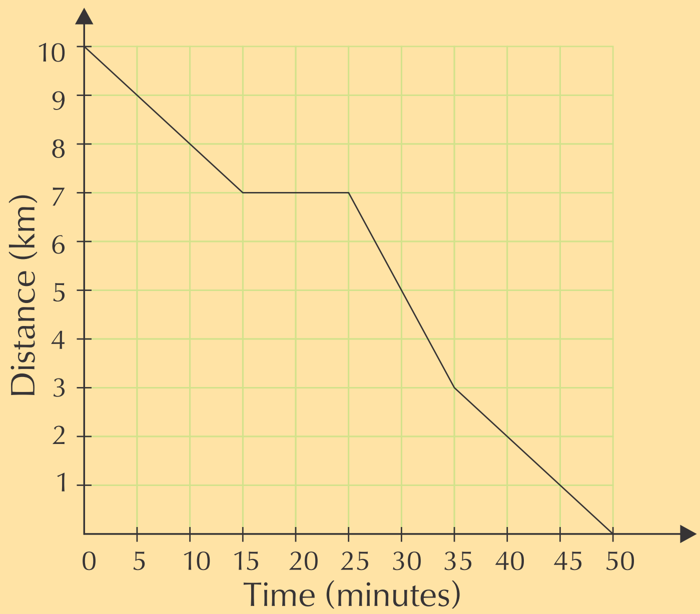
Because the graph is continuous, it will allow him to calculate how much money he earned for *any* number of pies. The precision with which he can read off the graph however, depends on the intervals between units on the graph's axes.

2.6 End of chapter activity

Activity 2 – 6: End of chapter activity

d) The two graphs below show how Dikeledi cycled to the Post Office and back home. Compare the two graphs to answer the questions that follow.





a) What relationship is shown in each graph?

b) Explain why the first graph has a positive slope.

c) Explain why the second graph has a negative slope for most of the way.

d) How long did Dikeledi take to cycle to the Post Office?

e) What is the distance between her home and the Post Office?

f) How long did she take to cycle home from the Post Office?

g) Dikeledi 's trip home has four parts, shown by four different line segments.

   i. When did Dikeledi cycle the fastest?

   ii. How far did she cycle before she slowed down?

   iii. When did Dikeledi cycle the slowest?

   iv. How far from home was Dikeledi after 10 minutes?

Solution:

a) The relationship between distance from home and time.

b) The longer Dikeledi cycles, the further she gets from home (so the greater the distance becomes), because she is cycling **away** from home.

c) The longer Dikeledi cycles for, the closer she gets to home (so the smaller the distance becomes) because she is cycling **towards** home.

d) 30 minutes

e) 10 km

f) 50 minutes

g) i. between time 25 and 35 minutes

   ii. 3 km

   iii. Between time 15 minutes and 25 minutes she stopped cycling altogether.

   iv. 8 km

2. It takes one carpenter at Jabulani Joinery 6 hours to make a wooden table. They need to make 20 wooden tables.

   a) What are the two variables in this relationship?

b) How long would 2 carpenters take to make the table?

c) How long would 4 carpenters take?

d) How long would 12 carpenters take?

e) What kind of a relationship is there between the two variables?

f) Draw up a table of values to plot a graph of this relationship.

g) Sketch a graph of these values.

h) Did you use a solid line or a dotted line? Explain why.

Solution:

a) The number of carpenters and the hours required to make 20 tables.

b) 3 hours.

c) 1,5 hours

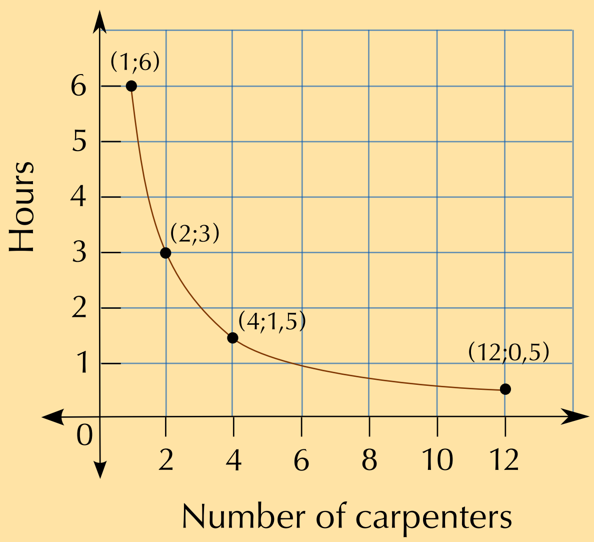
d) 30 minutes

e) Inverse proportional relationship

f)

No. of carpenters	1	2	4	12
Hours to make 20 tables	6	3	1,5	0,5

g)



h) The line must be dotted, because there can only be a whole number of carpenters (this is a discrete variable).

3. A computer game shop has a special deal for regular customers. Instead of paying R 30 to hire a game, you can join the Gamers Club for R 150 per year, and pay only R 15 per DVD.

a) How would you calculate the cost of hiring 10 games if you did not belong to the club?

b) Write an equation for the calculation in a.

c) How would Thomas calculate the cost of hiring five games if he belongs to the Gamers Club?

d) Write an equation for calculating the cost of hiring any number of games for the year for Gamers Club members.

e) In the relationship between costs and the number of games hired, which is the independent variable? Explain.

f) Which is the dependent variable?

g) Would a graph for this relationship have a positive or a negative slope? Give a reason for your answer.

Solution:

a) You would add the cost of 10 games, at R 30 each.

b) Cost = R 30 × number of games.

c) Cost = R 150 + R 15 × 5 games

d) Cost = R 150 + R 15 × number of games

e) The number of games hired is the independent variable. How much Thomas pays for the games depends on how many games he hires.

f) The cost of hiring the games is the dependent variable.

g) The slope is positive, because the cost increases as you hire more games.

CHAPTER 3

Conversions and time

3.2 Converting metric units of measurement from memory

Length

Activity 3 – 1: Converting units of length

1. A butterfly is 230 mm long. Convert this to cm.

   Solution:

   2,3 cm

2. The cover of a book is 16,2 cm long. How long is the book in mm?

   Solution:

   162 mm

3. A table is 1450 mm long. Convert this to metres.

   Solution:

   1,45 m

4. A garden is 5,32 m long.

   a) How long would it be in mm?

   b) Which unit (metres or millimetres) do you think is best for measuring the length of the garden?

   Solution:

   a) 5320 mm

   b) metres

5. A long workbench is 295 cm long. How long is it in metres?

   Solution:

   2,95 m

6. A playground is 4,02 m wide.

   a) How wide is the playground in cm?

   b) Which unit (metres or centimetres) do you think is best for measuring the width of the playground?

   Solution:

   a) 402 cm

   b) metres

7. Jack and Thembile live 6473 m apart. Convert this distance to km.

   Solution:

   6,473 km

8. The distance between Cape Town and Betty's Bay is 90,25 km.

   a) How far is this in metres?
   b) Which unit (metres or kilometres) do you think is best for measuring this distance?

   Solution:

   a) 90 250 m
   b) kilometres

9. The distance from Phumza's house to the shop is 1 890 000 mm.

   a) How far is this in kilometres?
   b) Which unit (km or mm) do you think is best for measuring this distance?

   Solution:

   a) 1,89 km
   b) km

10. Mary rides 7,82 km on her bicycle.

    a) How far does she ride in mm?
    b) Which unit (km or mm) do you think is best for measuring this distance?

    Solution:

    a) 7 820 000 mm
    b) km

11. Bongani walks 576 800 cm. How far does he walk in km?

    Solution:

    5,768 km

12. Jenny runs 405 m.

    a) How far does she run, in cm?
    b) Which unit (m or cm) do you think is best for measuring how far she runs?

    Solution:

    a) 4050 cm
    b) m

Activity 3 – 2: Converting units of volume

1. A can of cola has a capacity of 330 ml. How many litres of cola is this?

   Solution:

   0,33 ℓ

2. A tin of paint contains 3,5 ℓ of paint. How many millilitres of paint is in the tin?

   Solution:

   3500 ml

3. A reservoir on a farm holds 45 500 000 ml of water.

   a) How much water is this in ℓ?
   b) Which unit (ml or ℓ) do you think is best for measuring the capacity of the reservoir?

   Solution:

   a) 45 500 ℓ
   b) ℓ

4. A large vat in a juice factory holds 2300 ℓ of orange juice.

   a) How many ml of orange juice can it hold?
   b) Which unit (ml or ℓ) do you think is best for measuring the capacity of the juice vat?

   Solution:

   a) 2 300 000 ml
   b) ℓ

5. Harry's household uses 1023 ℓ of water per month. How much water do they use in kl?

   Solution:

   1,023 kl

6. A milk tanker truck has a capacity of 25,45 kl.

   a) How much milk can it hold in litres?
   b) Which unit do you think is best (litres or kilolitres) for measuring the capacity of the tanker truck?

   Solution:

   a) 25 450 ℓ
   b) kilolitres

Activity 3 – 3: Converting units of weight

1. A bag of maize weighs 5600 g.
    a) How much does the maize weigh in kg?
    b) Which unit (g or kg) do you think is best for measuring the weight of the bag?

    Solution:

    a) 5,6 kg
    b) kg

2. A cooking pot weighs 2,04 kg. Convert the weight of the pot into grams.

    Solution:

    2040 g

3. A blue whale weighs 150 700 kg.
    a) How many tonnes does the whale weigh?
    b) Which unit of measurement (kilogram or tonnes) do you think is best for measuring the weight of the whale?

    Solution:

    a) 150,7 t
    b) tonnes

4. A female elephant weighs 3,126 t. How much does the elephant weigh in kg?

    Solution:

    3126 kg

5. A large church bell weighs 0,852 tonnes. How much does the bell weigh in grams?

    Solution:

    852 000 g

6. A bus weighs 3 500 000 g. Convert the weight of the bus into tonnes.

    Solution:

    3,5 t

3.3 Converting units of measurement using given conversion factors

Activity 3 – 4: Converting units for cooking

1. Alex needs to cook 10 cups of rice. How many ml of rice must he cook?

   Solution:

   2500 ml

2. A group of friends has 1500 ml of orange soda. How many cups of orange soda is this?

   Solution:

   6 cups

3. Convert 90 ml of curry powder into tablespoons.

   Solution:

   6 tbsp

4. What is 4 tbsp of baking powder, measured in ml?

   Solution:

   60 ml

5. A bottle contains 85 ml of medicine. How many teaspoons is this?

   Solution:

   17 tsp

6. Convert 7 tsp of cooking oil into ml.

   Solution:

   35 ml

7. Convert 1060 ml of fruit juice into cups and tbsp.

   Solution:

   4 cups and 4 tbsp

8. How much is 4 cups and 6 tbsp of flour, converted into ml?

   Solution:

   1090 ml

3.4 Reading and calculating time

Activity 3 – 5: Converting between 12-hour and 24-hour clock times

1. Write the following times in the 12-hour format:

   a) The soccer game starts at 21:00.
   b) Elvis left the building at 17:40.
   c) Karen went to bed at 23:40.
   d) The moon rose at 00:13.

   Solution:

   a) 9:00 p.m.
   b) 5:40 p.m.
   c) 11:40 p.m.
   d) 12:13 a.m.

2. Write the following times in the 24-hour format:

   a) Lungile wakes up at 5:40 a.m.
   b) Simphiwe ate dinner at 6:59 p.m.
   c) Anna watched a movie that started at 7:18 p.m.
   d) David got home from his night shift at 12:30 a.m.

   Solution:

   a) 05:40
   b) 18:59
   c) 19:18
   d) 00:30

Converting units of time

Activity 3 – 6: Converting units of time

1. A jogger runs for 40 minutes.

   a) How many hours does he run for? (Give your answer as a fraction).
   b) How many seconds does he run for?

   Solution:

   a) $\frac{2}{3}$ of an hour

b) 2400 seconds

2. A school camp last 3 days.

   a) How many hours long is the camp?
   b) How many minutes long is the camp?
   c) How many seconds long is the camp?

   Solution:

   a) 72 hours
   b) 4320 minutes
   c) 259 200 seconds

3. Carine goes on holiday for 6 weeks.

   a) How many days is she away for?
   b) How many hours is she away for?

   Solution:

   a) 42 days
   b) 1008 hours

4. Vusi is ill for two and a half days. For how many hours is he ill?

   Solution:

   60 hours

5. An advert on TV lasts 70 seconds. How long does the advert last, in minutes and seconds?

   Solution:

   1 minute, 10 seconds

6. A chicken takes 100 minutes to roast in the oven. How long it does it take to roast, in hours and minutes?

   Solution:

   1 hour, 40 minutes

7. A plane trip (with stopovers) from South Africa to China takes 38 hours. How many days and hours does the trip take?

   Solution:

   1 day, 14 hours

Activity 3 – 7: Calculating elapsed time

1. Unathi's father goes to work at 8:00 a.m. He fetches her from school 7 hours and 30 minutes later. What time will he fetch Unathi? Give your answer in the 24-hour format.

   Solution:

   15:30

2. Lauren finishes her music class at 15:30. It takes her 30 minutes to get home. She then does homework for 50 minutes. Lauren meets her friend 20 minutes after she finishes her homework. What time do they meet? Give your answer in the 12-hour format

   Solution:

   5:50 p.m.

3. Heather starts baking biscuits at 6:15 p.m. The biscuits must come out of the oven at 6:35 p.m. and need to cool for another 20 minutes before they can be eaten.

   a) How long will the biscuits be in the oven for?

   b) What time will they be ready to eat? (Give your answer in the 12-hour format)

   Solution:

   a) 20 minutes

   b) 6:55 p.m.

4. a) Alison's favourite TV show starts at 20:35. It is forty-five minutes long. What time will it finish?

   b) If Alison watches the movie that follows her favourite show and it finishes at 10:50 p.m., how long was the movie (in hours and minutes)?

   Solution:

   a) 21:20

   b) 1 hour, 30 minutes

5. Vinayak is meeting his brother for lunch at 13:15. He also wants to go to the shops before lunch. It will take him 20 minutes to get from the shops to the restaurant where he's meeting his brother. If he leaves home at 10:10 how much time does he have to do his shopping? Give your answer in hours and minutes.

   Solution:

   2 hours, 45 minutes

Calendars

Activity 3 – 8: Creating your own calendar

1. You need to create a calendar (like the one in the previous worked example) for one month of the year. It should include the following:

   - close relatives' birthdays (that happen in that month)
   - any classmates' birthdays
   - sports fixtures
   - test and/or exam dates and times
   - school functions or events.

   Solution:

   Learner-dependent answer.

Timetables

Activity 3 – 9: Writing up a timetable

1. Sipho and Mpho are brothers. Their parents require them to do household chores every day. These chores need to fit into their school sports and homework timetables.

   Using the information provided in the table below, construct a timetable for each brother for **one** day of the week.

   The two brothers' timetables need to be clearly laid out and easy to read.

SIPHO	MPHO
Soccer practice 15:30 - 16:30	Piano lesson (1 hour)
Feed the dogs	Walk the dogs for a minimum of 30 minutes
Do the dishes	Study for his Maths test - 45 minutes
Complete his Life Orientation task - 45 minutes	Set (and clear) the table before and after dinner
Watch the news at 19:00 for his history assignment	Look through the newspaper for any information on natural disasters for his geography homework.

   Solution:

   Learner-dependent answer but an example:

Sipho:

Time	Event
15:30 -16:30	Soccer practice
18:00	Feed dogs
19:00	Watch news for history assignment
19:30 - 20:15	Complete LO task
20:15	Do dishes

Mpho:

Time	Event
15:30 -16:30	Piano lesson
17:00- 17:30	Walk dogs
18:00	Set table for dinner
19:00	Clear table for dinner
19:15 - 19:45	Look through newspapers for geography homework
19:45 - 20:30	Study for Maths Lit test

For this activity, we suggest you encourage learners to think logically about the sequence of events - for example, it makes little sense for Sipho to wash the dishes before dinner, or for Mpho to have his piano lesson late in the evening. It is up to the learner whether they only schedule the given events in the timetables, leaving free time in between or add additional items and plan the boys' entire day. Learners may be creative in adding in details like study breaks, dinner, bedtime etc. to fill up the entire timetable. The division of time is also for the learner to decide (e.g. 30 minute intervals, hours or irregular time slots). The timetable must be clear and easy to comprehend.

3.5 End of chapter activity

Activity 3 – 10: End of chapter activity

Thobeka is planning an end of term party for her classmates on a Saturday afternoon, and needs help with her measurement conversions and time management. Answer the questions that follow, and don't forget to show your working out.

1. Thobeka has a large table that she wants to use for drinks and snacks. She measures the table to be 164 cm wide.
   a) Convert the width of the table into metres.
   b) If she has a tablecloth that is 1500 mm wide, will it fit over the table? If not, by how many cm will it be too short?
   c) Thobeka has chairs that are 0,4 m wide. How many chairs can she fit along one side of the table?

Solution:

a) 1,64 m

b) 1500 mm = 1,5 m. The table is 1,64 m wide, so the table cloth will be 14 cm too short.

c) 1500 mm = 150 cm. 150 cm ÷ 40 = 3,75 chairs. She can't have 0,75 of a chair, so she can fit 3 chairs along one side of the table.

2. Thobeka wants to make party packets for her friends, and decides to tie them closed with pieces of ribbon. Each bag needs 100 mm of ribbon.

   a) How many centimetres of ribbon does each bag require?

   b) If Thobeka needs to tie 25 bags, how much ribbon will she need in total, in centimetres?

   c) How many metres of ribbon will Thobeka need to buy?

   d) How much will it cost?

   Solution:

   a) 100 mm = 10 cm

   b) 10 cm ×25 bags = 250 cm Ribbon costs R 7,50 per metre and is only sold in full metres (not half metres).

   c) She will have to buy 3 metres.

   d) 3 × R 7,50 = R 22,50

3. Thobeka is going to buy snacks, including chips and biscuits, for her friends.

   a) Each packet of chips weighs 50 g. How much is this in kg?

   b) If each packet of chips weighs 50 g and she wants to buy 1 kg of chips in total, how many packets will she have to buy?

   c) Thobeka buys 1 kg of chips and 400 g of biscuits. What is the ratio of the weight of chips to the weight of biscuits? Write the ratio in its simplest form.

   d) Thobeka asks each of her friends to bring a bag of sweets. If each friend brings a 500 g bag and 20 friends arrive, how many kilograms of sweets will there be in total?

   Solution:

   a) 50 g = 0,05 kg

   b) 1000 g ÷ 50 g = 20 packets

   c) 1000 g chips : 400 g biscuits = 5 : 2.

   d) 20 × 500 g = 10 000 g = 10 kg

4. Thobeka is also planning to make orange juice using orange concentrate and water. According to the concentrate bottle, she needs to mix 1 part concentrate with 10 parts water.

   a) What is the ratio of juice to water that Thobeka needs to mix?

   b) If she uses 300 ml of concentrate, how much water must she add to dilute it? (in ml)

   c) How much juice will she have in total (concentrate + water), in litres?

   d) If each paper cup at the party can hold 200 ml, how many cups of juice will Thobeka be able to fill completely?

e) If Thobeka mixes 400 ml of concentrate, and 4 ℓ of water, so that the total volume of juice is 4,4 ℓ of juice, what percentage of the juice is concentrate?

Solution:

a) 1:10

b) 3000 ml

c) 3300 ml

d) 3300÷ 200 = 16,5. So she will be able to fill 16 cups.

e) $\frac{\text{400 ml concentrate}}{\text{4400 ml mixture}} = 0{,}09.\ 0{,}09 \times 100 = 9\%.$

5. In addition to chips, biscuits and sweets Thobeka also wants to bake a cake.

a) According to the recipe she has, Thobeka needs 4 cups of flour for one cake. If she wants to bake 3 cakes, how much flour does she need (in ml)? (1 cup = 250 ml)

b) The recipe also calls for 25 ml of milk. How much milk does Thobeka need, in tablespoons and teaspoons? (1 tbsp = 15 ml and 1 tsp = 5 ml)

c) Before each cake goes into the oven, Thobeka measures the amount of wet cake mixture to be 4 litres. How many cups of cake mixture is this if 1 cup = 250 ml?

Solution:

a) 12 cups = 3000 ml

b) 1 tbsp and 2 tsp

c) 4000 ml ÷ 250 ml = 8 cups of cake mixture

6. On the invitations, Thobeka tells her friends to arrive at 2:00 p.m.

a) She thinks she needs at least 1 hour and 20 minutes to set up the tables, chairs, food and drink. What time should she start setting up to be ready for guests?

b) Thobeka needs to bake her cakes before she sets up. If the cakes will take 2 hours and 15 minutes (in total) to make, what time should she start baking? Write your answer in the 24-hour format.

Solution:

a) 12:40 p.m.

b) 10:25

7. Thobeka has asked her friends to bring music on CD's. She has 3 albums she wants to play that are 45 minutes, 50 minutes and 67 minutes long. If she plays her 3 albums back-to-back, how long will the music play for? Give your answer in hours and minutes.

Solution:

45 + 50 + 67 minutes = 162 minutes = 2 hours, 42 minutes

8. Thobeka decides she needs to be organised in her party planning and wants to make a timetable, to carefully plan her day and make sure she gets everything ready in time. She has some free time the night before the party and time in the morning, on the day of the party.

   She draws up the following list and estimates how long everything will take:

   - Sweep floors (1 hour, 15 mins)
   - Set up table and chairs (15 minutes)
   - Make party packs (1 hour 40 minutes)
   - Bake cakes (45 minutes to prepare, 1 hour 30 minutes to bake in oven)
   - Get dressed (10 minutes)
   - Wash dishes (20 minutes)

   She also really wants to watch a movie on TV the night before the party, that starts at 8:30 p.m. Bearing this in mind, and the fact that she needs 8 hours of sleep, draw up a timetable for Thobeka that includes all the things she has to do. Remember, some things she may be able to do at the same time - for example, do the dishes while the cakes are baking in the oven. Also, some things should be done before others (there is little point sweeping the floor before she bakes the cakes, because she may spill flour, for example!)

   Solution:

   Learner-dependent answer.

9. Thobeka has made the calendar below for the month of September. Answer the questions that follow:

Sept 2013

SUN	MON	TUES	WED	THURS	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12 My birthday!	13	14
15	16	17 Maths Lit exam	18	19	20 End of term!	21 School holidays start!
22	23 Leave for Durban	24 Heritage Day Durban	25 Durban	26 Durban	27 Back from Durban	28
29	30					

   a) i. Given that Thobeka wants her party to be an end of term celebration, what would be the best date to have it? (Remember, she wants the party to be on a Saturday).

ii. How many days after Thobeka's birthday would this be?
iii. How many days after her Maths Lit exam would it be?

b) If she changed her mind and decided she wanted the party to rather be a birthday celebration, when should she have it? (Remember, she wants to have it on a Saturday afternoon).

c) Thobeka decides to study 2 hours every day for her Maths Lit exam, and wants to study for a total of 9 hours for the exam.

   i. How many days before the exam should she start her studies?
   ii. How many minutes in total is she planning to study?

d) Is Thobeka likely to be directly affected by the public holiday on the 24th September? Explain your answer.

e) Thobeka is going to Durban for part of her school holidays.

   i. For how many days will she be away from home?
   ii. For how many hours will she be away from home?

f) Thobeka lives in the Northern Cape and decides to take the train to Durban. The journey will take 37 hours in total.

   i. How long will the train trip take in days and hours?
   ii. If Thobeka is planning to leave for Durban at 08:00 on Monday 23 September, on what date and at what time will she get to Durban?

Solution:

a) i. Saturday 21 September.
   ii. 9 days
   iii. 4 days

b) Saturday 14 September.

c) i. 9 hours ÷ 2 = 4,5 days. She should start studying 5 days before the exam.
   ii. 9 hours = 540 minutes.

d) No - she will be on holiday.

e) i. 5 days
   ii. 120 hours (depending on what time she leaves and comes back!)

f) i. 1 day and 13 hours
   ii. Tuesday 24 September at 21:00.

CHAPTER 4

Financial documents and tariff systems

4.2 Financial documents

Household bills

Activity 4 – 1: Understanding a municipal bill

Mr Mukondwa receives the following municipal bill. Study the document and answer the questions that follow.

MATJHABENG LOCAL MUNICIPALITY
708 WELKOM 9460
(See 16. Overleaf)

PERSONAL DETAILS

Dr / Rev. / Mr / Ms	MUKONDWA, T.A.
ADDRESS	22 PANORAMA DRIVE
	JIM FOUCHE PARK WELKOM
DEPOSIT	250.00

ACCOUNT NUMBER	10281851
DATE OF STATEMENT	28/06/2012
VALUATION VALUE	700000

SERVICE	DATE	OPENING BALANCE	PAYMENT	THIS MONTH	VAT	INTEREST	ADJUSTMENT	CLOSING BALANCE
	28/06	3512.62	-7463.33	1141.55	645.00	0.00	3465.53	1301.37
	28/06	1386.65	-3280.11	282.63	271.56	0.00	1661.47	322.20
	04/06	124.31	-222.16	53.34	19.44	0.00	85.88	60.81
	04/06	277.83	-497.34	79.47	37.86	0.00	192.78	90.60
rates	28/06	878.39	-1570.96	429.66	0.00	0.00	692.57	429.66
CC	04/06	599.20	-848.66	0.00	30.65	0.00	218.81	0.00
BE	04/06	382.90	-563.57	0.00	20.98	0.00	159.69	0.00
EX	00/00	0.00	-7559.43	0.00	0.00	0.00	0.00	-7559.43
REVEST	28/06	0.00	0.00	-944.70	-132.26	0.00	0.00	-1076.96
B/ELEC	28/06	0.00	0.00	110.51	15.47	0.00	0.00	125.98
TOTALS		7161.90	-22005.56	1152.46	908.70	0.00	6476.73	AMOUNT DUE
								-6305.77

Printed & Mailed by CAB Holdings

VAT REGISTRATION No. 4670194952

TAX INVOICE

ARRANGED	HANDED OVER	90 DAYS	60 DAYS	30 DAYS	CURRENT
0.00	0.00	0.00	0.00	0.00	-6305.77

TARIFF

WATER		ELECTRICITY
0.00 - 6.00 KL	8.9900	0.8500 R/KWH
6.00 - 50.00 KL	10.8900	
50.00+ KL	14.4200	

MESSAGE

WATER METER READINGS

PREVIOUS	PRESENT	CONSUMPTION
05/02 2387.00	05/31 2414.00	27.00
CNCN996		

ELECTRICITY METER READINGS

PREVIOUS	PRESENT	CONSUMPTION
03/28 47201.00	05/24 48544.00	1343.00
19448		

PROPERTY INFORMATION

ERF No.	00006773	WARD	
STREET ADDRESS	22 PANORAMA DRIVE		
SUBURB	WELKOM - JIM FOUCHEPARK		
PORTION	0000000000000	AREA	
UNIT	001010000067730000000000000		

DISCONNECTION

The supply of services may be discontinued without further notice if any amount is unpaid after the due date and the deposit may be reviewed simultaneously. Please note that the due date does not apply to any overdue balances.

Matjhabeng Municipality has Blue Drop Status – view your drinking water quality at www.dwa.gov.za/bluedrop under "My Water"

Kindly tear off and return with payment

EasyPay REMITTANCE ADVICE

>>>>>> 9 1911 0000 1028 1851 2

DUE DATE	12/07/2012
AMOUNT DUE	-6305.77
REF NO.	10281851

DIRECT DEPOSIT / ATM / INTERNET BANKING
FOR YOUR CONVENIENCE THIS ACCOUNT MAY BE PAID AT ANY BRANCH OF ABSA BANK
BRANCH NO: 632 005
A/C No: 4053 705 465
CHEQUE PAYMENTS: PLEASE ENSURE YOUR ACCOUNT No IS REFLECTED ON THE BACK OF YOUR CHEQUE

REF NO. 10281851

1. a) Name three kinds of services included in this invoice.

b) Which service used costs the most on this invoice?
c) Name two different ways in which this invoice can be paid.
d) When is payment for this invoice due?
e) What may happen if the invoice is not paid on time?

Solution:

a) Electricity, water, refuse sewerage, municipal rates
b) electricity
c) EasyPay, direct deposit, ATM, Internet banking
d) 12/07/2012
e) The services may be disconnected.

2. a) What is the total amount due?
b) Why is this a negative number?
c) Is there any amount brought forward from the last invoice?

Solution:

a) $-$R 6305,77
b) Because Mr Mukondwa has already paid more money into the account (credit) than he owed, so he is R 6305,77 in credit.
c) No. There are no outstanding amounts listed for the previous 30, 60 or90 days.

3. Water consumption is typically measured in kilolitres (kl).

a) What is the consumption level of water on this invoice?
b) How much is this in litres?

Solution:

a) 27 kl.
b) 27 000 ℓ.

4. Mr Mukondwa thinks that the closing balance for his electricity consumption is much higher than normal.

a) What does this suggest?
b) How many units of electricity were consumed in the previous month?
c) Can Mr Mukondwa verify this in any way? Explain your answer.
d) What should Mr Mukondwa do if he thinks the latest meter reading for his electricity is incorrect?

Solution:

a) Either he used much more electricity than usual, or there was a mistake with his electricity meter reading.
b) 1343,00 kWh
c) Yes. He can check the meter himself and see if the reading corresponds to the reading the municipality took.
d) He should call the municipality and query the bill.

Activity 4 – 2: Understanding a phone bill

Oliver receives the following cell phone bill:

c1COM / 204 / 01 / 0020905 / 041809

vodacom

L9243867-2
OLIVER MICHAELS
407 MONTFRERE
1 CLAIR STREET
WESTDENE
BLOEMFONTEIN
6523

Tax invoice

Account number: L9243867-2
Date: 03/07/2012
Your VAT registration number:

All data Contract customers on any data bundle will qualify for additional data to be used between midnight and 5am, e.g. if you have a MyMeg 250, you will get another 250MB of Night Owl. This offer excludes Top Up and Prepaid customers. T&Cs apply.

Account summary:

Date	Description	Item number	Reference	Amount	Total
04/06/2012	Balance Brought Forward			99.00	99.00
02/07/2012	Payment	SCZ1399863	159019863	-99.00	0.00
03/07/2012	Invoice	B227108838	726371238	99.00	99.00

Invoice summary:

Cellular number: 0731456720
Invoice number: B227108838
Due date: 31/07/2012

Description		Amount	VAT	Total
Subscription Services				
Data Promotion - Top Up MyGig1	July	86.84	12.16	99.00
HSDPA Voice Tariff	July	0.00	0.00	0.00
VAS - Balance Notification	July	5.70	0.80	6.50
VAS- Free Balance Notification	July	-5.70	-0.80	-6.50
Total Subscription Services		**86.84**	**12.16**	**99.00**
Subtotal		**86.84**	**12.16**	**99.00**
This invoice amount		**86.84**	**12.16**	**99.00**

>>> 9 2060 1903 149 721 9

Invoice Total **99.00**

Page 1 of 1

Your bank account will be debited with the full outstanding balance as reflected on this statement on the 1 August 2012

Vodacom (Pty) Ltd. Registered office. P O Box 3306 Cramerview 2060. Company Registration No. 1993/003367/07. V.A.T Registration No. 401013921

1. What is the balance brought forward from the previous invoice?

Solution:

R 99,00

2. On what date was the payment of this balance made?

   Solution:

   02/07/2012

3. When is the payment for the current outstanding amount due?

   Solution:

   31/07/2012

4. What subscription service does Oliver get for free?

   Solution:

   HSDPA Voice Tariff

5. What subscription does Oliver get a full refund for?

   Solution:

   VAS Balance Notification

6. What is the billing period for this invoice?

   Solution:

   The month of July 2012

7. Oliver wants to query the last payment he made. List four things he could use as a reference number.

   Solution:

   His cellphone number, his account number, the invoice number and the payment reference number.

8. Oliver wants to check that the VAT calculated on the total amount due is correct. Show how he can do this. Show all your calculations.

   Solution:

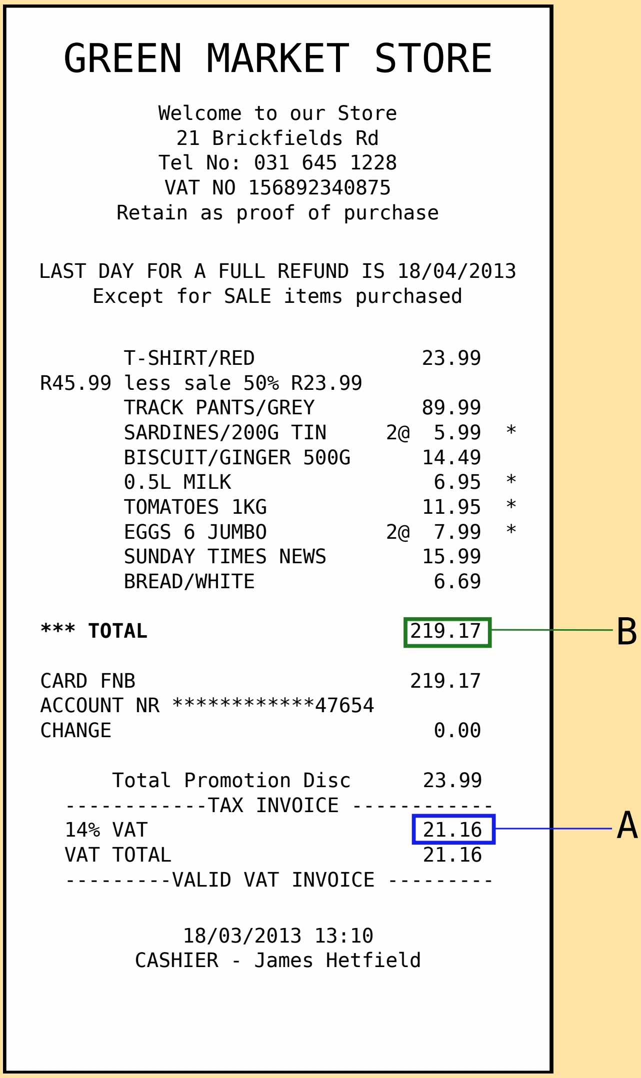
   Total without VAT $=$ R 86,84. 14% of this $= 86{,}84 \times \frac{14}{100} = 12{,}1576 \approx$ R 12,16.

Shopping documents

Activity 4 – 3: Understanding till slips

Sakhile goes to his local department store and buys some clothes and groceries.

He receives the following till slip. Study the slip and answer the questions that follow:



GREEN MARKET STORE

Welcome to our Store
21 Brickfields Rd
Tel No: 031 645 1228
VAT NO 156892340875
Retain as proof of purchase

LAST DAY FOR A FULL REFUND IS 18/04/2013
Except for SALE items purchased

T-SHIRT/RED		23.99	
R45.99 less sale 50% R23.99			
TRACK PANTS/GREY		89.99	
SARDINES/200G TIN	2@	5.99	*
BISCUIT/GINGER 500G		14.49	
0.5L MILK		6.95	*
TOMATOES 1KG		11.95	*
EGGS 6 JUMBO	2@	7.99	*
SUNDAY TIMES NEWS		15.99	
BREAD/WHITE		6.69	

***** TOTAL** 219.17 — B

CARD FNB 219.17
ACCOUNT NR ************47654
CHANGE 0.00

Total Promotion Disc 23.99
------------TAX INVOICE ------------
14% VAT 21.16 — A
VAT TOTAL 21.16
---------VALID VAT INVOICE ---------

18/03/2013 13:10
CASHIER - James Hetfield

1. What item did Sakhile buy on sale, and how much was the discount?

   Solution:

   A red T-shirt, 50% discount

2. Can Sakhile return the sale item for refund? Explain your answer.

   Solution:

   No, full refunds are only available for non-sale items.

3. Sakhile finds a hole in the tracksuit pants that he bought.

   a) Can he return them for a refund?
   b) If so, by what date must he return them?

   Solution:

   a) Yes - they were not sale items
   b) Before or on 18 April 2013

4. How many eggs did Sakhile buy?

   Solution:

   2 packs of 6, so 12 eggs.

5. Calculate the total value of the VAT exempt items Sakhile bought.

   Solution:

   2(R 5,99) + R 6,95 + 11,95 + 2(R 7,99) = R 46,86

6. Demonstrate how the amount indicated by Letter A was calculated. Show all your calculations.

   Solution:

   VAT incl items total R 151,15. 14% VAT of this = R 21,16

7. Demonstrate how the amount indicated by Letter B was calculated. Show all your calculations.

   Solution:

   VAT incl items total R 151,15. 14% VAT on this = R 21,16. Non-VAT items total R 46,86. VAT incl + 14% + VAT excl = R 219,17.

Activity 4 – 4: Understanding shop accounts

Jane receives the following account statement from Woolworths. Answer the questions that follow.

WOOLWORTHS FINANCIAL SERVICES

JANE@GMAIL.CO.ZA

STATEMENT DATE	12 SEP 2013
PAYMENT DUE DATE	07 OCT 2013
ACCOUNT NUMBER	5708 8501 **** ****
INSTALMENT FREQUENCY	Monthly

Woolworths Financial Services PO Box 5553 Cape Town 8000
21 Howe Street, Observatory, Cape Town, 7925
Telephone 0861 50 20 20 Fax 0861 99 91 94
Woolworths Financial Services (Pty) Ltd Reg no 2000/009327/07
A registered credit provider NCRCP49 Email: wwfs@woolworths.co.za

STORE CARD STATEMENT

YOUR TRANSACTION DETAILS

Page 1

DATE	STORE	DESCRIPTION	AMOUNT
		OPENING BALANCE	4318.33
13 AUG 2013	NICHOL WAY - JHB	PURCHASE -FOODS,CONDIMENTS DRE	302.03
15 AUG 2013	NICHOL WAY - JHB	PURCHASE -FOODS	171.74
19 AUG 2013	CAPE TOWN AIRPOR	PURCHASE -CUT FLOWERS,FOODS,PL	152.15
22 AUG 2013	NICHOL WAY - JHB	PURCHASE -FOODS	279.67
23 AUG 2013	SUMMIT ROAD	PURCHASE -PURCHASE	55.19
25 AUG 2013	NICHOL WAY - JHB	PAYMENT - THANK YOU	400.00 CR
12 SEP 2013	HEAD OFFICE	INTEREST	70.36
CLOSING BALANCE			**4949.47**

GET PEACE OF MIND BY ADDING BALANCE PROTECTION TO YOUR ACCOUNT. TO FIND OUT MORE CALL 0861 50 20 40.
PLEASE NOTE RATE CHANGE TO 14% ON BALANCES ABOVE R10 000 AND TO 17% ON BALANCES BELOW R10 000 EFFECTIVE 27 JULY 2012.

Minimum Payment	R371.21	**Overdue**		**Credit Available**	R251.00
Payment Due Date	07 OCT 2013	**Credit Limit**	R5200.00	**Closing Balance**	4949.47

Please note: If payment of full balance is not received by payment due date, interest is charged on full balance and on new purchases.

Banking Details:

Bank: ABSA Bank Account Holder: WFS Instore Cards Direct Deposits	Bank Account Number: 4072263822 Branch Code: 632005 Swift Code: ABSAZAJJ	**Beneficiary Reference: Please use your Woolworths account number as it appears on your Woolworths Store Card as the payment reference**

44/0067202
NI T-I/G-01

1. Is there anything unusual about Jane's contact details, when compared to the bills we've worked with thus far?

   Solution:

   Her contact details only list her e-mail address, no physical or postal address.

2. What is the opening balance on Jane's account?

   Solution:

   R 4318,33

3. When last did she make a payment into her account and how much was it for?

   Solution:

   Jane's last payment was for R 400, on 25 August 2013.

4. How many times did Jane shop at Woolworths in the month of August 2013?

   Solution:

   5 times

5. How much did she spend in total on goods from Woolworths in August 2013?

   Solution:

   R 302,03 + R 171,74 + R 152,15 + R 279,67 + R 55,19 = R 960,78

6. Which Woolworths store did she shop at the most often?

   Solution:

   At Nichol Way, JHB

7. Jane lives in Johannesburg. Did she travel at all in the month of August 2013? Explain your answer.

   Solution:

   Yes - on the 19th August she used her card at Cape Town Airport.

8. What is the minimum amount that Jane must pay into her account this month, and when must she pay it by?

   Solution:

   R 371,21 must be paid by 7 October 2013.

9. How much credit does Jane have available?

   Solution:

   R 251,00

10. How much does she owe in total to Woolworths?

    Solution:

    R 4949,47

11. Jane is interested in getting the credit card advertised at the bottom of the account statement. With this new credit card, if she spent R 400 at Woolworths, how much would money would she get back in WVouchers?

Solution:

3% of R 400 = R 400 × $\frac{3}{100}$ = R 400 × 0,03 = R 12,00.

4.3 Tariff systems

Municipal tariffs

Activity 4 – 5: Calculating costs using given municipal tariffs

Domestic electricity in the City of Cape Town is charged for using the tariffs below, for households who use more than 450 kWh of electricity per month. They refer to each category of electricity usage as a block, and the tariffs are charged in **cents** per kilowatt hour (kWh). VAT is included in the tariff costs listed below.

Block number (kWh)	cents per kWh (incl VAT)
Block 1 (0 - 150 kWh)	129,05
Block 2 (150,1 - 350 kWh)	134,65
Block 3 (350,1 - 600 kWh)	134,65
Block 4 (> 600 kWh)	159,81

1. If Jason's household uses 140 kWh of electricity in a month, calculate what his electricity bill will be, in Rands.

   Solution:

   140 × 129,05 c = 18 067 c = R 180,67

2. Thomas uses 200,5 kWh of electricity in a month. What will his electricity costs be in Rands?

   Solution:

   Block 1:140 × 129,05 c = 18 067 c = R 180,67.
   Block 2: 200,5 - 140 = 60,5 kWh.
   60,5 × 134,65 c = 8146,325 c = R 81,46325.
   R 180,67 + R 81,4572 = R 262,13325 ≈ R 262,13

3. The City of Cape Town decides to introduce a fixed additional tariff for anyone who uses more than 350 kWh of electricity. This fixed cost is R 24,45 per month. (I.e. the cost is R 24,45 plus the price per units used). If Neil uses 423 kWh of electricity in a month, calculate what his total electricity cost will be.

   Solution:

   Basic cost: R 24,45.
   Block 1:140 × 129,05 c = 18 067 c = R 180,67.
   Block 2: 350 - 150,1 = 199,99 kWh.
   199,99 × 134,65 c = 26 928,6535 c = R 269,286535.
   Block 3: 423 kWh - 350,1 kWh = 72,9 kWh.

$72{,}9 \times 134{,}65\text{ c} = 9815{,}985\text{ c} = \text{R }98{,}15985$.
$\text{R }24{,}45 + \text{R }180{,}67 + \text{R }269{,}286535 + \text{R }98{,}15985 = \text{R }572{,}566385 \approx$
R 572,57.

Telephone tariffs

Activity 4 – 6: Interpreting and comparing graphs of a tariff system

A local cellular provider charges the following for a standard contract:

- Monthly subscription: R 100
- Mandatory itemised billing: R 22

This monthly contract includes R 140 worth of airtime and R 40 worth of free, local SMS's.

Calls and SMS's are charged for using the tariffs given below. This service provider uses per second billing, so the tariff is Rands per 60 seconds of call time, even if those 60 seconds are split over two or more calls. Assume that these tariffs, or rates, and the monthly subscription are VAT inclusive. (An SMS is a text message, and an MMS is a text and data message, that may include a photo, for example).

Rate per minute for the first 5 minutes of the day	R 1,95
Rate per minute (60 seconds) thereafter	R 1,55
Calls to same network	R 0,99 per 60 seconds
International SMS	R 1,20 per SMS
SMS	R 0,60 per SMS
MMS	R 0,75 per MMS

1. Alfred has a contract like the one above. Assuming he does not use more than R 140 airtime in a month and R 40 worth of SMS's, what will his monthly cell phone bill cost?

   Solution:

   Monthly subscription + itemised billing = R 122

2. On the first day of the month, the first call Alfred makes is to his father (on a different network) and they talk for 2 minutes. How much will this call cost Alfred?

   Solution:

   $\text{R }1{,}95 \times 2 = \text{R }3{,}90$

3. On the same day, Alfred then calls his friend, Ivan. They talk for 4 minutes. How much will this second call cost him?

Solution:

After the first call, Alfred has used 2 of the first 5 minutes of calls. The next call will cost (3 × R 1,95) + (1 × R 1,55) = R 7,40

4. Later that afternoon, Alfred checks his phone and sees he has made 9 minutes, 25 seconds worth of calls.

   a) How many seconds is this?

   b) If he now calls his friend Azra, who is on the same network, and they talk for 360 seconds, how much will the call cost him?

   Solution:

   a) 9 minutes 25 seconds = (9 × 60 seconds) + 25 seconds = 565 seconds

   b) 360 seconds = 6 × 60 seconds. Calls to the same network are R 0,99 per 60 seconds so it will cost R 0,99 × 6 = R 5,94

5. Two weeks later, Alfred has made R 70,45 worth of calls, sent 25 local SMS's, 5 international SMS's and 2 MMS's. Calculate how much airtime he has left.

   Solution:

   Alfred starts with R 140 worth of airtime. We know he has spent R 70,45 on calls. The local sms's are covered by his monthly contract so we do not deduct them from his airtime (he will have 15 free local sms's left.) The 5 international sms's cost 5 × R 1,20 = R 6,00 and the 2 MMS's cost 2 × R 0,75 =R 1,50. Now we deduct all these costs from the initial amount or R 140: R 140 - R 70,45 - R 6,00 - R 1,50 = R 62,05. He has R 62,05 airtime left.

6. Alfred wants to buy an SMS bundle that he thinks is a good deal. With this bundle, he will get 125 SMS's for an extra R 78,75 per month (over and above the 40 free SMS's he already gets).

   a) How much will each of the 125 SMS's in the new bundle cost him?

   b) Is this a better deal than what he currently pays for his non-free SMS's?

   Solution:

   a) R 0,63

   b) No. SMS's currently cost him only R 0,60, so the bundled SMS's are more expensive.

7. Alfred calls his sister for a big chat, and accidentally uses all of his R 140 airtime in one day (assume this happened at the beginning of the month and he did not send any SMS's). If she is on a different network, how long did they talk for? Round your answer to the nearest minute, and write it in hours and minutes.

   Solution:

   The first 5 minutes cost: R 1,95 × 5 = R 9,75. This leaves him with R 140 - R 9,75 = R 130,25 airtime. The remaining minutes will cost R 1,55 each. R 130,25 ÷ R 1,55 = 84 minutes = 1 hour and 24 minutes.

Activity 4 – 7: Working with transport tariffs

Metrorail in Gauteng charges the following tariffs for Metro (Standard) Class tickets for different zones:

Zone	Single	Return	Weekly	Monthly
1 - 19 km	4,00	7,50	22,00	81,50
20 - 29 km	5,00	9,50	27,50	97,00
30 - 39 km	6,00	11,50	32,50	112,00
40 - 49 km	7,50	14,50	34,00	123,00
$>$ 50 km	9,50	18,50	38,50	140,00

1. Chuma travels 15 km on the train every day to school and back again. She buys a single ticket for every trip that she makes.

    a) how many trips will Chuma make (to school and back) in one month (4 weeks)?

    b) How much will this cost her, if she buys single tickets?

    c) How much cheaper will a monthly ticket be?

    d) If she buys a monthly ticket for R 81,50, how much will each trip cost her?

    e) How much cheaper than a single ticket is this?

    Solution:

    a) 2 trips per day $\times$ 5 school days per week $\times$ 4 weeks = 40 trips per month

    b) 40 $\times$ R 4,00 = R 160,00

    c) R 160,00 - R 81,50 = R 78,50 cheaper.

    d) R 81,50 $\div$ 40 trips = R 2,04.

    e) R 4,00 - R 2,04 = R 1,96 cheaper.

2. Lindiwe has a monthly ticket and travels a distance of 35 km, return, every day.

    a) How much does her monthly ticket cost her?

    b) Lindiwe's friend tells her that it's possible to get a 20% discount if you're a scholar, wearing your school uniform. What would her monthly ticket cost with a 20% discount?

    Solution:

    a) R 112,00

    b) R 112,00 $\times$ 0,20 = R 22,40. R 112,00 - R 22,40 = R 89,60

4.4 End of chapter activity

Activity 4 – 8: End of chapter activity

1. Simon gets the following municipal bill for his property rates and refuse removal.

13905

Joburg

a world class African city

TAX INVOICE

(011) 375-5555
(011) 358-3408/9

PO Box 5000
Johannesburg, 2000

joburgconnect@joburg.org.za

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TAX INVOICE

VAT NO.: CITY OF JOHANNESBURG: 4760117194
VAT NO.: JOHANNESBURG WATER 4270191077
VAT NO.: PIKITUP: 4790191292
VAT NO.: CITY POWER 4710191182

MOLESHE, SB
PO BOX 46216
JOHANNESBURG
2019

Date	2013/06/26
Statement for	June 2013
Physical Address	128 MYRTLE ROAD
Stand No./Portion	00001321 - 00000
Township	FOURWAYS EXT.1

Stand Size	Number of Dwellings	Date of Valuation	Municipal Valuation
920 m2	1	2008/07/01	Market Value R 2,920,000.00

Invoice Number: 34000962412
Client VAT Number:
Deposit: R 0.00

Account Number: 209395735 (Pin code: 016759)

Previous Account Balance	1,172.33
Less: Incoming Payment (Last Payment Made 2013/06/25)	- 3,700.00
Sub Total	- 2,527.67
Current Charges(see reverse for detail)	1,646.76

90 DAYS +	60 DAYS	30 DAYS	CURRENT	INSTALMENT PLAN	TOTAL AMOUNT OUTSTANDING
0.00	0.00	0.00	-880.91	0.00	-880.91

TOTAL DUE	R - 881.00
DUE DATE	2013/06/26

Introducing our new contact number: 0860 Joburg. Your City, Your Number - Starts 1 June 2013.

Remittance Advice:

This stub must accompany payment, please do not detach if paying at the post office

Date: 2013/06/26 MOLESHE SB
Acc No.: 209395735 128 MYRTLE ROAD

EasyPay >>>>>>> 91115 2023957398

Post Office 0146 202395739

ABSA

City of Johannesburg Bank Acc. No 405 439 8463
Branch Code 632005
Client Account No/Deposit Reference 202395739

516008800111159 20239573906

Total Due	R - 881.00
Due Date	2013/06/26

13905

Account Number: 209395735			Page 2 of 2
Property Rates	**VAT No.: 4760117194**	**Subtotal**	**Total Amount**
Category of Property: RESIDENTIAL: A The property rates are based on the market values of the property and are calculated as follows: R 2,920,000.00 X R 0.0052580 / 12 (Billing Period 2013/06) Less rates on first R150 000.00 of market value VAT: 0 %		1,279.45 - 65.73 0.00	1,213.72
Refuse	**VAT No.: 4790191292**	**Subtotal**	**Total Amount**
Domestic refuse charges are based on the value of the property. Institutions and commercial charges are based on a per service charge. Refuse removal: 1-bin @ R 189.93 (Billing Period 2013/06) VAT: 14.00%		379.86 53.18	433.04
Current Charges			1,646.76

a) What city does he live in?

b) When last did he make a payment into this account, and how much was this payment for?

c) How much was the balance brought forward from his previous account?

d) How much is he being charged for property rates and refuse for the current billing period?

e) Why is the total due a negative amount?

f) What does Simon pay for property rates per year?

g) Does he get any deductions on his annual property rates?

h) Does he pay VAT on his property rates?

i) Show how the municipality calculated the R 53,18 VAT on his refuse subtotal.

Solution:

a) Johannesburg

b) He paid R 3700,00 on 2013/06/25

c) R 1172,33

d) R 1646,76

e) Because Simon has paid more money into his account than is due - he is in credit.

f) R 1279,45 $\times$ 12 = R 15 353,40, or R 2 920 000 $\times$ R 0,052580 = R 15 353,40.

g) Yes. He gets a R 65,73 deduction.

h) No. The VAT is listed at 0%.

i) R 379,86 $\times$ 0,14 = R 53,18

2. Lucia receives the following account for her phone line with Neotel:

Neotel

Computer Generated

Statement

Ms Lucia Molepo
39 Ash Street
Obesrvatory, Johannesburg, Gauteng

2192

Invoice number:	S001998985
Account number:	R001365923
Invoice date:	01-10-2013
Payment due date:	23-10-2013
Bill period:	SEPTEMBER 2013
Current balance:	R 690.99
VAT REG NO.:	NOT AVAILABLE
Payment terms:	21 days

Account no.: R001365923

Date	Transaction	Amount	Effective balance due
01-09-2013	Opening balance	R 771.18	R 771.18
26-09-2013	Payment Allocated Payment Allocated	R 771.18	R 0.00
	Invoice - TI0218010078_R000000490533	R 690.99	R 690.99

Current	30 Days Overdue	60 Days Overdue	90 Days Overdue	120 Days Overdue
R 690.99	R 0.00	R 0.00	R 0.00	R 0.00

Banking details are on the last page

TOTAL DUE: R 690.99

Neotel (Pty) Ltd **Customer Care Number** 0800 333 636 **Reg No.** 2004/004619/07
NeoVate Park 44 Old Pretoria Road Midrand 2191 Gauteng South Africa
Tel 0800 333 636 **Fax** 086 637 7523 **Email** consumers@neotel.co.za **Web** www.neotel.co.za **V.A.T. registration no.** 48 00 22 44 55

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Please Note: When you hear three beeps after dialing a number it means that the number has been ported to another fixed line telecommunications operator. Such a call may be charged at a different rate from calls that stay on the Neotel network.

Neotel Payment Options	
For your convenience, all accounts are subject to paying via debit order Should your debit order payment be unsuccessful, you must make a payment with either options below **Option 1:** Cash deposit into our bank account: **Account name:** Neotel (Pty) Ltd - Consumer **Bank:** Nedbank **Account number:** 1454 088 567 **Branch number:** 1454 05 **Branch name:** Corporate Client Services Quote your reference number which is your Neotel account number.	**Option 2:** You can pay by Electronic Fund Transfer (EFT). Quote your reference number which is your Neotel account number. **For cash and EFT payments please note:** Your payment will reflect on your Neotel account within 7 working days from receipt of payment.

Standard terms and conditions apply to all contracts. Full details of these terms and conditions can be found at http://www.neotel.co.za .

a) What is the billing period for this invoice?

b) How many days does Lucia have to pay this bill?

c) Do the numbers listed under "Effective balance due" include VAT? explain your answer.

d) When last did she make a payment to Neotel and how much was it for?

e) Does Lucia have any overdue payments?

f) List two ways in which she can pay her account?

g) List four ways in which Lucia can contact Neotel if she wants to query this invoice.

h) The Neotel invoice does not show how much VAT was added to Lucia's bill. If the total before VAT was R 606,13, calculate how much VAT was added to get the total due. Show your calculations.

Solution:

a) September 2013

b) 21 days

c) Yes, they are VAT inclusive. Neotel must charge VAT on the cost of their services, and there is nothing in the invoice to indicate that VAT has not yet been added to the totals due.

d) She paid R 771,18 on 26 September 2013

e) No - her payments are up to date.

f) She can make a cash deposit at Nedbank or she can pay via Electronic Fund Transfer (EFT)

g) She can call their customer care number, she can send a fax to them, she can e-mail them or she can use their website.

h) R 606,13 $\times$ 0,14 = R 84,86 VAT.

3. Alison receives the following till slip from The General Store in Upington:

THE GENERAL STORE

228 Main Rd
Upington
Tel No: 055 683 1228
VAT NO 1345789075

21-02-2013 10:15
CASHIER - Leroy Jenkins

BREAD/BROWN		6.99 *
FRUIT JUICE/1 L APPLE		11.45
SAMP 500G		10.39 *
BAKED BEANS 250G TINS	2 @	6.50
FROZEN HAKE 300G		35.00
POWDER MILK/200G	5 @	3.45 *
ORANGES 1 KG		11.99 *
TOILET PAPER 2-PLY/9 ROLLS		43.99
POTATOES 500G		19.99 *

TOTAL	184.53
	-0.03
CASH	200.00
CHANGE	15.50

------------TAX INVOICE ------------

14% VAT	14.48
VAT TOTAL	14.48

---------VALID VAT INVOICE ---------

a) How did Alison pay for her shopping?

b) Calculate the total cost of VAT exempt items on the till slip.

c) Calculate the total cost of items that are subject VAT.

d) Calculate how much VAT is added to the VAT-inclusive items.

e) Show how the above three amounts make up the total due.

f) Alison paid with cash, and received R 15,50 change. This means she paid R 184,50 for her shopping. Explain why this amount is different to the Total of R 184,53.

g) How much will 1 kg of potatoes cost at The General Store?

h) If the store advertised a 20% discount on potatoes, how much will one kg of potatoes cost?

Solution:

a) With cash.

b) R 66,61

c) R 103,44

d) R 103,44 $\times$ 0,14 $=$ R 14,48

e) Total $=$ R 66,61 $+$ R 103,44 $+$ R 14,48 $=$ R 184,53

f) The total is rounded down to the nearest multiple of 5, to accommodate for the fact that we no longer have 1c or 2c coins in South Africa.

g) 500 g costs R 19,99, therefore 1 kg costs R 19,99 × 2 = R 39,98

h) R 39,98 × 0,20 = 7,996. R 39,98 - R 7,996 = R 31,98.

4. Michael receives the following invoice from Ivy Supermarket, where he has a store account:

IVY SUPERMARKET

MR MICHAEL BHEMBE
84 12TH ST
POLOKWANE
015 564 3949

STATEMENT DATE 5 MAY 2013
PAYMENT DUE 31 MAY 2013
ACCOUNT NUMBER 1456 9523 ****
BILLING PERIOD APRIL 2013

TAX INVOICE

DATE	DESCRIPTION	AMOUNT	BALANCE
4 APR 2013	**OPENING BALANCE**	R623.95	**R623.95**
5 APR 2013	PURCHASE - FOOD	R341.45	R965.40
8 APR 2013	PAYMENT - THANK YOU	-623.95	R341.45
12 APR 2013	PURCHASE - FOOD/CLOTHES	R245.50	R586.90
25 APR 2013	PURCHASE - FOOD	R184.49	R771.39

TOTAL EXCL VAT: R676.66
14% VAT: R94.73
TOTAL DUE: R771.39

Current	30 Days Overdue	60 Days Overdue	90 days Overdue
R771.39	R0.00	R0.00	R0.00

PAYMENT VIA ELECTRONIC FUNDS TRANSFER (EFT) OR CASH DEPOSIT

BANKING DETAILS
Account name: Ivy Supermarket. **Bank**: Standard Bank.
Account number: 1456 9234 0654. **Branch number**: 456 987

Ivy Supermarket. Tel: 015 734 9345. Shop 42 Riverside Mall. 342 Main Street, Polkiwane.
Reg No. 2006/0654345/08. VAT Registration No: 34 96 12 69 88

a) In what city does Michael live?

b) How many times did Michael shop at Ivy Supermarket in April 2013?

c) How much money did he owe from his previous invoice?

d) When last did he pay money into his account, and how much did he pay?

e) Name two ways in which Michael can pay his account.

f) If Michael receives his invoice in the post on 10 May 2013, how many **weeks** does he have to pay his bill?

g) Show how the R 94,73 VAT is calculated.

h) If Michael can only afford to pay R 350 into his account this month, what will his opening balance for June 2013 be?

i) Do you think Michael is responsible about paying his account on time? Explain your answer.

Solution:

a) Polokwane.

b) 3 times.

c) R 623,95

d) He paid R 623,95 into his account on 8 April 2013.

e) He can pay via EFT or cash deposit.

f) The payment is due on 31 May, so he has 21 days to pay his account. 21 days is 3 weeks.

g) R 676,66 $\times$ 0,14 = R 94,73.

h) R 771,39 - R 350 = R 421,39.

i) Yes - he has no overdue payments from previous invoices.

5. Buffalo City Metro gives the following tariffs for electricity for schools and sports fields in the East London area:

Energy Charge	**Total Rands Excl. VAT**	**VAT Rands 14%**	**Total Rands VAT Incl.**
First 2000 kWh	1,24566	0,17439	1,4200
Next 8000 kWh	0,92405	0,12937	1,0534
Above 10 000 kWh	1,29982	0,18198	1,4818
Minimum charge per month, or part thereof	164,32824	23,00595	187,3342

a) Buffalo High School uses 9000 kWh of electricity in one month.

   i. How much will their electricity cost, before VAT is added?

   ii. Calculate what the 14% VAT on the school's electricity bill will be.

   iii. Calculate the total the school will pay for electricity in a month, including VAT.

b) Eastwood Primary School closes for the month of December, and uses no electricity during this period. What will the school's electricity bill be, including VAT?

c) Windyvale High School has a large campus and sports fields, and on average uses 11 000 kWh of electricity per month.

   i. Calculate how much the school's electricity bill will be (including VAT).

   ii. List at least three things that the school do to reduce its electricity consumption.

Solution:

a) i. 2000 kWh × R 1,24566 = R 2491,32. 9000 kWh - 2000 kWh = 7000 kWh. 7000 kWh × R 0,92405 = R 6468,35. R 2491,32 + R 6468,35 = R 8959,67

ii. R 8959,67 × 0,14 = R 1254,35

iii. R 8959,67 + R 1254,35 = R 10 214,02

b) There is a minimum charge of R 187,3342.

c) i. First 2000 kWh: 2000 × R 1,4200 = R 2840,00. Next 8000 kWh: 8000kWh × R 1,0534 = R 8427,20. Last 1 kWh (over 10 000 kWh) = 1000 kWh × R 1,4818 = R 1481,80. Total = R 2840,00 + R 8427,20 +R 1481,80 = R 12 749,00

ii. The school could turn off lights when they aren't being used (e,g, at night). They could install solar panels. They could turn off the geysers at night, or install solar panel geysers to save electricity.

6. Neotel lists the following call tariffs for calls (per minute) from a Neotel phone to landlines (the prices below include VAT):

	Neotel to landline	**Neotel to Neotel**
Local - peak	R 0,34	R 0,17
Local - off peak	R 0,17	R 0,17
Regional - peak	R 0,46	R 0,34
Regional - off peak	R 0,29	R 0,34
National - peak	R 0,57	R 0,43
National - off peak	R 0,33	R 0,43
After hours calling (daily between 18h00 - 07h00, plus all day on weekends and public holidays)	-	Free

a) Wendy calls her friend Karabo, who lives nearby, from her Neotel landline, on a Wednesday afternoon. They talk for 540 seconds.

i. How much will the call cost if Karabo is with another phone provider?

ii. How much will the call cost if Karabo is also with Neotel?

b) Neo's mother lives in the Transkei. His mother has a Neotel phone line.

i. Neo lives in Johannesburg and has a non-Neotel phone line. If his mother calls him from the Transkei on a Saturday, what will the call cost her per minute?

ii. Will the call be cheaper the call be if Neo had a Neotel phone line that his mother could call him on?

iii. How much would a 420 second call cost, (from Johannesburg to the Tranksei, from a Neotel line to a Neotel line) if Neo called his mother at 20h30 on a Monday night?

Solution:

a) i. 540 seconds = 9 minutes. 9 × R 0,34 = R 3,06

ii. 540 seconds = 9 minutes. 9 × R 0,17 = R 1,53

b) i. National, off peak per minute rate, to a non-Neotel line is R 0,33.

ii. Yes. After hours and on weekends a call from a Neotel line to a Neotel line is free.

iii. 420 seconds = 6 minutes. Per minute rate from Neotel tell to Neotel, between 18h00 and 07h00 is free.

7. Metrorail in Cape Town gives the following tariffs for normal Metro Class train travel from Cape Town Central Station:

Zone (km distance)	**Single**	**Week**	**Month**
1 - 10	R 6,00	R 39,00	R 117,00
Claremont, Esplanade, Hazendal, Kentemade, Koeberg Road, Maitland, Mowbray, Mutual, Ndabeni, Newlands, Observatory, Paarden Island, Pinelands, Rondebosch, Rosebank, Salt River, Thornton, Woltemade, Woodstock, Ysterplaat			
11 - 19	R 6,50	R 42,00	R 126,00
Akasia Park, Athlone, Avondale, Belhar, Bellville, Bontheuwel, Century City, Crawford, De Grendel, Diep River, Elsies River, Goodwood, Harfield Road, Heathfield, Heideveld, Kenilworth, Langa, Lansdowne, Lavistown, Monte Vista, Netreg, Oosterzee, Ottery, Parow, Plumstead, Retreat, Steurhof, Tygerberg, Vasco, Wetton, Wittebome, Wynberg			
20 - 30	R 7,50	R 49,00	R 147,00
Blackheath, Brackenfell, Clovelly, Eikenfontein, False Bay, Fish Hoek, Kalk Bay, Kuils River, Lakeside, Lentegeur, Mitchells Plain, Mandalay, Muizenberg, Nolungile, Nyanga, Pentech, Philippi, Sarepta, Southfield, St James, Steenberg, Stikland, Stock Road, Unibell			

a) Naledi wants to take the train from the city centre to Kalk Bay. How much will a single ticket cost her?

b) How much does a monthly ticket from Kuils Rivier to the Central Station cost?

c) Kevin takes the train every week day from Akasia Park to the Central Station and back.

i. If he buys single tickets for each trip, how much will he pay per week for his train transport?

ii. How much cheaper would a weekly ticket for the same route be?

iii. If he buys a monthly ticket for the same route, for R 126,00, how much will he pay per trip?

iv. How much cheaper is this than paying for a single ticket?

Solution:

a) R 7,50

b) R 147,00

c) i. R 6,50 $\times$ 2 trips per day $\times$ 5 days = R 65,00 per week

ii. Weekly ticket costs R 42,00. This is R 22 cheaper.

iii. He makes 10 trips per week, and 1 month $\approx$ 4 weeks, so he makes 40 trips per month. R 126,00 $\div$ 40 = R 3,15
iv. R 6,50 − R 3,15 = R 3,35 cheaper

CHAPTER 5

Measuring length, weight, volume and temperature

5.2 Estimating and measuring length and distance

Activity 5 – 1: Measuring length and calculating cost

1. Mr. Madikiza has just finished building a new house. He measured the distance around his yard and found it to be 90 m.

   a) Fencing material is sold at R 95,20 per metre. How much is the fencing material going to cost him?

   b) Suppose he has to put a pole after every 1,5 m. How many poles will he have to buy?

   c) If the fencing poles cost R 65 each, calculate the total costs of the poles alone.

   d) Calculate the total cost of fencing the yard.

   Solution:

   a) $90 \times$ R 95,20 = R 8568,00

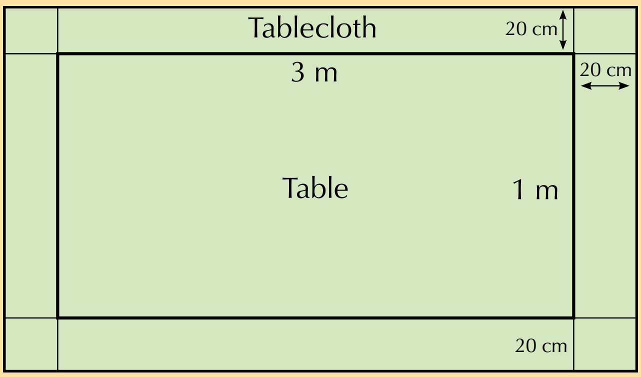
   b) $90 \div 1{,}5 = 60$. He will need 60 poles.

   c) $60 \times$ R 65 = R 3900,00

   d) R 8568,00 + R 3900,00 = R 12 468,00

2. Jenny has started a decorating business and has a contract to provide decor at a wedding reception.

   a) The tables used at this wedding are rectangular with a length of 3 m and a width of 1 m. The fabric she plans to use for the tablecloth costs R 75 per metre (but can be bought in lengths smaller than a metre) and is sold in rolls that are 1,4 m wide. The bride and groom want the tablecloths to hang at least 20 cm over the edges of the tables. Calculate the cost of the cloth for each table.



   b) If there are 15 tables at the wedding, calculate how much she is going to spend on tablecloths alone.

   Solution:

a) The cloth is the same width (1 m + 20 cm + 20 cm) as the fabric sold. She will therefore need 3,4 metres of material to cover one table. 3,4 m × R 75,00 = R 225,00

b) R 225,00 × 15 tables = R 3825,00

5.3 Measuring mass or weight

Activity 5 – 2: Calculating weight

1. A lift in a shopping mall has a notice that indicates that it can carry 2,2 tonnes or a maximum of 20 people. Convert the tonne measurement to kilograms and work out what the engineer who built the lift estimated the maximum weight of a person to be.

   Solution:

   2,2 t = 2200 kg. 2200 kg ÷ 20 people = 110 kg each.

2. A long distance bus seats 50 passengers and allows every passenger to each have luggage of up to 30 kg.

   a) If 50 people, with average weight of 80 kg per person, and one piece of luggage each that weighs an average of 29 kg, what would be the total load being carried by the bus in tonnes?

   b) If the bus weighs 4 tonnes, how much does it weigh in total (in kg) including all the passengers and the luggage?

   Solution:

   a) (50 × 80 kg) + (50 × 29 kg) = 4000 kg + 1450 kg = 5450 kg = 5,45 t.

   b) 4 t = 4000 kg. 4000 kg + 5450 kg = 9450 kg.

3. John applied for a job as a flight attendant but was told that he had to lose at least 5 kg before he met their maximum weight allowance (so that the plane - full of passengers, luggage and fuel - is not too heavy) and could reapply.

   a) If John weighed 85 kg at the time he applied for the job, what is the maximum weight that he can weigh in order to re-apply for the job?

   b) John weighs 78 kg when he weighs himself after six months. Do you think he can reapply for the job? Explain your answer.

   Solution:

   a) 80 kg

   b) Yes - he weighs less than 80 kg and has lost more than the minimum 5 kg.

4. Sweet Jam can be bought in bulk from a warehouse in boxes of 25 tins each.

   a) Suppose that a trader buys a box of 250 g Sweet Jam tins for resale. Calculate the total weight of the tins in the box, in kg.

b) If he orders 15 boxes of Sweet Jam, calculate the total weight of his order in kg.

Solution:

a) $250\ \text{g} \times 25 = 6250\ \text{g} = 6{,}25\ \text{kg}$.

b) $15\ \text{boxes} \times 6{,}25\ \text{kg} = 93{,}75\ \text{kg}$

Activity 5 – 3: Monitor your weight at home

If you have a bathroom scale at home, monitor your weight every day for a week. Whilst you should weigh yourself at the same time and in the same kinds of clothes everyday to get consistent results, you may experiment with your measurements: for example, do you weigh more with your shoes on? Or do you weigh more before or after a meal? Don't forget to check that your scale is correctly calibrated before you take each measurement.

1. What is the difference between your weight on Day 1 and Day 7, if any?

   Solution:

   Learner-dependent answer.

2. Plot a graph showing your weight measurements.

   Solution:

   Learner-dependent answer.

3. Are there any measurements that are unexpectedly low or high? If so, give reasons why you think this may be. (Hint: your weight shouldn't fluctuate much in a week but factors like how much water you've had to drink or how much you've had to eat can influence the measurements!)

   Solution:

   Learner-dependent answer.

If learners don't have access to a bathroom scale, bring one to class and let them weigh themselves at school. Explain the importance of weighing themselves at same time of day and in similar clothes (for consistent measurements) but the aim of the exercise is also for them to experiment with this and see how different variables can affect their measurements. A degree of sensitivity is required for this activity. Children should not be required to share their weight with the class or weigh themselves in front of others, if they don't wish to. Ideally, this should be done at home where privacy can be maintained.

Activity 5 – 4: Calculating whether or not your school bag is too heavy

Read the following statements and complete the activities that follow:

According to mysafetyandhealth.com, you should never carry more than 15% of your body weight. Elias weighs 66 kg and his backpack, with school books, weighs 12 kg. Elizabeth weighs 72 kg and her school bag, with school books, weighs 8 kg.

1. Determine 15% of Elias's weight.

   Solution:

   9,9 kg

2. Is his bag too heavy for him?

   Solution:

   Yes. It weighs more than 9,9 kg.

3. Determine 15% of Elizabeth's weight.

   Solution:

   10,8 kg

4. Is her bag too heavy for her?

   Solution:

   No. It weighs less than 15% of her body weight.

5. Using a bathroom scale, weigh your school bag, with your school books inside it.

   Solution:

   Learner-dependent answer.

6. Weigh yourself.

   Solution:

   Learner-dependent answer.

7. Do the necessary calculations in order to write the weight of your school bag as a percentage of your own weight.

   Solution:

   Learner-dependent answer.

8. Is your school bag too heavy for you? Give a reason for your answer.

   Solution:

   Learner-dependent answer.

The teacher may have to provide a bathroom scale in class for learners to complete this activity.

Activity 5 – 5: Measuring weight and calculating costs

A chef is preparing a meal that needs 3,75 kg of rice and 1,5 kg of beef. The recipe will feed 8 people.

1. Rice is sold in packets of 2 kg. How many packets will he need for this meal?

   Solution:

   2

2. Suppose it costs R 31,50 per 2 kg pack. Calculate the total cost of rice he will need.

   Solution:

   $2 \times \text{R } 31{,}50 = \text{R } 63{,}00$

3. If beef costs R 41,75 per kg, calculate the total cost of beef needed for this meal.

   Solution:

   $\text{R } 41{,}75 \times 1{,}5 \text{ kg} = \text{R } 62{,}63$

4. Calculate the total cost of preparing the meal. (Assume that all the other ingredients are available for free).

   Solution:

   $\text{R } 63{,}00 + \text{R } 62{,}63 = \text{R } 125{,}63$

5.4 Measuring volume

Activity 5 – 6: Measuring and comparing volume

1. A six pack of soft drinks contains 6 cans of 330 ml each. What is the total volume of soft drink in a six pack? Give your answer in litres.

   Solution:

   $6 \times 330 \text{ ml} = 1980 \text{ ml} = 1{,}98 \text{ litres}$

2. A large juice container has a capacity of 30 litres.

   a) If the container is 75% full, calculate the amount of juice in the container in litres.

   b) How many 300 ml cups of juice can you fill (to the top)?

   Solution:

   a) $30 \text{ litres} \times 0{,}75 = 22{,}5 \text{ litres}$

   b) $22{,}5 \text{ litres} \div 300 \text{ ml} = 2250 \text{ ml} \div 300 \text{ ml} = 6{,}8 \text{ cups} = 6 \text{ full cups}.$

3. Jonathan uses the following recipe to make chocolate muffins:
   $\frac{2}{3}$ cup of baking cocoa

2 large eggs
2 cups of flour
$\frac{1}{2}$ cup of sugar
2 teaspoons of baking soda
$1\frac{1}{3}$ cups of milk
$\frac{1}{3}$ cup of sunflower oil
1 teaspoon of vanilla essence
$\frac{1}{2}$ teaspoon of salt

a) If 1 teaspoon = 5 ml, calculate how much baking soda Jonathan will use. Give your answer in ml.

b) Calculate the amount of vanilla essence Jonathan will use in this recipe. Give your answer in ml.

c) Jonathan does not own measuring cups but he does own a measuring jug calibrated in ml. How many ml of flour does he need? (1 cup = 250 ml).

d) If Jonathan buys a 100 ml bottle of vanilla essence, how many times will he be able to use the same bottle, if he bakes the same amount of muffins each time?

e) The recipe above is used to make 30 muffins. Calculate how many cups of flour Jonathan will need to make 45 muffins.

Solution:

a) 2×5 ml = 10 ml.

b) 1 tsp = 5 ml.

c) 2 cups flour $\times$ 250 ml = 500 ml.

d) 100 ml $\div$ 5 ml = 20 times.

e) $\frac{\text{2 cups flour}}{\text{30 cupcakes}} = \frac{\text{3 cups flour}}{\text{45 cupcakes}}$ so he will need 3 cups of flour.

Activity 5 – 7: Measuring volume and calculating costs

1. Thandi is baking cupcakes and the recipe she has requires $1\frac{1}{3}$ cups of milk.

   a) Calculate how many ml of milk she will need if 1 cup = 250 ml.

   b) If the recipe is designed to produce 20 cupcakes, calculate the amount of milk required to bake 30 cupcakes. Give your answer in litres.

   c) Milk is sold in bottles of 1 litre each for R 8,50 at the local store. Calculate the amount of money Thandi will need to spend on milk to make the 30 cupcakes.

Solution:

a) $1\frac{1}{3}$ cups = $\frac{4}{3}$. $\frac{4}{3} \times 250$ ml = 333 ml of milk.

b) $\frac{\text{330 ml}}{\text{20 cupcakes}} = \frac{\text{500 ml}}{\text{30 cupcakes}}$. She will need 500 ml of milk.

c) 1 bottle = R 8,50 (she will only use half).

2. Thabiso decides to sell homemade lemonade. He has made 5 litres of lemonade to sell at the local schools' rugby tournament.

   a) Thabiso will be selling his lemonade in 250 ml plastic cups. Calculate the number of cups of lemonade he will be able to sell.
   b) If he sells the lemonade at R 5 per cup, how much money will he make from the lemonade? (Assume that he sold all of his lemonade).
   c) If it cost Thabiso R 120 to make the lemonade, how many cups would he need to sell (at R 5 each) before he's made back the money he spent?

   Solution:

   a) 5 litres = 5000 ml. 5000 ml $\div$ 250 ml = 20 cups.
   b) 20 cups $\times$ R 5 = R 100
   c) R 120 $\div$ R 5 = 24. He would need to sell 24 cups just to recoup his costs.

5.5 Measuring and monitoring temperature

Activity 5 – 8: Understanding temperature

1. Katie is going to bake fish and potatoes for dinner. On the box of frozen fish, the instructions say "Cook for 20 min at 200°C". Her recipe for baked potatoes needs the oven temperature to be 120°C. What is the temperature difference between these two temperatures?

   Solution:

   200°C - 120°C = 80°C

2. Bheki lives in Durban. He knows that at sea level, water boils at 100°C. He is trying to boil water in a kettle on the stove. If the water is 72°C, how much hotter does it need to be (in °C) before it will start boiling?

   Solution:

   100°C − 72°C = 28°C hotter

3. Marie wants to make ice cubes. She knows that water freezes at 0°C. She measures the temperature of the water in the ice tray to be 23°C. How much colder (in °C) does the water have to be before it will freeze?

   Solution:

   23°C − 0°C = 23°C colder.

4. Thembile lives in Sutherland (the coldest town in South Africa) and records the following minimum temperatures, (in degrees Celsius), during winter:
   3; −5; 6; 8; −2; 4; 1; 0; 7

a) Arrange these temperatures from coldest to warmest.

b) What is the difference between the coldest and warmest temperature he recorded?

Solution:

a) $-5; -2; 0; 1; 3; 4; 6; 7; 8$

b) $8°C - (-5°C) = 13°C$

5. Aparna lives in Polokwane. She finds the following weather forecast for her city in the newspaper:

Day	Wed	Thurs	Fri	Sat	Sun
Max Temp	23	26	29	25	26
Min Temp	15	16	22	20	18

a) What day is supposed to be the hottest?

b) On this hottest day, what will the difference between the maximum and minimum temperature be?

c) What is the difference between the minimum temperature on Wednesday and the minimum temperature on Sunday?

d) Draw a graph of the maximum temperatures.

e) On a separate set of axes, draw a graph of the minimum temperatures.

f) Do these two graphs have the same shape? Answer yes or no.

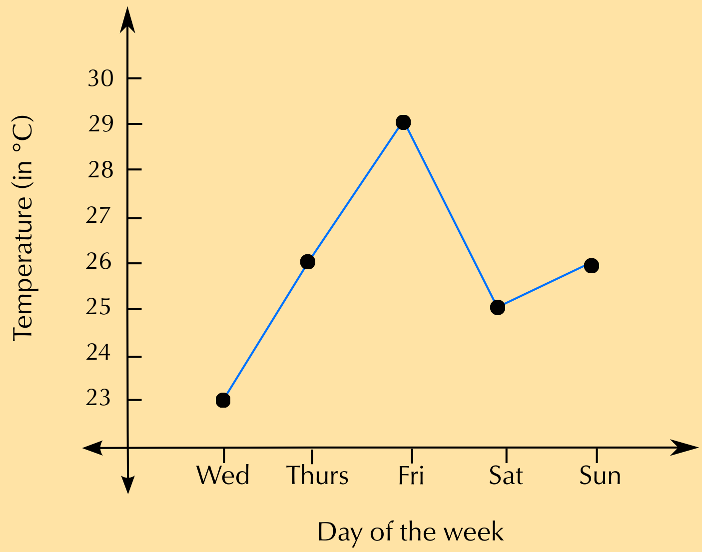
Solution:

a) Friday

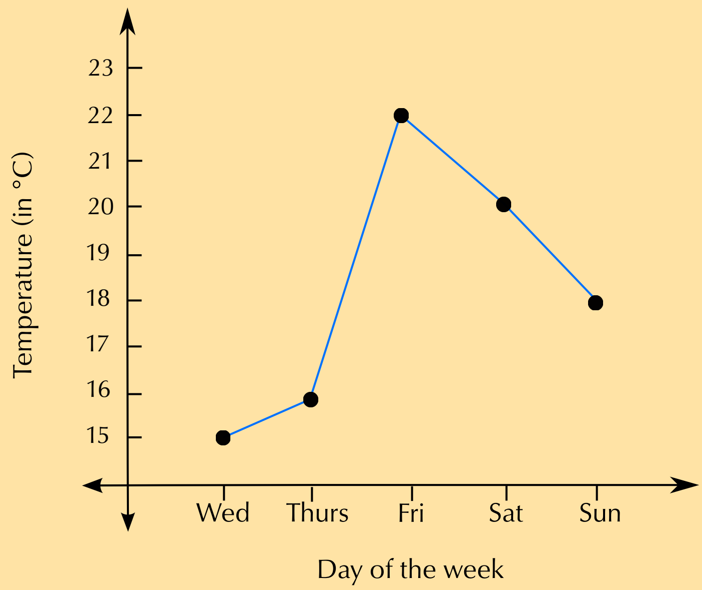
b) $29°C - 22°C = 7°C$

c) $18°C - 15°C = 3°C$

d)



e)



f) No.

5.6 End of chapter activity

Activity 5 – 9: End of chapter activity

The Grade 10 class at Masibambane High School are organising a tea party for the residents of a nearby old age home.

1. Some of the class members are going to bake cake, using the following recipe:
   1 cup butter
   1 cup sugar
   1 teaspoon vanilla essence
   1 teaspoon lemon extract

5 eggs
2 cups flour
1 teaspoon baking powder
2 egg whites for icing

a) The learners know that this recipe will make one cake, and that one cake yields 8 slices. If there will be 60 people at the tea party, and everyone has only one slice of cake, how many cakes do they need to make?
b) The learners decide to bake 9 cakes, so that there will be more than enough cake to go around.
    i. How many cups of butter will they need?
    ii. How many litres of flour will they need? (1 cup = 250 ml).
    iii. How many ml of vanilla essence will the learners need for 9 cakes? (1 tsp = 5 ml).
    iv. If vanilla essence is sold in 25 ml bottles, how many bottles will the learners need to buy?
    v. If vanilla essence costs R 7,85 a bottle, how much will the required vanilla essence for 9 cakes cost?
    vi. How many eggs will the learners need for 9 cakes?
    vii. If eggs are sold in boxes of 6, how many boxes will they need to buy and how many eggs will be left over?
    viii. If one box of eggs costs R 8,40, how much will enough eggs for 9 cakes cost?
c) The cakes are baked in square cake tins. If the width of one cake is 200 mm, how wide will 6 cakes packed side by side be? (Give your answer in cm).
d) If one cake weighs 700 g, and there are 8 slices per cake, calculate how much one slice will weigh.
e) The cake needs to be baked in the oven for 40 minutes at 180°C. According to the oven's temperature dial, the temperature in the oven is 200°C.
    i. By how much must the oven cool before the cake can be baked?
    ii. What do you think will happen if they leave the oven temperature at 200°C and bake the cake at this higher temperature?

Solution:

a) $60 \div 8 = 7,5$ cakes. They can't bake half a cake so they will have to bake 8.
b)
    i. 9 cups.
    ii. 1 cake requires 2 cups = 250 ml of flour. 9×250 ml = 2250 ml = 2,25 litres
    iii. 1 cake requires 1 tsp = 5 ml. 9×5 ml = 45 ml of vanilla essence.
    iv. 45 ml $\div$ 25 = 1,8 bottles. They can't buy 0,8 of a bottle so they will have to buy 2 bottles.
    v. $2 \times$ R 7,85 = R 15,70
    vi. 5 eggs $\times$ 9 cakes = 45 eggs.
    vii. $45 \div 6 = 7,5$ boxes. They can't buy 0,5 of a box so they will have to buy 8 boxes. 6×8 boxes = 48 eggs. 48 - 45 = 3 eggs left over.
    viii. R 8,40 $\times$ 8 boxes = R 67,20
c) 200 mm $\times$ 6 = 1200 mm = 120 cm

d) 700 g ÷ 8 = 87,5 g

e) i. 200°C - 180°C = 20°C

ii. The cake will flop, or it may burn.

2. Other learners in the class are going to make fruit juice for the tea party.

a) They estimate that each person will have 600 ml of juice. How many **litres** of juice will they need to make in total (for 60 people)?

b) The class makes 40 litres of juice. They wish to transport it in 1,5 ℓ flasks.

i. How many flasks will they need?

ii.

Solution:

a) 600 ml × 60 = 36 000 ml = 36 litres.

b) i. 40 litres ÷ 1,5 litres = 26,67 flasks. They can't have 0,67 of a flask so they will need 27 flasks.

ii. 27 flasks ÷ 15 flasks = 1,78 trips. They can't make 0,78 of a trip so they iwll have to make 2 trips.

3. The old age home has a kettle that can hold 1,7 litres of water.

a) How many 200 ml cups of water can be poured from the kettle when it is full?

b) What percentage of 1,7 litres is one 200 ml cup?

c) Alison measures the temperature of the water in the kettle (with a thermometer) to be 65°C. She knows that the water will boil at 100°C. How much hotter (in °C) does the water need to be in order to boil?

Solution:

a) 1,7 litres = 1700 ml. 1700 ml ÷ 200 ml = 8,5. So they can fill 8 full cups.

b) $\frac{200 \text{ ml}}{1700 \text{ ml}} = 0{,}12$ = 12 percent

c) 100°C - 65°C = 35°C

4. The class decide they also want to buy bags of sweets for their tea party. If one 250 g bag of jelly beans costs R 5,49, calculate how much 3 kg of jelly beans will cost.

Solution:

There are 4250 g bags in 1 kg, so 3 kg = 3 × 4 = 12 bags. 12 × R 5,49 = R 65,88

5. The learners estimate that each person will eat 300 g of biscuits.

a) If there are 60 people attending the party, how many kg of biscuits should they buy?

b) If biscuits are only sold in 500 g boxes, how many boxes will they need to buy?

c) If one box of biscuits costs R 3,99, calculate how much the learners will have to spend to buy enough biscuits for everyone.

Solution:

a) 60×300 g = 18 000 g = 18 kg
b) 18 000 g $\div$ 500 g = 36 boxes.
c) 36 boxes $\times$ R 3,99 = R 143,64

6. The Grade 10 class want to hang ribbons in the room where they are going to host their tea party. They want to cut the ribbons into 600 mm lengths.

   a) If they buy 5 m of ribbon, how many whole pieces of 600 mm ribbon will they be able to cut?
   b) If the ribbon costs R 6,99 per metre, how much will the ribbon cost in total?

Solution:

   a) 5 m = 5000 mm. 5000 mm $\div$ 600 mm = 8,33. So they can cut 8 whole pieces of ribbon.
   b) R 6,99 $\times$ 5 m = R 34,95

7. The class checks the weather report for the week in which the want to have the party:

Day	Mon	Tues	Wed	Thurs	Fri
Temperatures	15/17	14/19	18/23	19/26	17/20

   a) If they want to have the tea party outside in the home's gardens, on which day should the plan to do it? Give reasons for your answer.
   b) What is the lowest temperature predicted for the week?
   c) What is the highest temperature predicted for the week?
   d) What is the difference between the minimum and maximum temperatures forecast for the Tuesday?

Solution:

   a) Thursday - the weather will be warmest for an outdoor event.
   b) 14°C.
   c) 26°C.
   d) 19°C − 14°C = 5°C.

CHAPTER 6

Scale, maps and plans

6.2 Number and bar scales

Activity 6 – 1: Using the bar and number scales

1. You measure the distance between two building on a map to be of 5 cm. If the map has a number scale of 1: 100, what is the actual distance on the ground?

   Solution:

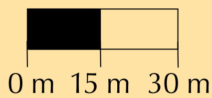
   5 cm × 100 = 500 cm = 5 m

2. You are given a map with the number scale 1 : 20. you measure a distance of 12 cm on the map. What is the actual distance in real life?

   Solution:

   12 cm × 20 = 240 cm = 2,4 m.

3. You measure a distance of 10 cm on a map with the following bar scale:

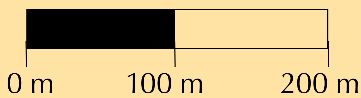


   (1 cm = 15 m). What is the actual distance on the ground?

   Solution:

   10 cm ÷ 1 cm = 10 segments. 10 segments × 15 m = 150 m

4. You measure a distance of 15 cm on a map with the following bar scale:



   (2 cm : 100 m) What is the actual distance on the ground?

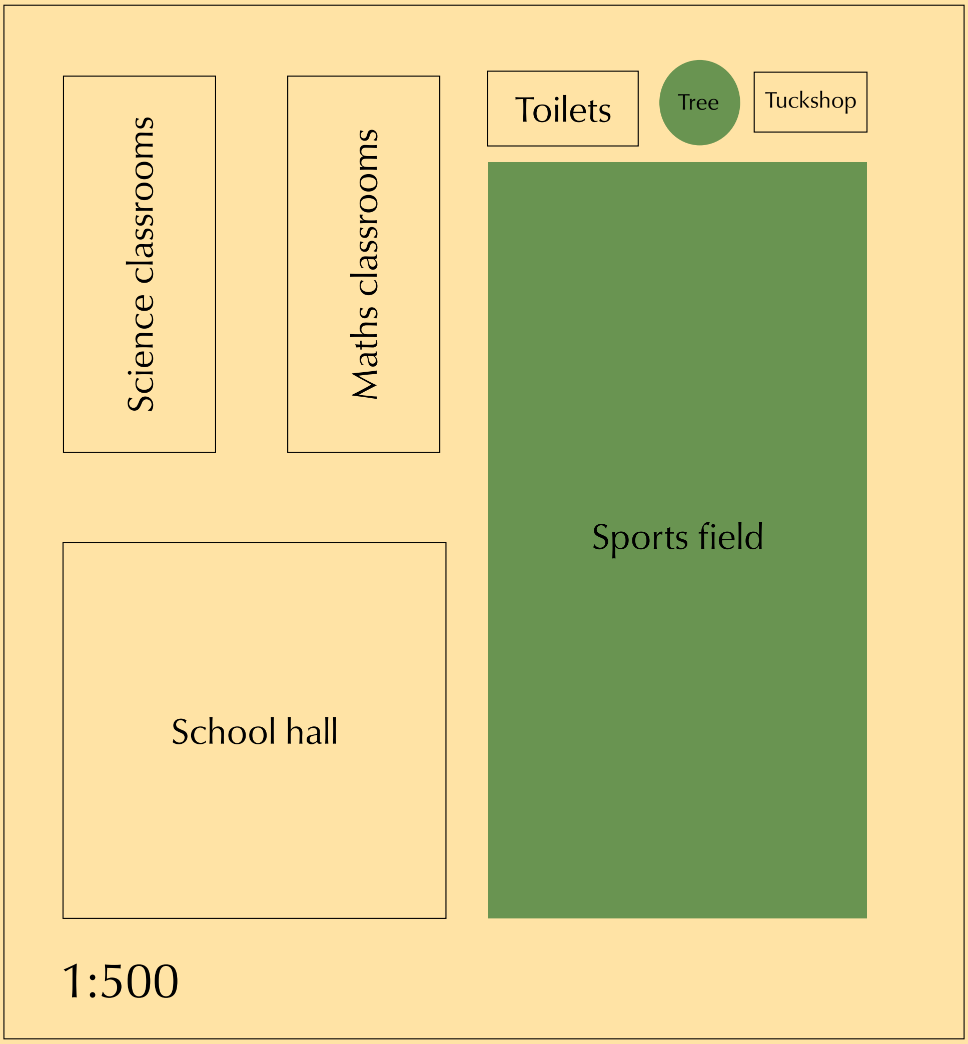
   Solution:

   15 cm ÷ 2 cm = 7,5 segments. 7,5 segments × 100 m = 750 m.

Using number and bar scales to measure distance

Activity 6 – 2: Using the number scale

Using the school map and scale given below, measure the drawings and then estimate the following real distances in metres:



1. The width and length of the school hall.

   Solution:

   Width and length of the school hall on the map is 5 cm. 5 cm × 500 = 2500 cm = 25 m.

2. The width of the toilet block.

   Solution:

   Width of the toilet block on the map is 2 cm. 2 cm × 500 = 1000 cm = 10 m.

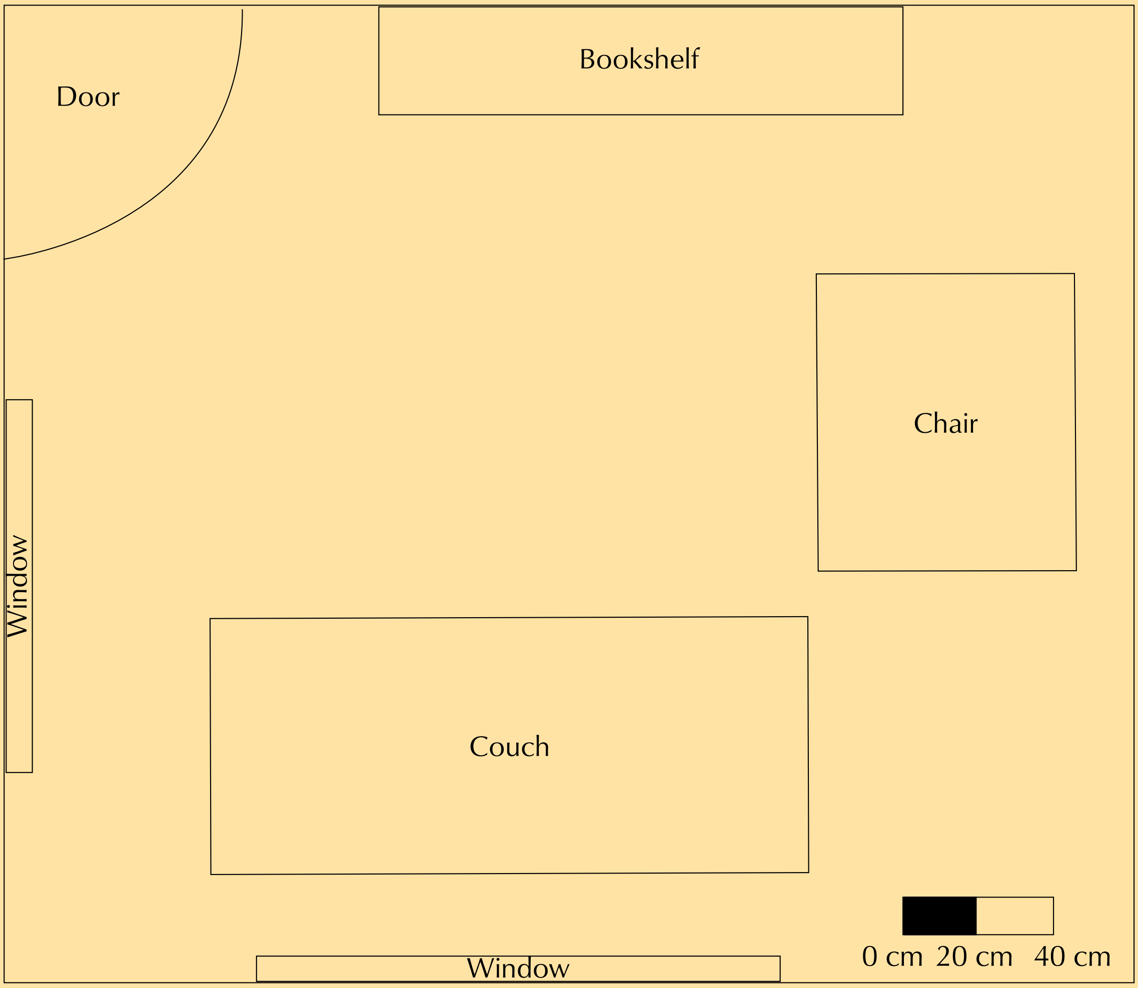
3. The distance between the science and maths buildings.

   Solution:

   Distance between the science and maths buildings on the map is 1 cm. 1 cm × 500 = 500 cm = 5 m.

Activity 6 – 3: Using the bar scale to estimate actual length

Using the diagram given below, calculate the real life dimensions for:



1. The length of the bookshelf.

   Solution:

   1 cm on a ruler = 20 cm on the ground. Width of bookshelf is 7 cm. 7 cm ÷ 1 cm (length of segment) = 7 segments of bar scale. 7 segments × 20 cm = 140 cm = 1,4 m. The bookshelf is 1,4 m wide.

2. The width and length of the chair

   Solution:

   1 cm on a ruler = 20 cm on the ground. Width of chair is 3,5 cm. 3,5 cm ÷ 1 cm (length of segment) = 3,5 segments of bar scale. 3,5 segments × 20 cm = 70 cm. Length of chair is 4 cm. 4 cm ÷ 1 cm (length of segment) = 4 segments. 4 segments × 20 cm = 80 cm.

3. The length of each of the windows.

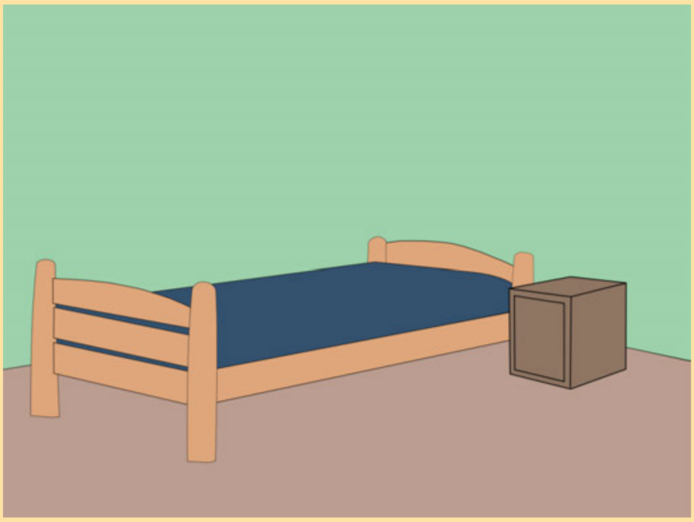
   Solution:

   1 cm on a ruler = 20 cm on the ground. Length of left hand window is 5 cm. 5 cm ÷ 1 cm (length of segment) = 5 segments of bar scale. 5 segments × 20 cm = 100 cm = 1 m. Length of bottom window is is 7 cm. 7 cm ÷ 1 cm (length of segment) = 7 segments of bar scale. 7 segments × 20 cm = 140 cm = 1,4 m.

Drawing a scaled map when given real (actual) dimensions

Activity 6 – 4: Drawing a scaled map

1. The bedroom in the picture is 3,5 m by 4 m. It has a standard sized single bed of 92 cm by 188 cm. The bedside table is 400 mm square. Draw a floor plan to show the layout of the room. Use the number scale 1 : 50.



Solution:

Room real measurements:

width 3,5 m = 350 cm

length 4 m = 400 cm

Scale drawing:

350 ÷ 50 = 7 cm

400 ÷ 40 = 8 cm

Bed real measurements:

Width = 92 cm

Length = 188 cm

Scale drawing:

92 cm ÷ 50 = 1,84 cm

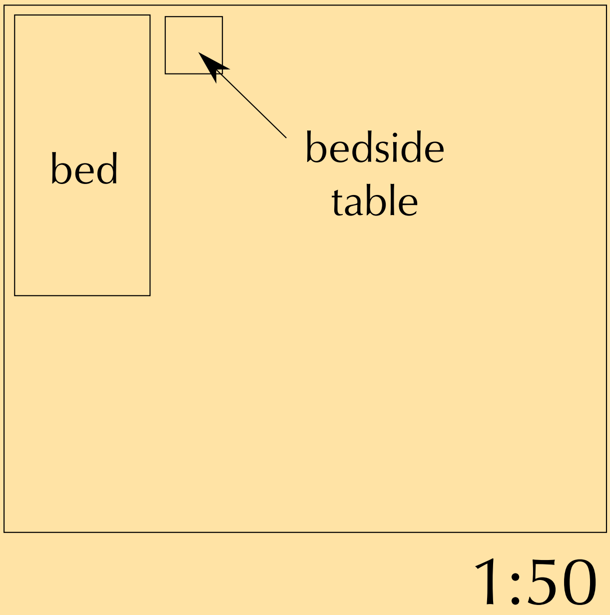
188 cm ÷ 50 = 3,76 cm

Bedside table real measurements:

400 mm

400 mm ÷ 50 = 8 mm

Scale drawing:



Activity 6 – 5: Drawing scaled maps

1. Divide into groups in order to measure and draw an accurate, scaled floor plan of your classroom. Use a scale of 1 : 50. You will need to measure all the large objects (e.g. desks, windows, the blackboard) in the classroom, calculate what their scaled dimensions will be and then draw them carefully on your floor plan. Can you think of a different or better way to arrange the furniture in your classroom?

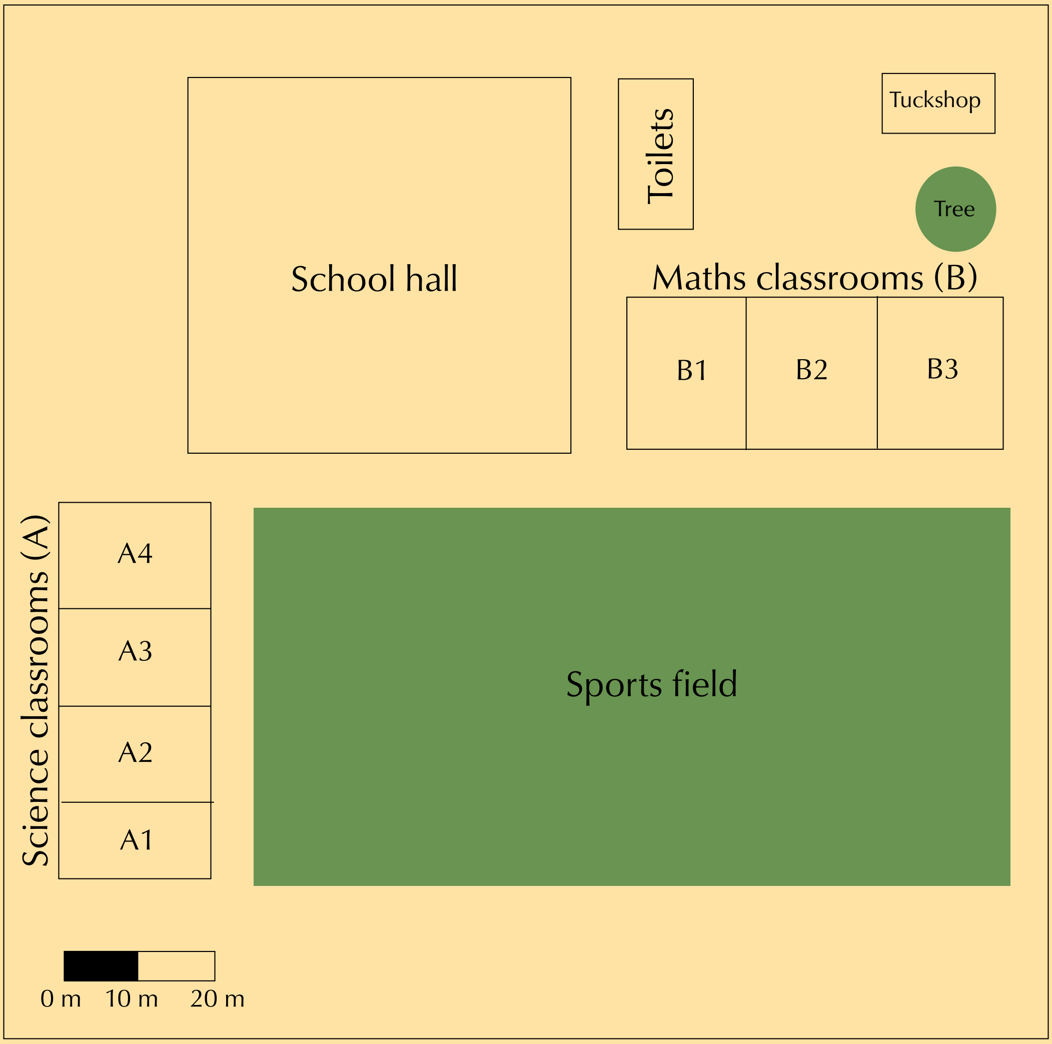
   For this activity, we suggest providing square grid paper for the learners' to use, to make the drawing process easier. You will also need to provide measuring tapes for the learners to use to measure the actual dimensions of the furniture in the classroom. If the classroom is very large or has lots of furniture, the activity can be simplified by assigning a section of the classroom to each group, so that they have less to measure and draw.

   Solution:

   learner-dependent answer.

6.3 Maps, directions, seating and floor plans

Activity 6 – 6: Using the bar scale and directional navigation on a school ground plan



1. Measure the width and length of the sports field in mm.

   Solution:

   Width = 50 mm. Length = 100 mm.

2. Use the bar scale to estimate the real (actual) width and length of the field in metres.

   Solution:

   10 mm on ruler = 10 m on the ground. Width = 50 mm. 50 mm ÷ 10 mm (length of one segment of bar scale) = 5 segments. 5 segments × 10 m = 50 m. Length = 100 mm. 100 mm ÷ 10 mm (length of 1 segment) = 10 segments. 10 segments × 10 m = 100 m.

3. What subject would you be studying if you are in classroom A3?

   Solution:

   Science.

4. What subject is taught in the classrooms that are next to the hall and face the sports fields?

   Solution:

   Mathematics.

5. Tebogo, a new learner, has started at your school. You are in the Science classroom, A1, when the break bell rings. Explain to Tebogo how to get to the tuckshop.

   Solution:

   Walk out of the Science classroom towards to sports field. Turn left, and walk along the edge of the field towards to school hall building. At the school hall, turn right. At the first opportunity, turn left (before the maths classrooms) and walk past the maths building. Then turn right and walk straight towards the tree. At the tree, turn left. The tuckshop will be the building in front of you.

Activity 6 – 7: Understanding a stadium seating plan

Study the plan of a rugby stadium below, and answer the questions below:

1. Using words such as "near to" and "in the middle of", describe the position of a player standing at the point marked X.

   Solution:

   A player at Point X would be standing on the field, near the left hand side goal posts, and the Category 5 seats in Block G of the South Stand ramp seating.

2. Why do you think the seats are categorised?

Solution:

The seats are colour-coded and categorised by price.

3. Describe the position of the stand that contains the most Category 3 seats.

Solution:

The West Stand has the most Category 3 seats. It is on the left of the stadium, between the North Stand and the South Stand.

4. If your are standing at Point Y, what is the quickest way to get to the South Stand Ramp seating?

Solution:

Walk behind the East stand seating, with the stadium on your right. Then turn right and walk straight to the South Stand Ramp seating.

5. Describe the position of the hot dog stand at Point Z.

Solution:

The hot dog stand at Point Z is in the top-left corner of the diagram. It is between the West and North Stands.

6. Your friend is at the hot dog stand (at Z). Explain to him how to find you if you are seated in a category 5 seat, Block A.

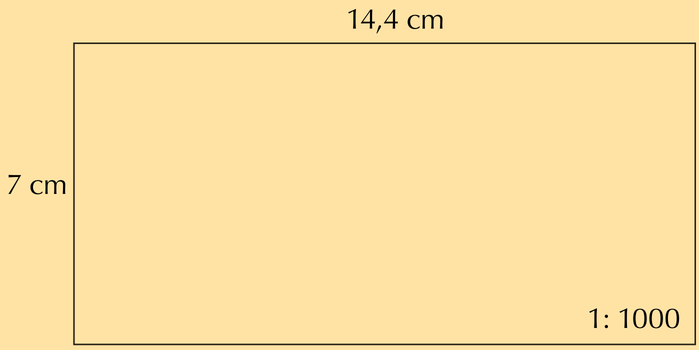
Solution:

Walk behind the West stands (with the stands on your left). Turn left at the end of the stands, and walk straight to the edge of the South Stand ramp seating. Walk between the South Stand Ramp seating and South Stand Seating Level 1, past Blocks H, G, F, E, D, C and B. Block A (category 5) is on your left, at the end of the South Stand Ramp Seating.

7. The width of the rugby field is 70 m the length 144 m. Draw a scale drawing of the rugby field using the number scale 1 : 1000.

Solution:

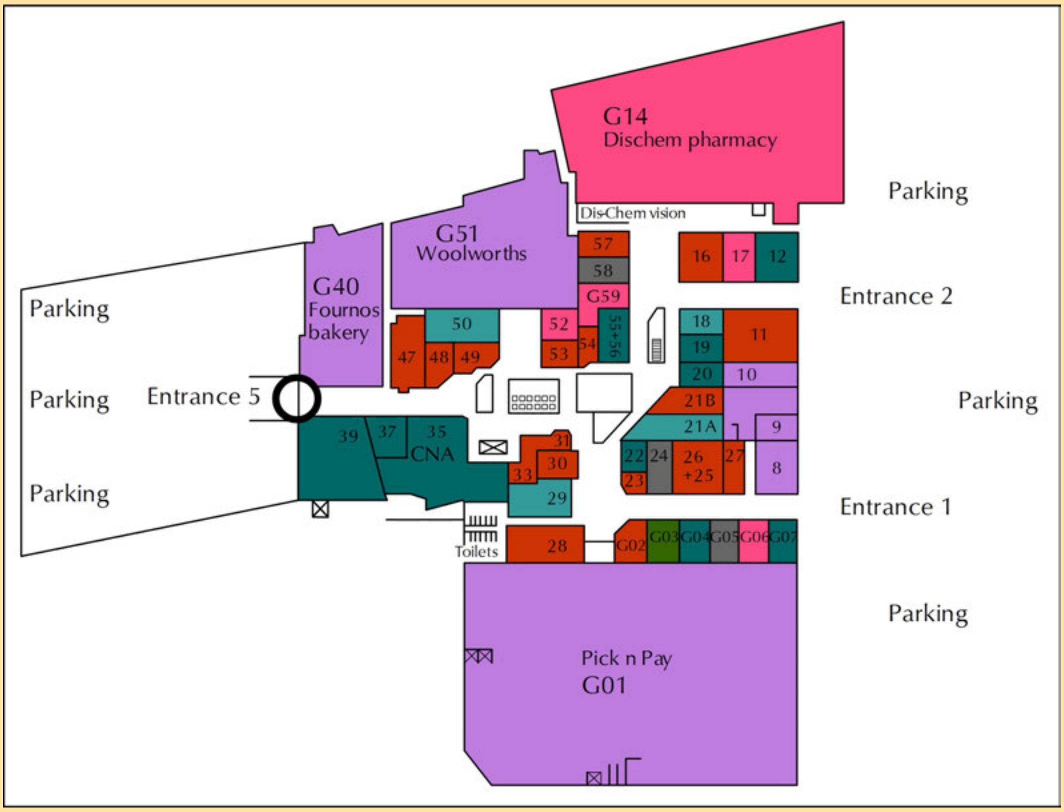
Width $= 70$ m $= 7000$ cm. 7000 cm $\div$ 1000 $= 7$ cm. So scaled width is 7 cm. Length is 144 m $= 1440$ cm. 1440 cm $\div$ 1000 $= 14{,}4$ cm. So scaled length is 14,4 cm.



(Note: above image is not drawn do scale, but given dimensions are correct)

Activity 6 – 8: Navigating a shopping mall

Study the map of the ground floor of a shopping centre and answer the questions that follow:



1. You want to go to Shop 37 to buy new shoes. What store will you find next to it?

   Solution:

   Shop 35: CNA

2. What does "G51 Woolworths" mean on this map?

   Solution:

   Woolworths is Shop 51 on the ground floor.

3. Do you think this shopping centre has more than one floor? Explain your answer.

   Solution:

   Yes - there are stairs indicated on the map.

4. Where should you park if you want to go to Fournos bakery and buy some fresh bread?

   Solution:

   Near Entrance 5.

5. Name the two stores you could buy stationery from and describe how you would get to each of them from Entrance 1.

   Solution:

   1. CNA: Go straight towards Shop 29. Turn right, go left around the corner at Shop 31. Go straight. CNA will be on your left. 2: Pick n Pay: Go straight passing shops G07 - G02 on your left. Turn left into the entrance of Pick n Pay.

6. If you are at Entrance 2, explain how you would get to the toilets.

Solution:

Go straight, turn left at Shop 18, in front of the stairs. Walk past shops 18 - 23 (following the mall as it curves to the right). Turn slightly left towards Pick 'n Pay. Just before Pick 'n Pay, turn right, between shops 28 and 29. Go straight down this passageway, the toilets are at the end.

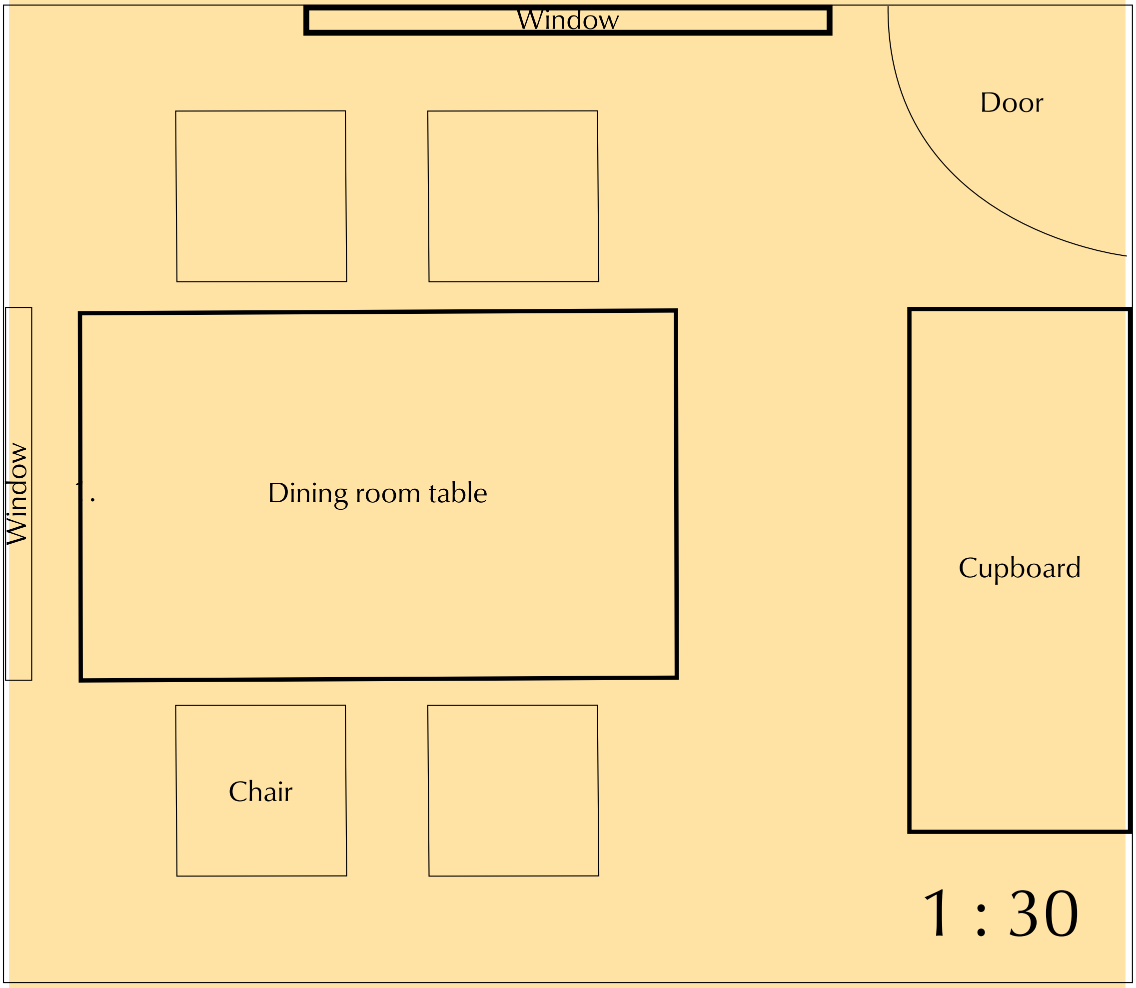
7. You are standing at the entrance of Dis-Chem. Your friend arrives at Entrance 5 and wants to meet you. Give your friend directions to explain where they will find you.

Solution:

Go straight, keeping to the left of the escalators in the middle. Pass the entrance to Woolworths on your left. Pass shops 53 - 56 (on your left) and then turn left in front of the escalators/stairs. Go straight, passing shops G59, 58 and 57. Dis-Chem will be in front of you.

6.4 End of chapter activity

Activity 6 – 9: End of chapter activity



a) Using the number scale estimate the actual (real) size in metres of:

   i. The dining room table.
   ii. The chairs.
   iii. The cupboard.

b) Using the number scale estimate the actual (real) size of the dimensions of the room in metres.

c) Explain where the door to the room is.

d) Is it possible to calculate how high the windows are? Explain your answer.

e) Calculate the width of curtaining that will be required for both windows (in cm).The width of the material required should be twice the width of the window.

f) Rearrange the furniture in this room. To help you, you can redraw and cut out the same size shapes. Draw the basic structure of the room (the walls, windows and door) in your books. Use the shapes you cut out to show your new room design. Paste them onto your room plan when you are happy with your design. You may also include some pictures from magazines to show what kind of furniture and accessories you would like in your room.

g) A carpet measures 1,8 m by 1,2 m.

   i. Using the scale 1 : 30, draw a scale version of the carpet.
   ii. Will the carpet fit into the room in Question 1? Explain your answer.

Solution:

a) i. $(8\text{ cm} \times 5\text{ cm}) \times 30 = 240\text{ cm} \times 150\text{ cm} = 2{,}4\text{ m} \times 1{,}5\text{ m}$
   ii. $(2{,}3\text{ cm} \times 2{,}3\text{ cm}) \times 30 = 69\text{ cm} \times 69\text{ cm} = 0{,}69\text{ m} \times 0{,}69\text{ m}$
   iii. $(3\text{ cm} \times 7\text{ cm}) \times 30 = 90\text{ cm} \times 210\text{ cm} = 0{,}9\text{ m} \times 2{,}1\text{ m}$

b) $(15\text{ cm} \times 13\text{ cm}) \times 30 = 450\text{ cm} \times 390\text{ cm} = 4{,}5\text{ m} \times 3{,}9\text{ m}$

c) The door is in the corner of the room, between the window and the cupboard.

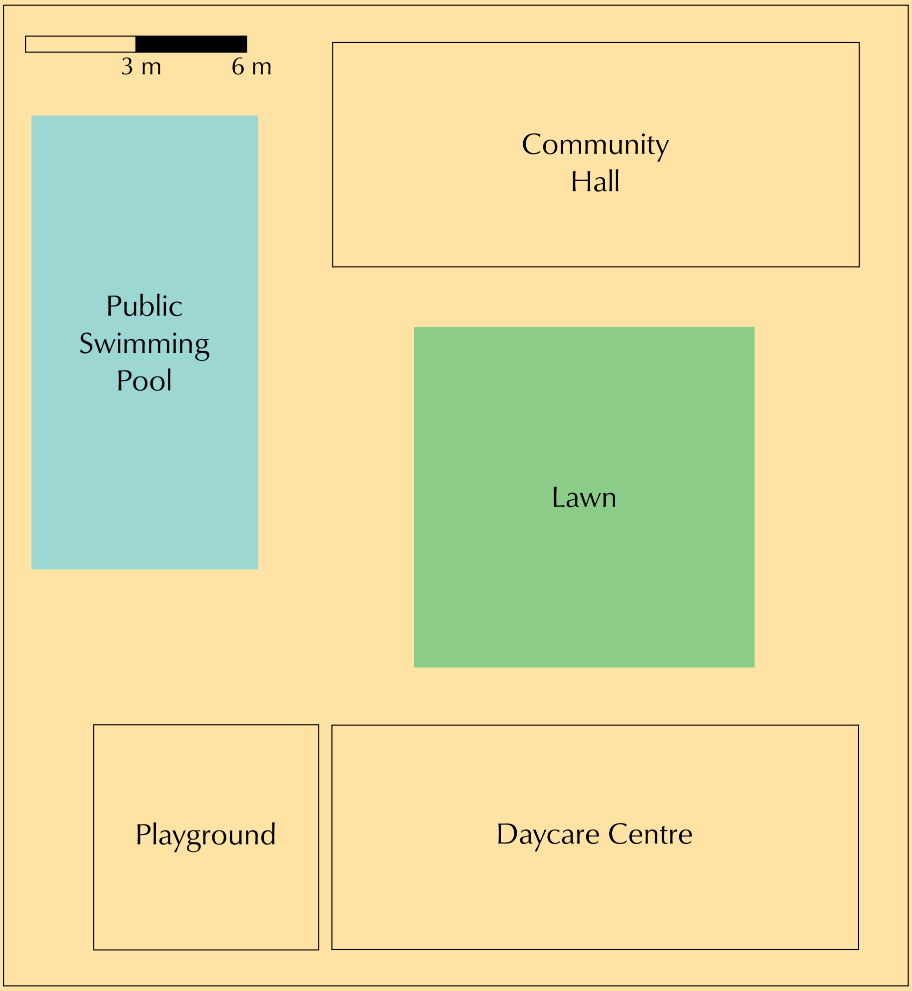
d) No. We are not given any information about the height of the windows. We can only calculate how long they are.

e) Top window $= 7$ cm long. $7\text{ cm} \times 30 = 210$ cm. $210\text{ cm} \times 2 = 420$ cm. Left window $= 5$ cm long. $5\text{ cm} \times 30\text{ cm} = 150$ cm. $150\text{ cm} \times 2 = 300$ cm. $420\text{ cm} + 300\text{ cm} = 720$ cm of material for both curtains.

f) Learner-dependent answer.

g) i. $1{,}8\text{ m} = 180$ cm. $180 \div 30 = 6$ cm on scale map. $1{,}2\text{ m} = 120$ cm. $120\text{ cm} \div 30 = 4$ cm on scale map. So diagram will be a rectangle that is $6\text{ cm} \times 4$ cm.
   ii. Yes - the dimensions of the carpet are smaller than the dimensions of the room.

2. The following diagram shows a walled day care facility. Answer the questions that follow.



a) Use the bar scale to estimate the actual (real) size in metres of:

   i. The swimming pool.
   ii. The daycare centre.
   iii. The lawn.

b) Health and and safety regulations require that the swimming pool has a fence around it. The fence must be a minimum of 1,5 m from the pool. The fence must run from the left boundary wall (between the pool and playground) around the bottom of the pool, and then between the pool and the lawn, to the top boundary wall (i.e. it goes around the bottom and the right side of the pool). Calculate the minimum amount of fencing required.

c) Describe the position of the swimming pool in relation to the other buildings.

d) Where would you plan to dig a flower bed for the day care facility? Explain why.

e) Would a room with the dimensions 7 m × 11 m fit inside the community hall? Use your calculations to justify your answer.

f) Describe where you would put a pathway that would link all the facilities together.

Solution:

a) i. Dimensions = 3 cm × 6 cm = 2 segments × 4 segments = 6 m × 12 m.

ii. Dimensions = 3 cm × 7 cm = 2 segments × 4,66667 segments = 6 m × 14 m

iii. Dimensions = 3 cm × 3 cm = 2 segments × 2 segments = 6 m × 6 m

b) Pool is 6 m × 12 m. So fencing is (6 + 1,5 m) + (12+1,5 m) = 21 m

c) The pool is in the corner of the property, by the side of the community hall, overlooking the lawn and the playground.

d) Learner-dependent answer, but one option would be to the right of the lawn - there is space and it would not be in the way of any entrances/throughfares.

e) Dimensions = 3 cm × 7 cm = 2 segments × 4,66667 segments = 6 m × 14 m. So a 7 m × 11 m room would not fit into the hall.

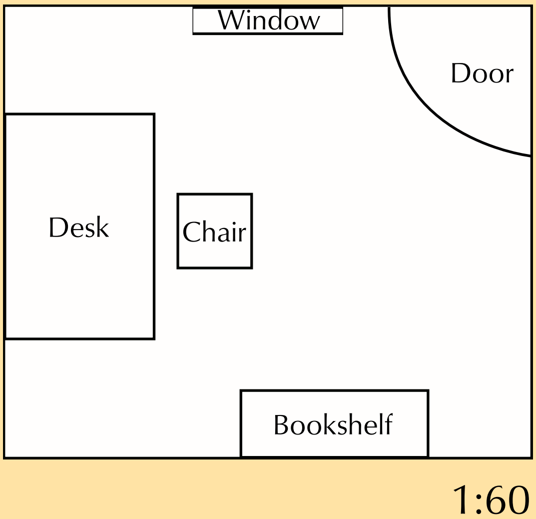
f) Learner-dependent answer.

3. You are given the following information about the actual dimensions of a study and the furniture in it:

- Room: 3,6 m wide and 4,2 m long
- Window: 1,2 m wide
- Door: 1,2 m wide
- Desk: 120 cm wide and 180 cm long
- Chair: 60 cm wide and 60 cm long
- Bookshelf: 1,5 m long

Using a scale of 1 : 60, calculate the scaled dimensions of the room and furniture, and draw a scaled map of the room. Arrange the furniture in any sensible manner.

Solution:



Room: 6 cm × 7 cm. Window: 2 cm wide. Door: 2 cm wide. Desk: 2 cm × 3 cm. Chair: 1 cm × 1 cm. Bookshelf: 2,5 cm long.

4. You have the following ticket for a performance at The Hillvale Theatre.

The Hillvale Theatre
Performance
Seat: C 17
Date: 15 May 2013
Time: 20h00

Study the seating plan and answer the questions that follow:

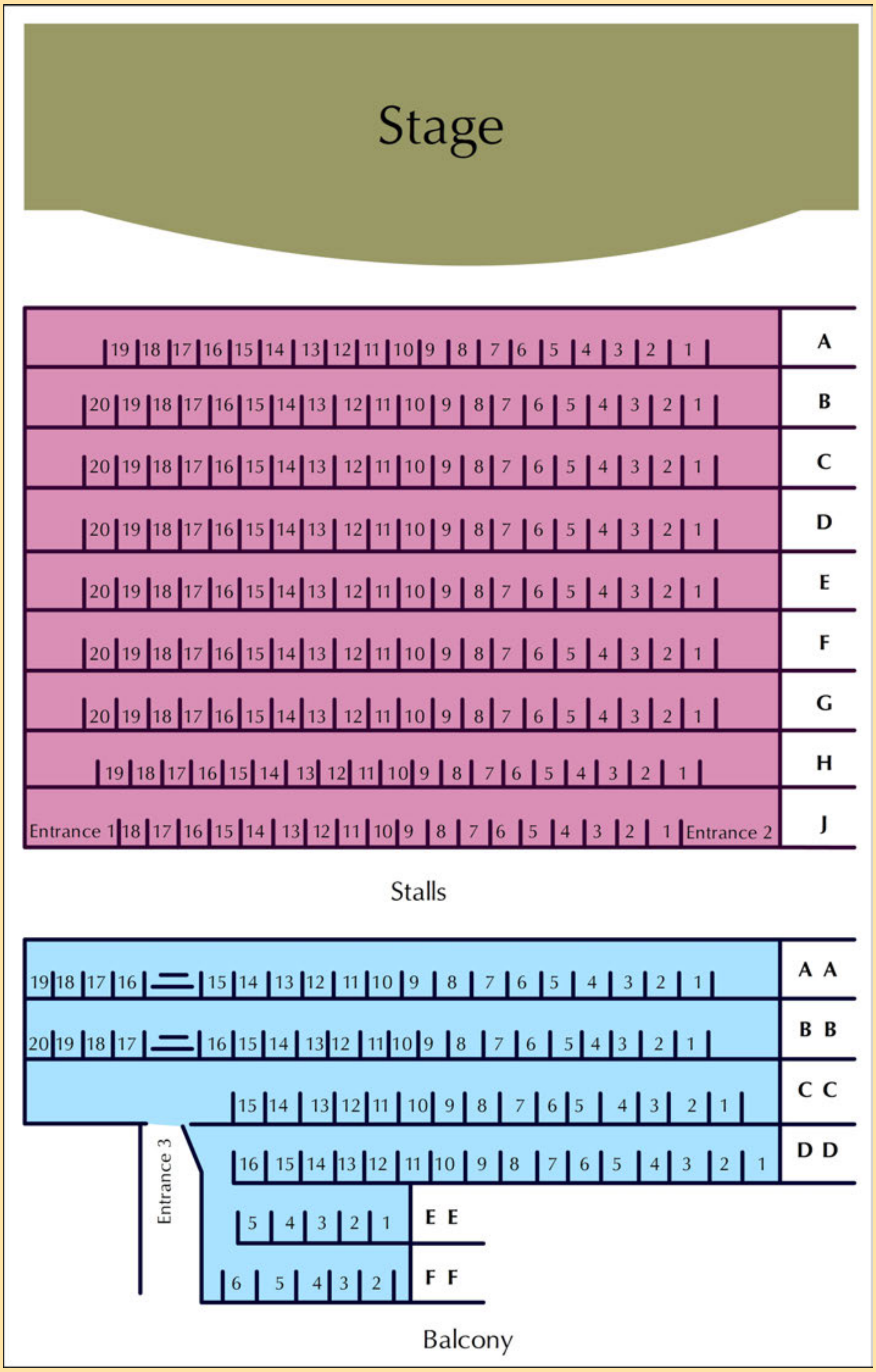


Figure 6.1:

Seating plan for The Hillvale Theatre

a) Why are there only 18 seats in row J?

b) Your ticket indicates that you must sit in C17. Which entrance would you use and why?

c) There are 3 seats to your right between you and your friend. What is your friend's seat number?

d) How many rows are between row B and row J?

e) How many seats are in the theatre?

f) Your school wants everyone to attend the stage production of your prescribed English book. There are 30 people in your class. If the first person sits in seat D5 and the class takes up the rest of row D (to D20) and seats from the beginning of row E (E1, E2 etc), where will the last person in your class sit in row E, if the seats are filled consecutively?

g) What percentage of the seats would your class of 30 fill?

h) Why are some rows labeled AA to FF?

i) Are rows AA and BB on the same level? Explain your answer.

j) Do you think the seats on the balcony wheelchair accessible?

k) What ratio of the total number of seats are balcony seats?

l) How many seats will still be available if $\frac{4}{5}$ of the seats are sold?

m) The cost of the tickets for the stalls is R 200. If school groups get a 10% discount, how much will your class's 30 tickets cost the school?

Solution:

a) Because there are entrances to the theatre on either side of the row.

b) Entrance 1. It is closest to seat C17.

c) C13

d) 6 rows

e) $19 + 20 + 20 + 20 + 20 + 20 + 20 + 19 + 18 + 19 + 20 + 15 + 16 + 5 + 5 = 256$ seats

f) E14

g) $\frac{30}{256} = 0{,}1171\ldots$
$0{,}1171\ldots \times 100 = 11{,}7\%$

h) These rows of seats are in the balcony.

i) No. There is a short flight of stairs between them.

j) There is nothing on the seating plan to suggest that they are.

k) Number of balcony seats $= 19+20+15+16+5+5 = 80$. So 256: 80

l) $\frac{4}{5}$ of $256 = 204$ seats booked. So there will be 51 seats available.

m) $30 \times$ R 200 $=$ R 6000. 10% of R 6000 $=$ R 600. So the tickets will cost R 6000 - R 600 $=$ R 5400.

5. Study the seating plan of the stadium given and answer the questions that follow:

a) Describe where the players would enter onto the field.
b) Are the blocks numbered in a clockwise or anti clockwise direction?
c) Your seat is in Block 35. What entrance would you go to to get to your seat?
d) The south entrance is closest to Block 35. Where is this entrance?
e) How many blocks are there in the purple category?
f) What percentage of the blocks are red?
g) If your friend is sitting in Block 25 and you are in one of the blue blocks. Describe where you are in relation to your friend.
h) The rugby match starts at 18:30. The game is 80 minutes long. Half time is 10 minutes long.
   i. What time will the match finish? (Assuming there is no over time)
   ii. The sun sets at 6:45 p.m. behind the main entrance. Where will you be sitting if you are looking into the sun during the game?
i) You are given the following ticket prices for an upcoming rugby match:

R250	R300
R450	R200

   i. Which are the cheapest seats?
   ii. You are going to buy 3 tickets for yourself and your friends in the blue category. How much will this cost?
   iii. You decide that 3 tickets in the blue category is going to be too expensive and you'd rather sit in the orange stalls. How much will three orange category tickets cost?

Solution:

a) Through the tunnel, in the middle of the field, under Block 6.

b) Clockwise.

c) The South entrance.

d) It is in the corner of the stadium, between the main entrance and the east entrance

e) 11 + 12 = 23 Blocks.

f) 17 red blocks out of 71 blocks in total. $\frac{17}{71} \times 100 = 23{,}9\%$

g) If the friend is in Block 25, then the blue blocks are to their left, along the left side of the field.

h) i. Total duration of match = 90 minutes. 18:30 + 90 minutes = 20:00

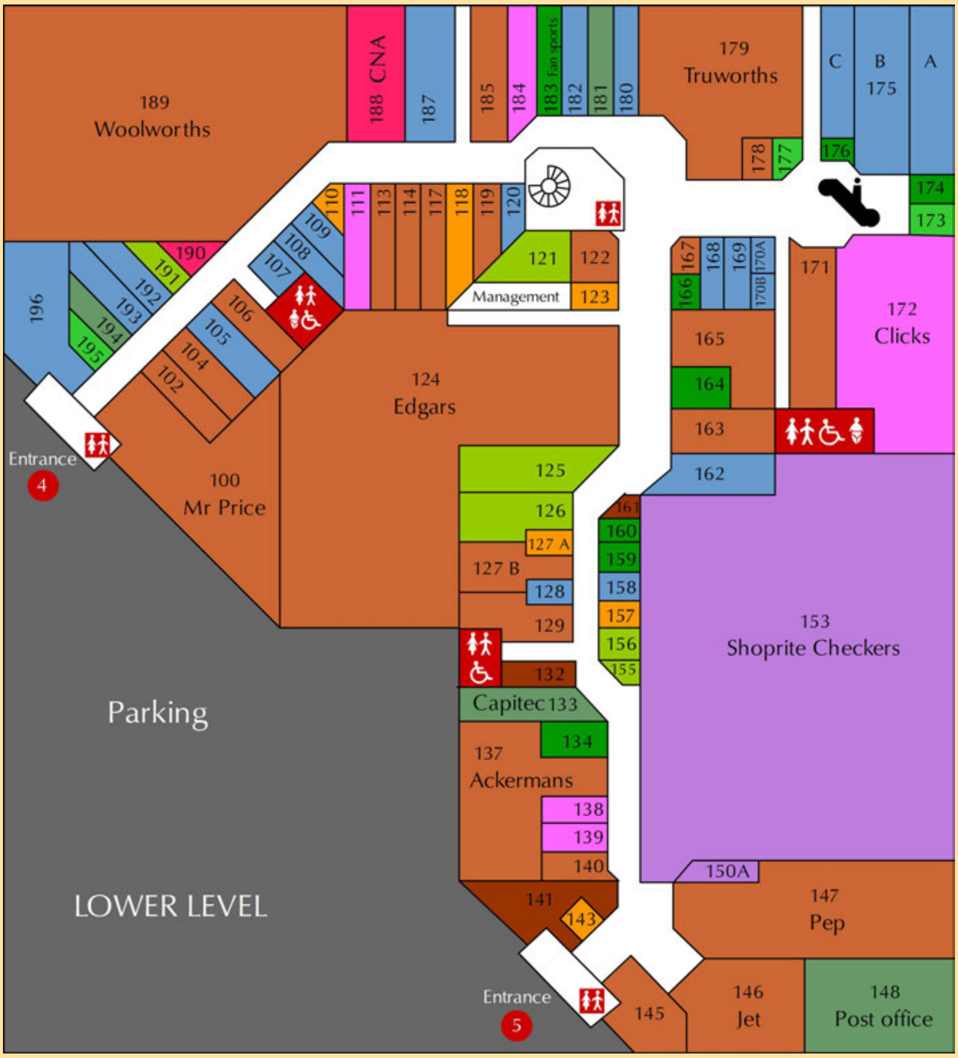
ii. In the orange blocks.

i) i. The seats in the purple blocks.

ii. 3 × R 300 = R 900

iii. 3 × R 250 = R 750

6. Study the shopping mall map below and answer the questions that follow:



a) What would you expect to be able to do in shop 148?

b) How many 'baby changing rooms' are there on the lower level and where are they?

c) Describe how you would get from Entrance 4 to Truworths.

d) Near which entrance would you park if you wanted to shop at Shoprite Checkers and Ackermans?

e) What would be a good meeting point for you and your friends? Explain your answer.

f) Give three reasons why you would assume that this is a multi-level shopping centre.

Solution:

a) Collect or send post.

b) Two - one between shops 106 and 107 (behind Edgars) and the other next to shop 171 and Clicks.

c) Walk straight along the mall. Pass Woolworths and CNA on your left. Follow the mall to the right. Pass the circular stairs and toilets on your right. Truworths with be in front of you, to your left.

d) Entrance 5 is closest to Checkers and Ackermans.

e) Learner-dependent answer, but generally somewhere central and easy to find.

f) There are stairs and an escalator indicated on the map, and the entire map is for the lower level.

CHAPTER 7

Probability

The probability scale

Activity 7 – 1: Becoming familiar with the probability scale

Work in a group to answer the following questions about the probability scale:

1. a) Think about five events that have different chances of happening.
   b) Draw a probability scale with all the word labels written on it.
   c) Discuss where these events should go on the probability scale and come to an agreement in your group. You might find that different people have different ideas about what the words on the scale mean.
   d) Write your five events on this probability scale.

   Solution:

   a) Learners should come up with their own meaningful descriptions here.
   b) Learner-dependent answer.
   c) It is useful for learners to have a discussion about this to help them see that the descriptions are somewhat subjective.
   d) Learner-dependent answer.

2. Place these events on your probability scale:

   a) A one in ten chance of pulling a red T-shirt out of your cupboard without looking.
   b) An 80% chance of rain.
   c) A $\frac{1}{20}$ chance of having twins.
   d) A one in a million chance of being struck by lightning

   Solution:

   a) At 0,1 on the scale.
   b) At 0,8 on the scale.
   c) At 0,05 (unlikely) on the scale.
   d) Close to zero on the scale.

3. Write these probabilities as decimals and as percentages:

   a) $\frac{1}{4}$
   b) $\frac{4}{5}$
   c) $\frac{1}{20}$
   d) $\frac{3}{100}$
   e) $\frac{6}{7}$

Solution:

a) 0,25; 25%

b) 0,8; 80%

c) 0,05; 5%

d) 0,03; 3%

e) 0,86; 86%

4. Discuss whether you think it is easier to describe a probability using a number or a word description.

Solution:

Learner-dependent answer. Encourage learners to discuss the fact that will probably give different answers if they use words, while using a number ensures that everyone has the same understanding.

7.2 Prediction

Games of chance

Activity 7 – 2: Experimenting with games of chance

1. Work in groups to carry out the following experiment and record your results. You will need coins and dice for each group.

Each of you should flip a coin 20 times. Record your results in a tally table like this:

	Tally	**Total**
H		
T		

a) Calculate the relative frequency of Tails, by working out the fraction of 20, the decimal fraction and the percentage.

b) How does this compare to the theoretical probability of 50%?

c) Now put all your results together. Work out the relative frequency of Tails as:

i. a fraction out of 100.

ii. a decimal fraction.

iii. a percentage.

d) Do the combined results get closer to 50% than your results on their own?

e) What was the relative frequency of Heads in each case?

You should find that the relative frequency gets closer to the theoretical probability when you increase the number of throws. Each result is caused by chance, and eventually the experiment will reflect the theoretical chance.

Solution:

a) Learner-dependent answer.

b) Learner-dependent answer. Learners may find it quite confusing that they do not get 50% Tails.

c) i. Learner-dependent answer.

ii. Learner-dependent answer.

iii. Learner-dependent answer.

d) Learner-dependent answer. We expect that a higher number of trials gives an answer closer to 50%. Allow plenty of time for a class discussion about this.

e) Learner-dependent answer. Some learners may realise that the frequency of Heads will be complementary to the frequency of Tails (the two totals together equal 1 or 100%).

2. a) What is the theoretical probability for each outcome when you throw a dice? In other words, what fraction describes how often you expect to get each number?

b) Draw up a table for all the possible outcomes for throwing a dice.

c) Throw the dice 50 times and keep a tally of the results.

d) Calculate the relative frequency of each outcome.

e) How do the answers in d) compare to the expected probability in a)?

Solution:

a) $\frac{1}{6}$

b) Learner-dependent answer.

c) Learner-dependent answer.

d) Learner-dependent answer.

e) Learner-dependent answer. Here again, learners will see that the frequency is different to the actual probability.

It is very important that learners actually do these practical tasks (and the others in the chapter). If learners struggle with probability, it helps them to develop an intuitive understanding of the concepts.

Activity 7 – 3: More games of chance

1. Most dice are cubes, which means that they have six identical faces. It is also possible to get dice with different numbers of faces. As long as all of the faces are the same shape and size, the dice should still be fair.

The photograph below shows some dice with 8 faces.

a) List the possible outcomes when throwing one of these dice.
b) What are the theoretical chances of throwing a "7" on one of these dice?
c) Is it more likely that you will get an even number on these dice than on normal 6-sided dice? Explain.

Solution:

a) 1; 2; 3; 4; 5; 6; 7; 8
b) 1 in 8 or 12,5% or 0,125
c) The chance is the same, as there are the same number of even numbers and odd numbers on each type of dice.

2. Work in two groups to carry out a new probability experiment. Colour in some paper disks red and blue. One group should make 8 red disks and 4 blue disks. The other should make 4 red disks and 4 blue disks.

   a) Put the disks into a closed box or bag and take turns to draw a disk out and note down which it is. (Remember to put the disk back each time.)
   b) Draw up a table and record your results.
   c) Write a few sentences to describe the difference in the two groups' results.

Solution:

a) Learner-dependent answer.
b) Learner-dependent answer.
c) Learner-dependent answer.

7.3 Fair and unfair games

Activity 7 – 4: Fair and unfair games

1. In this activity you need to invent fair and unfair games. Invent your two games using a single dice. You must explain clearly how a person can win the game. Make:

   a) a fair game.

b) an unfair game.

Solution:

a) Learner-dependent answer.

b) Learner-dependent answer.

2. Write a paragraph explaining how your games work.

Solution:

Learner-dependent answer.

3. Which of these games is more likely to be used by a person who is planning to make a lot of money out of the game? Why?

Solution:

Learner-dependent answer.

7.4 Single and combined outcomes

Activity 7 – 5: Calculating combined outcomes

1. Look at the table given for all the possible outcomes for tossing two coins.

	H	**T**
H	H, H	H, T
T	T, H	T, T

a) How many possible outcomes are there altogether?

b) How many possible outcomes are there for getting two Heads (H; H)?

c) What is the probability of getting two Heads?

d) Is the probability of getting two Heads the same as the probability of getting two Tails?

e) How many possible outcomes are there for getting one Heads and one Tails, in any order?

f) Is the probability of getting one Heads and one Tails greater or smaller than the probability of getting two Heads? Explain your answer.

Solution:

a) Four possible outcomes.

b) One possible outcome.

c) 1 in 4 or $\frac{1}{4}$

d) Yes.

e) There are two ways of getting this: H; T or T; H.

f) It is twice as likely to get one Heads and one Tails, because there are two possible ways of getting this and only one way of getting H; H.

2. A bag contains 5 balls: 2 red (R) and 3 blue (B). In a game of chance, a learner takes a ball out of the bag without looking, notes down the colour, and then puts it back into the bag. The learner then takes out another ball, notes down the colour and puts it back into the bag.

   The two-way table shows all of the possible outcomes for this game.

	R	**R**	**B**	**B**	**B**
R	R; R	R; R	B; R	B; R	B; R
R	R; R	R; R	B; R	B; R	B; R
B	R; B	R; B	B; B	B; B	B; B
B	R; B	R; B	B; B	B; B	B; B
B	R; B	R; B	B; B	B; B	B; B

   a) How many possible outcomes are there?
   b) How many of the events represent getting R and then B?
   c) Use your list to say what the probability of getting R and then B is.
   d) What is the probability of drawing blue twice?

   Solution:

   a) 25
   b) 6
   c) $\frac{6}{25}$
   d) There are 9 possible outcomes out of 25, so the probability is $\frac{9}{25}$.

3. In a game of chance, learners toss two coins, a R 1 coin and a R 2 coin.

   a) Draw up a two-way table to show all the possible outcomes.
   b) How many possible outcomes are there altogether?
   c) How many of the events are two Heads (H; H)?
   d) In how many of the events is there only one Heads?
   e) How many of the events are two Tails (T; T)?

   Solution:

	H	T
H	H; H	T; H
T	H; T	T; T

   a) There are four possible outcomes.
   b) One of the outcomes is (H; H).
   c) Two of the outcomes have one H only.
   d) One of the outcomes is (T; T).

7.5 Weather predictions

Activity 7 – 6: Working with weather predictions

1. Try to find three different weather forecasts for your area. Listen to weather reports on the radio, watch them on the television and read them in newspapers. Collect information for a week about the predicted temperatures and the predicted rainfall.

   Solution:

   Learner-dependent answer.

2. Keep a record of what the weather is actually like on the day and note whether it was different or similar to the predicted weather.

   Solution:

   Learner-dependent answer.

3. If a weather prediction was very different from the weather that you experienced in reality, explain why this could have happened.

   Solution:

   The prediction is based on past experience with similar weather conditions, and is not always correct.

4. Explain how weather forecasters use past data about the weather to predict the weather.

   Solution:

   Weather forecasters look at the weather characteristics (temperature, pressure, humidity, etc.) and compare it to their accumulated data about weather patterns. Then they make a prediction based on this.

5. If a weather forecast says there is a 80% chance that it will rain in your area, does that mean that you will definitely see rain? Is there a chance that it will not rain where you are? Explain.

   Solution:

   Forecasters know that it rained on 80% of the days in the past with similar weather conditions, but they can only state a probability, not exactly what will happen. There is also a 20% probability of no rain.

Activity 7 – 7: Weather predictions

1. When one enters some games reserves and national parks in South Africa managed by SA National Parks you will find a sign in the form of a pie chart indicating the risk of a fire occurring in the park that particular day. Look at the picture of

one of these fire risk pie charts and determine what weather predictions the fire risk probability is based upon.

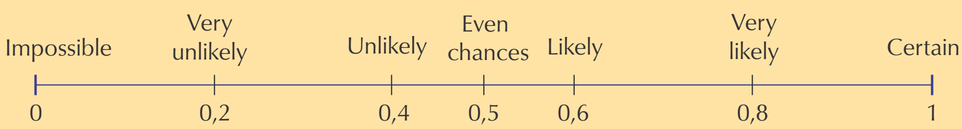
Solution:

The fire risk probability depends on different aspects of the weather - primarily the probability of rain and high wind speeds. For example, if it has been very dry, and it is predicted that it will be windy, the risk of fire increases. If there is a 90% chance of rain predicted, the risk if fire is reduced.

7.6 End of chapter activity

Activity 7 – 8: End of chapter activity

1. On a the probability scale below choose the which words best describe the probability of each of the following events:



Learners' answers to this kind of activity will differ, as some learners will put more weight on the very slight chance that something will happen, while others will say that things that have a very remote possibility of happening are impossible. Encourage learners to discuss their choices.

a) The chance of visiting Mars.
b) The sun rising tomorrow morning.
c) Getting snow in the Kruger National Park in December.
d) The chance of getting rain in the Sahara Desert.
e) The chance of throwing Heads on a coin.

Solution:

a) Learner-dependent answer.
b) Learner-dependent answer.
c) Learner-dependent answer.
d) Learner-dependent answer.
e) Learner-dependent answer.

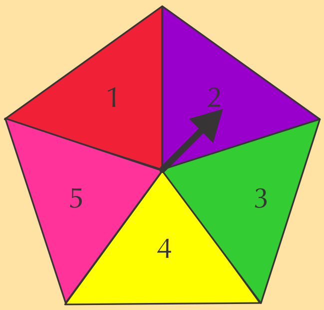
2. Fill in the numbers in this table to show probabilities in different number formats.

Fraction (simplest form)	Decimal fraction	Percentage
$\frac{3}{4}$	0,75	
	0,3	
		10%
		90%
$\frac{1}{8}$		

Solution:

Fraction (simplest form)	Decimal fraction	Percentage
$\frac{3}{4}$	0,75	75%
$\frac{3}{10}$	0,3	30%
$\frac{1}{10}$	0,1	10%
$\frac{9}{10}$	0,9	90%
$\frac{1}{8}$	0,125	12,5%

3. Look at the five-sided spinner shown in the diagram. When we spin the arrow, it has an equal chance of landing in each triangle, because they are all the same size.



Answer the following questions:

a) List all the possible outcomes for getting an even number.
b) List all the possible outcomes for getting an odd number.
c) Is there an equal chance of getting an odd number and an even number? Explain.
d) How could you use this spinner to design an unfair game of chance?

Solution:

a) 2; 4
b) 1; 3; 5

c) No, there is a higher chance of getting an odd number, because there are more possible outcomes for odd numbers.

d) The game would be unfair if a player has a small chance of winning, for example, if they win only if they get five. It would also be unfair if they win only if they get an even number.

4. a) Draw a tree diagram with the first set of branches showing the possible outcomes for spinning the spinner in question 3. Then add the outcomes for a coin toss to each of the branches.

b) How many possible outcomes are there altogether?

c) How many outcomes are there for getting a 4; H?

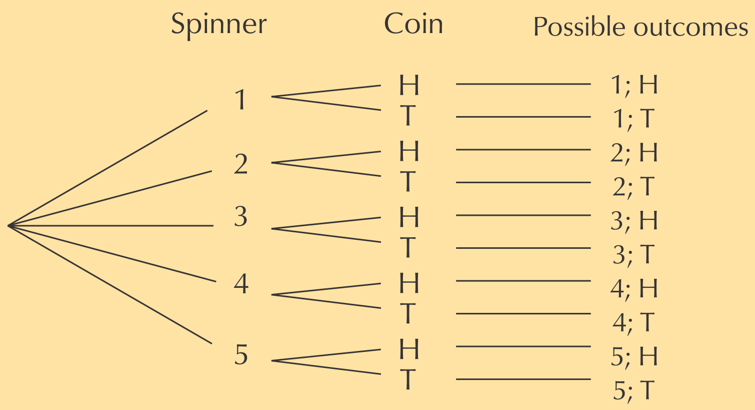
d) What is the probability of getting a 4; H?

e) How many outcomes are there for getting an even number and Heads? List them.

f) What is the probability of getting an even number and Heads?

Solution:

a)



b) Ten

c) Only one.

d) One in ten or $\frac{1}{10}$

e) Two: 2; H and 4; H

f) The probability is 2 in 10, which simplifies to 1 in 5 or $\frac{1}{5}$

CHAPTER 8

Personal income, expenditure and budgets

8.2 Personal income and expenditure

Income

Activity 8 – 1: Personal income

1. Read the paragraph below and identify all Petrus's sources of income. Classify each source of income as fixed, variable or occasional.
   Petrus has just started his first job and he earns a basic salary as a sales representative, and also receives allowances for cell phone and travel. He also gets paid commission every three months on the sales that he makes. He has started a small music band and he sometimes gets asked to play at events such as birthday parties and weddings, where he negotiates his hourly fee.

   Solution:

   Fixed: basic salary, allowances for cell phone and travel. Variable: commission. Occasional: hourly fee for band performances.

2. You are currently in Grade 10 and in order to earn extra money you accept a job at a Spur restaurant as a waiter. You work the following shifts per month:

   - Four Friday shifts per month for 5 hours. Friday rate/hour = R 20
   - Four Saturday shifts per month for 10 hours. Saturday rate/hour = R 30
   - Two Sunday shifts per month for 8 hours. Sunday rate/hour = R 40
   - Estimated tips earned per month = 1,5 × your monthly salary.

   Calculate your total income for one month.

   Solution:

   Total Income earned = [(4 × 5) × R 20 + (4 × 10) × R 30 + (2 × 8) × R 40]
   = [R 400 + R 1200 + R 640] = R 2240 / month

Expenditure

Activity 8 – 2: Personal expenditure

1. You decide to spend your income in the proportions shown below:

Clothes	30%
Entertainment	10%
Savings	10%
Charitable organisations	25%
Transport	12%
13%	
Total:	100%

If you earn an income of R 1200 in a particular month, calculate exactly how much money you will be spending on each of the above items.

Solution:

Clothes	$30\% \times$ R 1200 $=$ 0,30 $\times$ R 1200 $=$ R 360
Entertainment	$10\% \times$ R 1200 $=$ 0,10 $\times$ R 1200 $=$ R 120
Savings	$10\% \times$ R 1200 $=$ 0,10 $\times$ R 1200 $=$ R 120
Charitable organisations	$25\% \times$ R 1200 $=$ 0,25 $\times$ R 1200 $=$ R 300
Transport	$12\% \times$ R 1200 $=$ 0,12 $\times$ R 1200 $=$ R 144
Sweets and cool drinks	$13\% \times$ R 1200 $=$ 0,13 $\times$ R 1200 $=$ R 156
Total:	100% $=$ R 1200

8.3 Personal budgets, and income and expenditure statements

Monthly budgeting

Activity 8 – 3: Managing a personal monthly budget

Jacob is a young man in his first job. He earns a salary of R 5900. He has the following expenses:

Rent	R 1500
Clothing	R 260
Water and lights	R 280
Satellite TV subscription	R 280
Taxi transport	R 900
Groceries	R 940
Cell phone contract	R 99
Magazines	R 180
Instalment on DVD player	R 350
Bank charges	R 52
Entertainment	R 580
Medicine	R 120

1. Classify each item of his expenses as high priority or low priority.

Solution:

High priority: Rent, water and lights, groceries, taxi transport, bank charges, medicine, cell phone contract, instalment on DVD player. Low priority: Clothing, satellite TV subscription, magazines, entertainment.

2. Calculate the total cost of his variable expenses.

Solution:

Variable expenses include clothing, water and lights, taxi transport, groceries, magazines, entertainment. So: R 260 + R 280 + R 900 + R 940 + R 180 + R 340 + R 580 = R 3480

3. Jacob has no savings plan and lives just within his income.

   a) Write down a few things that could happen that would make him unable to live within his income.

   b) What expenses could he reduce to help him to save up for unforeseen expenses?

Solution:

   a) His rent could increase. The cost of his medicine may increase. The cost of taxi transport could increase.

   b) He could reduce his spending on clothing, entertainment and magazines, and possibly cancel his satellite subscription.

4. Suppose now that Jacob earns R 6500 each month. He could choose to buy a flat screen TV on hire purchase but he still owes R 2000 on the DVD player. What would you advise him to do?

Solution:

Jacob should finish paying for the DVD player before he acquires more debt.

Budgeting for particular items or events

Activity 8 – 4: Understanding a budget

1. Study the budget below and answer the questions that follow:
Sam is currently in Grade 12 and he works part-time at Checkers Hypermarket to earn money. Sam's monthly budget is as follows:

Budget	Expenditure	Income
Earnings from Checkers		R 800
Allowance from parents		R 200
Transport	R 80	
Food	R 160	
Entertainment	R 200	
Clothes	R 180	
Unforeseen expenses	R 100	
Interest received from fixed account deposits		R 50

Investment in fixed account	R 100	
Present for girlfriend	R 100	
Total	R 920	R 1050
Surplus or deficit	Income - Expenditure	R 1050 - 920 = 130

a) Estimate what fraction of total expenditure he plans to spend on clothes.

b) Now express your answer for the previous question as a percentage.

c) Estimate as a fraction of total income the amount of money he earns at Checkers. Express it as a percentage of total income.

Solution:

a) The fraction of total expenditure to be spent on clothes $= \frac{180}{920} = \frac{9}{46}$

b) $\frac{9}{46} \times 100 = 19{,}56\%$

c) $\frac{800}{1050} = \frac{16}{21}$, and as a percentage of the total income $= \frac{16}{21} \times 100 = 76{,}19\%$

2. Thando and Lisa are thinking of going on a planned adventure hike. They find the following advertisement from a company who arrange hikes.

Normal cost is R1 800.
Trip leaves on Friday 21 September,
returns on Sunday 23 September.
Price includes transport, tents, meals, SANParks fees
and maybe a free stone from the summit if you make it to the top!
Hikers need to have a moderate fitness level
as the hike is about 40 km long.

Additional costs over and above the quoted price include:
- **Equipment hire** (if you don't have any hiking equipment.) for R25 per item per day.
  We supply tents and cooking equipment, gas, etc. however, you will need a sleeping bag, a sleeping mat and a rucksack (backpack).
  We do not hire out clothing. It's a good idea to check out our proposed equipment list as well as our advice on proper layering.
- **Breakfast** on the way there, in Harrismith
- **Lunch** on the way back, in Harrismith
- **Drinks** after hike

Draw up a budget for both of them, assuming that they do not have any equipment of their own.

Solution:

Learner-dependent answer, but all the costs listed in the advertisement must be included.

3. Douglas wants to travel from Cape Town to Durban to visit his cousin. His parents said that they can give him R 500 towards the trip. He decides to draw up a budget to determine how much money the trip will cost. His uncle has offered to give him a lift home so he only needs to budget for the trip to Durban. He has R 2000 saved in his bank account. He wants to have some spending money left over when he gets there.

   He phones Rainbow Buses to find out how much it costs to travel from Cape Town to Durban. They give him two options:

   OPTION 1: Leave Saturday morning and travel straight to Durban. The trip costs R 1200 and he will need to pay for 3 meals at R 30 per meal

   OPTION 2: Leave Saturday morning and travel to Plettenberg Bay first. The trip costs only R 400. He can then catch a bus on Sunday morning to Durban. This bus trip will cost R 500. If he does this he needs to find a place to stay on Saturday night and budget for three extra meals (estimated at R 30 each). He estimates that a Backpackers' Lodge would be the cheapest place to stay, at R 200 a night.

	Income	**Expenses**	**Running total of money that he has**
Money from parents			
Savings			
Bus fare			
Meals on bus			
Accommodation			

   a) Copy the above budget sheet and fill in the amounts for income and expenses in the correct columns for:

      i. Option 1.

      ii. Option 2.

   b) Would you advise Douglas to take Option 1 or Option 2? Explain your answer.

Solution:

a) **OPTION 1:**

	Income	**Expenses**	**Running total**
Money from parents	500		500
Savings	2000		2500
Bus fare		1200	1300
Meals on bus		$3 \times 30 = 90$	1210
Accommodation		0	1210

OPTION 2:

	Income	Expenses	Running total
Money from parents	500		500
Savings	2000		2500
Bus fare		400 + 500 = 900	1600
Meals on bus		$6 \times 30 = 180$	1420
Accommodation		200	1220

b) Although the bus fare for Option 2 was cheaper the costs are quite similar in the end. Option 1 is much more convenient and is quicker, so he should choose this option.

8.4 The difference between budgets and statements

Activity 8 – 5: Understanding a statement

1. Consider the previous activity, where Douglas planned to travel to Durban. He eventually decided to travel to Durban using bus Option 1. He kept all the receipts and till slips so that he could write a statement to see how much money he actually spent. Read the following summary of Douglas's bus trip:

   When Douglas arrived at the bus station to buy the ticket, he finds that the advertised price did not include VAT, and he needs to add 14% to the cost. To add to his problems, the bus breaks down and Douglas needs to find a place to stay the night in Knysna. He finds a backpackers' lodge that costs R 200 a night for a shared room. He also needs to rent a locker for R 20 to keep his luggage safe. He needs to buy both supper and breakfast, which cost him R 30 each.

   a) Fill in a table like the one used for his budget, to show his actual expenses. You may need more rows in the table.

Expenses	Amount	Running total

   b) What is the amount of money he ends up with as spending money in Durban? (Remember: he had R 2500 to begin with).

Solution:

a)

Expenses	Amount	Running total
Bus Fare	R 1200 + R 168 VAT	R 1468
Meals on bus	R 90	R 1558
Backpacker's accomodation	R 200	R 1758
Locker	R 20	R 1778
Meals	R 30 $\times$ 2 = R 60	R 1838

b) He has R 2000 saved and receives R 500 from his parents. R 2500 - R 1838 = R 662 to spend in Durban.

2. A household has the following monthly expenses:

- rent R 2300;
- transport R 520;
- cell phone R 200;
- pre-paid electricity R 800;
- water bill R 350;
- TV contract R 250;
- loan repayment R 310;
- furniture store account R 570;
- clothing store account R 315;
- groceries R 2500;
- medical expenses R 75

They live on the following monthly income: a state pension of R 1140, a disability grant of R 1140 and a salary of R 5250. This month, one of the children falls ill and they have additional medical expenses of R 500 for doctor's visits and medication.

a) Draw up a statement for the household for this month.

b) What is the total difference between the income and expenses?

c) Which costs could be reduced in their budget?

d) If those costs were reduced, would the family have enough money to cover their expenses?

e) What advice would you give the family? Write down two suggestions.

Solution:

a)

	Income	**Expenses**
State pension	R 1140	
Disability grant	R 1140	
Salary	R 5250	
Rent		R 2300
Transport		R 520
Cell phone		R 200
Pre-paid electricity		R 800
Water bill		R 350
TV contract		R 250
Loan repayment		R 310
Furniture store account		R 570
Clothing store account		R 315
Groceries		R 2500
Medical expenses		R 75 + R 500 = R 575
Total	**R 7530**	**R 8690**

b) R 8690 - R 7530 = R 1160 more for expenses than they receive in income.

c) Water and electricity usage could be reduced, the furniture and store accounts could be paid off and closed, and grocery expenses could be reduced.

d) Probably. They aren't thousands of Rands over budget so a series of small reductions across their expenses would bring their expenses in line with their income.

e) Learner-dependent answer, but examples include reducing water and electricity consumption and paying off and closing the clothing and furniture store accounts.

8.6 End of chapter activity

Activity 8 – 6: End of chapter activity

1. Chuma writes down the following percentages for each of the items in her budget:

Clothes	40%
Entertainment	30%
Fixed savings account	10%
Transport	5%
Donations	5%
Tuck shop spending	10%
Total	100%

If she has earned an income of R 500 in a particular month, calculate exactly how much money she can allocate to each of the above items.

Solution:

Clothes: R 200, Entertainment: R 150. Fixed savings account: R 50. Transport: R 25. Donations: R 25. Tuck shop spending: R 50.

2. Amanda budgeted her monthly expenses as follows:

Clothes	25%
Entertainment	40%
Transport	10%
Tuck shop spending	15%
Donations	5%
Unforeseen costs	5%
Total	100%

If she has R 1800 to spend this month, how much money can she allocate to each expenditure item?

Solution:

Clothes: R 450. Entertainment: R 720. Transport: R 180. Tuckshop spending: R 270. Donations: R 90. Unforeseen costs: R 90.

3. Look at the family budget for the month of December 2013, for the Philander family. There are two adults and two children (both in school) in the family.

Item	**Expenditure**		**Income**	**Total income less total cost**
	Fixed	Variable		
Mrs Philander's salary			R 9500	
Mr Philander's salary			a)	
Additional income			b)	
Bond repayment	c)			
Food		d)		
Edgars clothing account payment	e)			
School fees	f)			
Transport		g)		
Entertainment		h)		
Savings	i)			
Car repayment	R 1300			
Municipality rates	j)			
Electricity	R 200	k)		
Vodacom contract cost	l) i.	l) ii.		
Telkom account	m) i.	m) ii.		
Total	?	?	?	?
Surplus or deficit?				?

Complete the above budget of the family by calculating the following:

a) Mr Philander's income: He works 20 days per month at a rate of R 500 per day.

b) Additional income: Mr Philander owns additional property which he hires out to people at a fixed charge of R 2500 per month.

c) The monthly bond repayments are fixed at R 5550 per month.

d) The average amount spent on food each month comes to R 2500. Mrs Philander believes that this should be increased by 10% due to recent food price increases.

e) Mr Philander pays Edgars an amount of R 800 per month,. However, since he bought his children their school uniforms on account, he estimates that this amount will increase by a further 12%.

f) The school fees are R 1200 per child per month.

g) Transport costs are as follows: For the children: taxi fare per child = R 5,00 per trip to school and another R 5,00 each for the trip home. There are 20 school days in a month. Mr Philander first drives his wife to work and then goes to work himself. In the evenings he would pick her up and then drive home again. They both work 20 days per month. Mr Philander has noticed that his car uses an average of 4 litres of petrol per day each time he does this. On the other 10 days of the month, his car uses an average of 3 litres per day. The cost of petrol is R 10,50 per litre. Calculate the total amount that should be budgeted for transport.

h) The amount budgeted for entertainment is estimated at 5% of the combined income of Mr and Mrs Philander.

i) Savings are currently 5% of Mrs Philander's income.

j) The amount budgeted for municipal rates is 5% of the total income earned by the Philander household.

k) The fixed component of the electricity account is currently R 200 per month. The variable component is calculated as follows:The average amount of electricity consumed by the Philander household is 550 kilowatt hours per month at a rate of R 0,50 per kilowatt hour.

l) Vodacom contract cell phone account:

  i. **Fixed component**: R 135 per month

  ii. **Variable component**: R 0,80 per minute of airtime used during peak time. An average of 100 minutes of airtime per month is used during peak time. Off peak minutes are charged at a rate of R 0,40 per minute. An average of 200 minutes per month is used during this time.

m) Telkom account:

  i. **Fixed component** is R 400 per month.

  ii. **Variable component:** R 0,50 per minute during normal time. An average of 350 minutes is spent each month on the phone during this time. Call more time is calculated at R 7 per night. The children use the phone an average of 20 nights per month during this time.

n) Is the Philander family within budget? Explain your answer.

Solution:

a) $20 \times$ R 500 = R 10 000

b) R 2500

c) R 5500

d) R 2500 + R 250 = R 2750

e) R 800 + R 96 = R 896

f) R 1200 $\times$ 2 = R 2400

g) Taxi fare: R 10 per day $\times$ 2 children $\times$ 20 days = R 400. Petrol: (20 $\times$ 4 litres $\times$ R 10,50) + (10 $\times$ 3 litres $\times$ R 10,50) = R 840 + R 315 = R 1155

h) Total salaries = R 19 500. 5% of this is R 975.

i) 5% of R 9500 = R 475.

j) Total income = salaries + additional income = R 19 500 +R 2500 = R 22 000. 5% of this is R 1100.

k) (550 $\times$ R 0,50) =R 275

l) i. R 135

  ii. (100 $\times$ R 0,80) + (200 $\times$ R 0,40) = R 160

m) i. R 400

  ii. (350 $\times$ R 0,50) + (R 7 $\times$ 20) = R 315.

n) The total for fixed expenses is R 12 456. The total for variable expenses is R 5630. So the total for all expenses is R 18 086. The total income for the household is R 22 000, so yes - they are within budget, because their income is greater than their total expenditure and they have a surplus of money.

CHAPTER 9

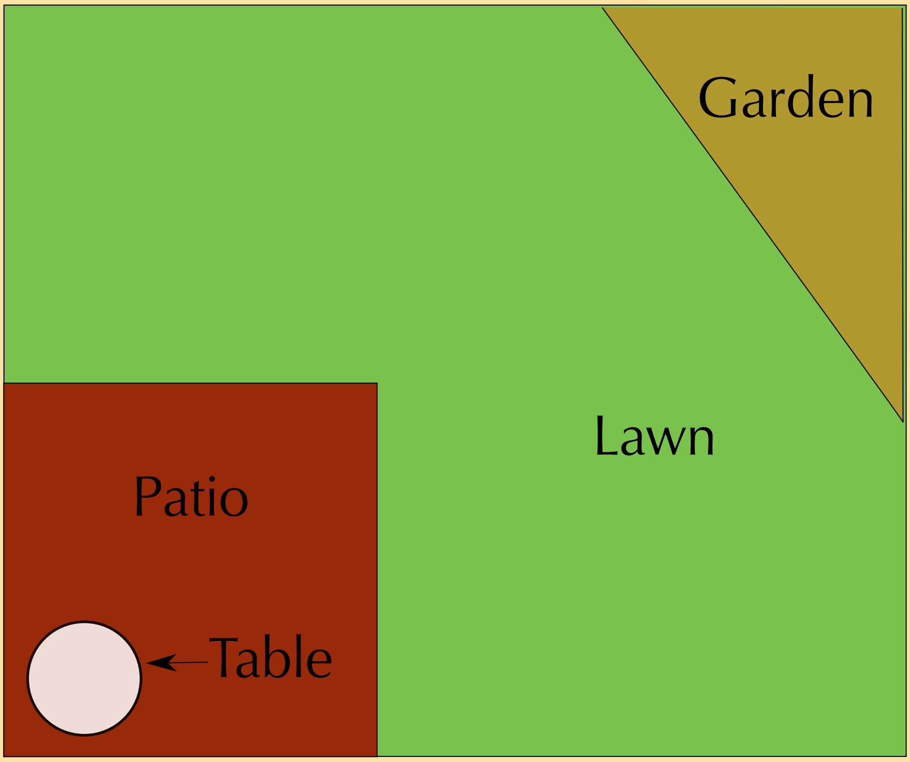
Measuring perimeter and area

9.2 Measuring perimeter

Estimation and direct measurement of perimeter

Activity 9 – 1: Measuring and estimating perimeter

1. Study the diagram below and answer the questions that follow:



a) Before Mr Dlamini builds his fish pond, he decides he wants to make the patio smaller. Using a ruler, measure the new perimeter of the patio on the diagram (in cm)

b) Mrs Dlamini decides it might be better to build her vegetable garden on the right of the garden because that area gets more sun. Using a ruler, measure the perimeter of the new triangular garden on the diagram (in mm).

c) Mrs Dlamini also buys a new, circular table for the patio. Using a piece of string and a ruler, estimate the circumference of the table (in mm).

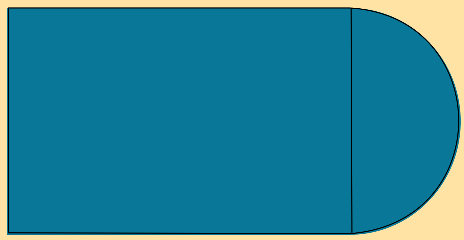
Solution:

a) Perimeter $= 5$ cm $+ 5$ cm $+ 5$ cm $+ 5$ cm $= 20$ cm

b) Perimeter $= 40$ mm $+ 55$ mm $+ 68$ mm $= 163$ mm

c) Circumference ≈ 47 mm.

2. Mr Dlamini has two options for the design of his new fish pond. The second option is shown below. Using a ruler and string, measure the dimensions of the new pond (on the diagram) in cm.



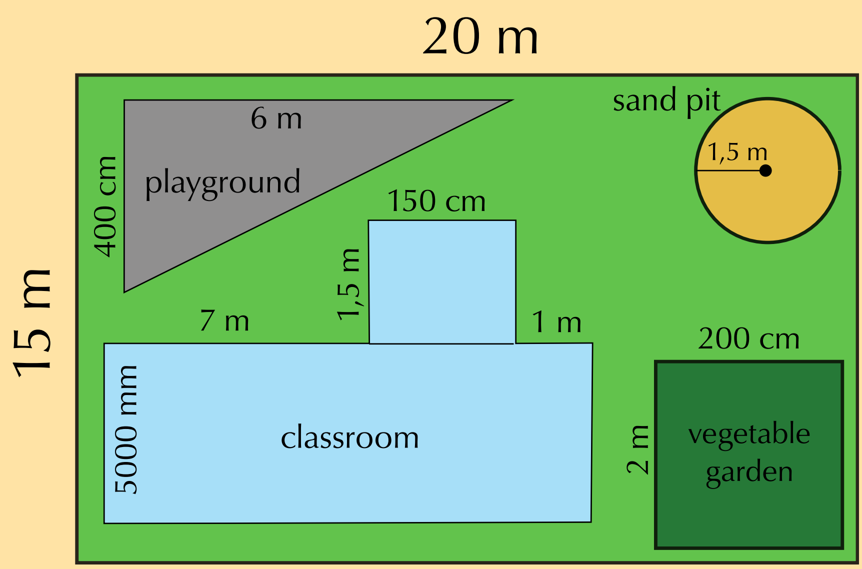
Solution:

Perimeter = (3 sides of rectangle) + half circle ≈ (4,5 cm + 3 cm + 4,5 cm) + 4,5 cm = 16,5 cm

Using formulae to calculate perimeter

Activity 9 – 2: Using formulae to calculate perimeter

The Inkathalo Nursery School is doing some renovations and improvements to their property. They want to build some new walls and fences and paint some walls, but they need your help calculating the perimeter of these objects so they can calculate how much the improvements are going to cost. They give you a diagram of their school as shown below (**not** drawn to scale). Using the appropriate formula, answer the following questions:



1. Calculate the following perimeters (in metres):

   a) The playground.

b) The classroom.

c) The vegetable garden.

d) The sand pit (Round your answer to two decimal places).

e) The entire property (the large, light green rectangle).

Solution:

a) Perimeter triangle = length + length + length = 400 cm + 6 m + 7,2 m = 4 m + 6 m + 7,2 m = 17,2 m

b) Perimeter = sum of sides = 7 m + 1,5 m + 150 cm + 1,5 m + 1 m + 5000 mm + (1 m + 1,5 m + 7 m) + 5000 mm = 7 m + 1,5 m + 1,5 m + 1,5 m + 1 m + 5 m + 9,5 m + 5 m = 32 m

c) Perimeter square = 4 × side = 4 × 2 m = 8 m

d) Circumference = $\pi \times (2\times$ radius$) = \pi \times (2 \times 1{,}5$ m$)$ = 3,142 × 2 × 1,5 m = 9,426 m $\approx$ 9,43 m

e) Perimeter rectangle = 2 × length + 2 × width = (2 × 20 m) + (2 × 15 m) = 40 m + 30 m = 70 m

2. The school decides to build a low wall around the playground, which they want to paint. They know that 1 ℓ of paint will cover a 50 cm long piece of the wall.

   a) How many litres of paint do they need to buy?

   b) If paint is only sold in 2,5 ℓ tins, how many tins of paint do they need to buy?

   Solution:

   a) Perimeter of playground is 17,2 m. 17,2 ÷ 0,5 m = 34,4 litres of paint.

   b) 34,4 litres ÷ 2,5 litres = 13,76. So they need to buy 14 tins of paint.

3. The school wants to put a new fence around the vegetable garden. They find fencing that is available in 1,5 m long segments.

   a) How many segments will they need to buy in order to fence in the vegetable garden?

   b) If each segment costs R 145,50, how much will the fencing cost them?

   Solution:

   a) 8 m ÷ 1,5 m = 5,333. They can't buy a third of a segment so they will have to buy 6 segments.

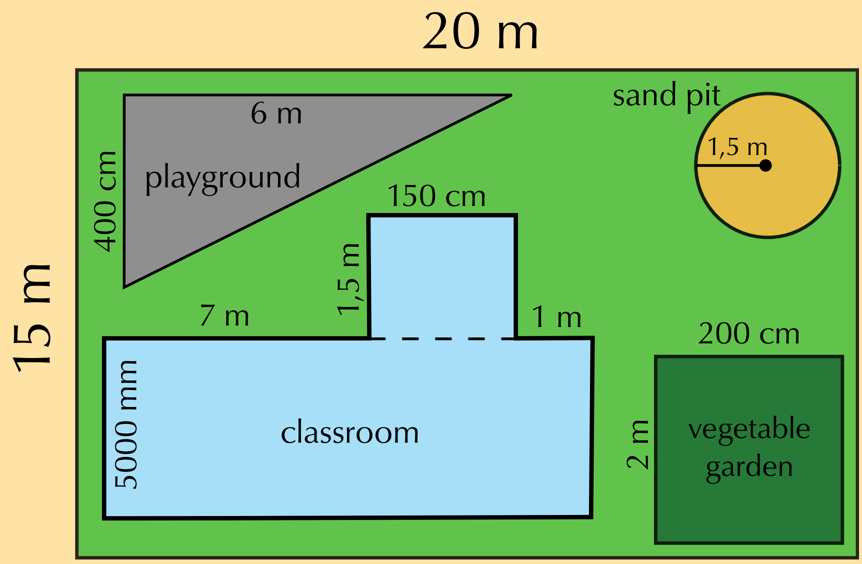
   b) 6 × R 145,50 = R 873.

9.3 Measuring area

Using formulae to calculate area

Activity 9 – 3: Using formulae to calculate area

You did such a good job helping the Inkathalo Nursery School with their perimeter measurements that they ask you to help them with area calculations too. They are planning further major improvements for the school, including new sand, compost for the vegetable garden and carpets in the school building. Using the measurements given on the diagram of the school (**not** drawn to scale), and using an appropriate formula, answer the questions that follow:



1. The school decides to replace the gravel in the playground.
   a) Calculate the area of the playground in m^2.
   b) If one bag of gravel will cover 1,5 m^2, how many bags will they need to buy?

Solution:

a) $\frac{1}{2}$ base $\times$ height $= \frac{1}{2} \times$ 6 m 4$\times$ 4 m $=$ 12 m^2

b) 12 $m^2 \div$ 1,5m^2 $=$ 8 bags

2. The school also needs to order new sand for the sandpit.
   a) Calculate the area of the sandpit in m^2
   b) If one big bag of sand will cover 1 m^2, how many bags do they need to buy?
   c) If a bag of sand costs R 60,75, how much will the sand cost them?

Solution:

a) Area $= \pi r^2 = \pi(1,5 \text{ m})^2 = 7,07 \text{ m}^2$

b) $7{,}07 \div 1{,}5 = 4{,}713$ bags. So they will have to buy 5 bags.

c) $5 \times$ R 60,75 = R 303,75

3. The school's gardener decides that they also need buy compost for the vegetable garden.

   a) Calculate the area of the vegetable garden in m^2.

   b) If half a bag of compost will cover 1 m^2 of garden, how many bags do they need to buy?

Solution:

a) Area $= 2 \text{ m} \times 2 \text{ m} = 2 \text{ m} \times 2 \text{ m} = 4 \text{ m}^2$

b) 1 bag.

4. The gardener decides to plant rows of lettuce seedlings in his newly composted garden.

   a) If each row is 2 m long and 50 cm wide, and they are planted right next to each other, how many rows can he plant in the vegetable garden?

   b) If one row of lettuce seeds costs R 12,95, how much will the seeds cost in total?

   c) If the gardener leaves 1 m^2 of space in which to plant carrots, what percentage of the total area of the vegetable garden will be taken up by carrots?

Solution:

a) $2 \text{ m} \div 50 \text{ cm} = 2 \text{ m} \div 0{,}5 \text{ m} = 8$. He can plant 8 rows of seedlings.

b) $8 \times$ R 12,95 = R 103,60

c) Total area $= 16 \text{ m}^2$. $1 \text{ m}^2 \div 16 \text{ m}^2 = 0{,}0625$. $0{,}0625 \times 100 = 6{,}25\%$

5. Lastly, the school decides they want to tile the floor of the classroom.

   a) Calculate the total floor area of the classroom.

   b) The tiles cost R 73,49 per square metre. How much will the tiling cost in total?

Solution:

a) Area = Area rectangle + area square $= (5 \text{ m} \times (7 + 1{,}5 + 1{,}5 \text{ m})) + (1{,}5 \times 1{,}5 \text{ m}) = 50 \text{ m}^2 + 2{,}25 \text{ m}^2 = 52{,}25 \text{ m}^2$

b) $52{,}25 \text{ m}^2 \times$ R 73,49 = R 3839,85

6. The school is renting the property for R 10 000 a month.

   a) Calculate how much they are paying each month, per metre^2 of property.

   b) How much is the school's rent for 1 year?

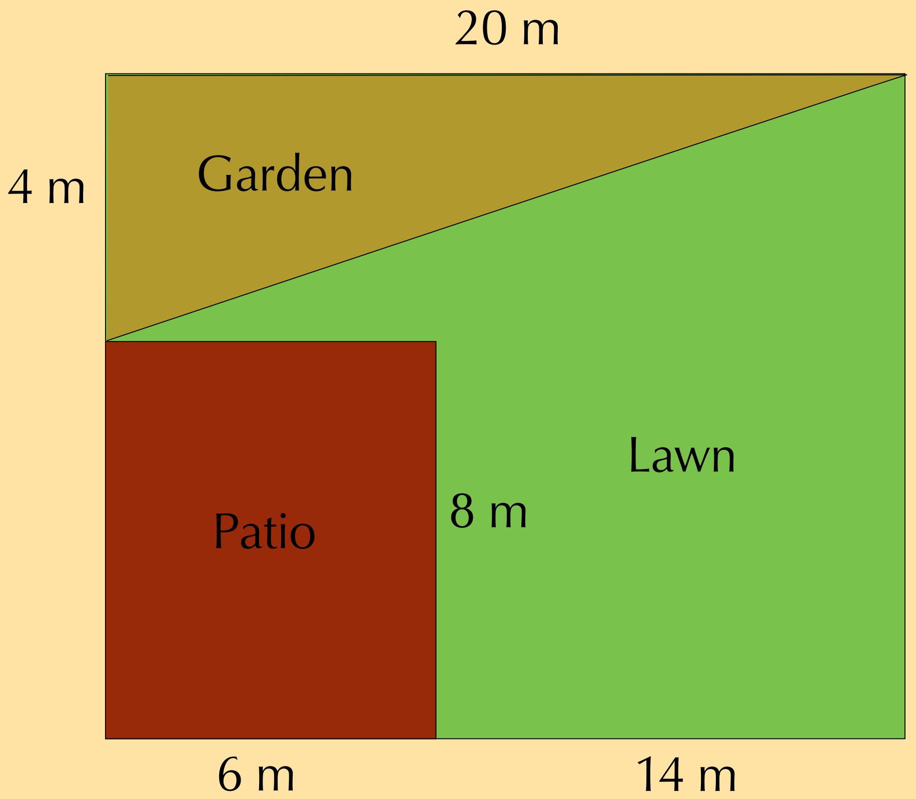
Solution:

a) Area of entire property $= 15 \text{ m} \times 20 \text{ m} = 300 \text{ m}^2$. R 10 000 $\div 300 \text{ m}^2 =$ R 33,33 per m^2

b) R 10 000 $\times$ 12 months = R 120 000

Activity 9 – 4: End of chapter activity

1. Mr and Mrs Dlamini need to make a final decision about their garden and what they are prepared to spend. The diagram below (**not** drawn to scale) shows what their garden currently looks like, with the lawn, patio and garden.



a) Calculate the area of the property, in metres squared. Use the following formula: Area = length × width.

b) Calculate the area of the garden (indicated on the diagram) using the following formula: Area = $\frac{1}{2}\times$ base × perpendicular height.

c) What percentage of the area of the whole property is the triangular garden? Express your answer as a whole number.

Solution:

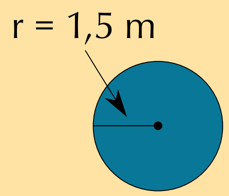
a) Area = (20 m) × 4 m + 8 m) = 20 m × 12 m = 240 m^2

b) Area = $\frac{1}{2}\times$ 20 m × 4 m = 40 m^2

c) $\frac{40}{240}$ = 0,16666. 0,16666 × 100 = 16,67%

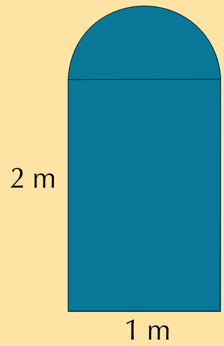
2. Mr Dlamini still has not decided on a shape for his new fish pond.

a) One option is for Mr Dlamini to install a circular fish pond with a radius of 1,5 m, as shown in the diagram:



Calculate the area of this pond in metres squared, using the formula: Area $= \pi \times$ radius^2, where $\pi = 3{,}142$.

b) The alternative design for the fish pond, as we have already seen looks as follows:



Using the dimensions given on the diagram above, calculate the area of the other possible fish pond using the formulae Area $= \pi \times$ radius^2 and Area $=$length $\times$ width, where $\pi = 3{,}142$.

c) How does your answer to b) compare to the area of the circular fish pond that we calculated in a)? Which shape of fish pond should Mr Dlamini choose if he is worried about the pond taking up too much space in his garden? Give reasons for your answer.

Solution:

a) Area $= 3{,}142 \times (1{,}5 \text{ m})^2 = 7{,}07 \text{ m}^2$

b) Area $=$ area rectangle $+$ area semicircle $= (2 \text{ m} \times 1 \text{ m}) + \frac{1}{2}(\pi \cdot (1 \text{ m})^2) = 2 \text{ m} + 1{,}57 = 3{,}57 \text{ m}^2$

c) The second design is much smaller than the first. If he is concerned that the pond will be too large, he should decide on the second shape.

3. Mr Dlamini is concerned that his dog will try to climb into the fish pond once it's built. He will need to put a fence around the fish pond. He has still not decided which style of fish pond he wants to build. He decides to get quotes from a fencing company called "Fence-Me-In". They give him the following information:

   a) Labour costs: R 549,99 for the whole project

   b) 1 metre of fencing costs R 29,99.

   Calculate the total cost for each style of pond.

   Solution:

   Pond shape 1 (circle): cost $=$ Labour $+$ fencing price $\times$ perimeter $=$ R 549,99 $+$ (R 29,99)($2\pi \times 1{,}5$ m) $=$ R 549,99 $+$ R(29,99)(9,426 m) $=$ R 549,99 $+$ R 282,69 $=$ R 832,68.

   Pond shape 2: Cost $=$ Labour $+$ fencing price $\times$ perimeter $=$ R 549,99 $+$ (R 29,99)(2 m $+$ 1 m $+$ 2 m $+ \frac{1}{2} \times 2 \times \pi \times$ 1 m) $=$ R 549,99 $+$ (R 29,99)(5 m $+$ 3,142 m) $=$ R 549,99 $+$ R 244,18 $=$ R 794,17

4. Based on your answers to Questions 2 c) and d), which style of fish pond do you think Mr Dlamini should choose? Give reasons for your answer.

Solution:

Learner-dependent answer, but based on his concern about the size of the pond he should choose the second design - it's cheaper to fence too.

5. The Dlamini's are also wanting to redo the paving of the patio, and replace the bricks with cobblestones. The actual dimensions of the patio are as follows: length = 6 m and width = 8 m.

   a) If the dimensions of **one** cobblestone is 10 cm by 10 cm, how many cobble stones will be needed to pave the patio? (Hint: convert all units to be the same!)

   b) Cobblestones are sold in batches of 200. How many batches will be needed to be bought?

   c) If one batch costs R 129,99, what will be the **total** cost of the cobblestones?

Solution:

   a) Area of patio $= 6 \text{ m} \times 8 \text{ m} = 48 \text{ m}^2$. Area of cobblestone $= 0{,}1 \text{ m} \times 0{,}1 \text{ m} = 0{,}01 \text{ m}^2$. $48 \div 0{,}01^2 = 4800$ cobblestones.

   b) $4800 \div 200 = 24$ batches of cobblestones.

   c) $24 \times$ R 129,99 = R 3119,76

6. Sam's uncle works for a company that puts up safety fences around swimming pools, and nets over swimming pools. He must calculate how much fencing and netting they need for each of the swimming pools shown below. The fencing is always 1 metre away from the swimming pool. For each swimming pool below, calculate:

   i. the perimeter of the swimming pool

   ii. the length of fencing needed

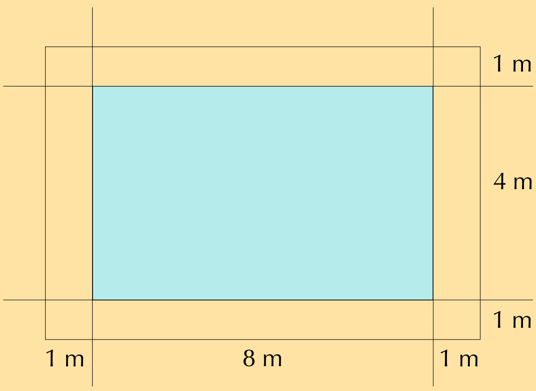
   iii. the area of the swimming pool (the area of netting needed)

   iv. the cost of the fence at R 250,00 per metre

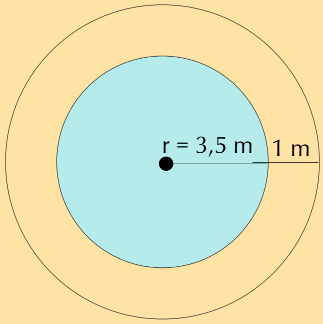
   v. the cost of the netting at R 199,99 per m^2.

   Round all of your answers to two decimal places.

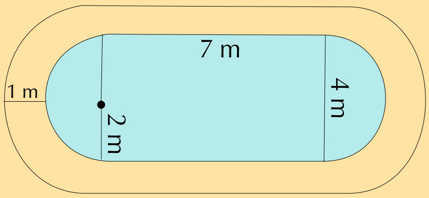
   a)



b)



c)



Solution:

a) i. Perimeter of pool = 2 × (8 m + 4 m) = 24 m

ii. Length of fencing = 2 × (10 m + 6 m) = 32 m

iii. Area of pool = 8 m × 4 m = 32 m^2

iv. Cost of fence = R 250,00 × 32 m = R 8000

v. Cost of netting = R 199,99 × 32 m^2 R 6399,68

b) i. Perimeter of pool = $2\pi r$ = 2 × 3,142 × 3,5 = 21,99 m

ii. Length of fencing = 2π(4,5 m) = 28,28 m

iii. Area of pool = πr^2 = 3,142 × $(3{,}5 \text{ m})^2$ = 38,49 m^2

iv. Cost of fence = R 250,00 × 28,28 m = R 7070

v. Cost of netting = R 199,99 × 38,49 m^2 = R 7697,62

c) i. Perimeter of pool = 2(perimeter of semi-circles) + length of 2 rectangular sides = (perimeter one circle with radius 2 m) + 2(7 m) = 2π(2m) + 14 m = 12,568 m + 14 m = 26,57 m

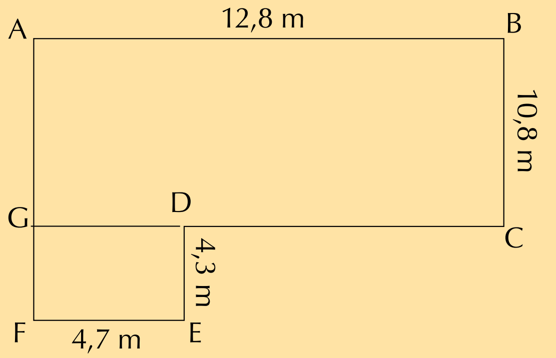
ii. Length of fencing = 2(perimeter of semi-circles) + length of 2 rectangular sides = (perimeter one circle with radius 4 m) + 2(7 m) = 2π(4m) + 14 m = 25,136 m + 14 m = 39,14 m

iii. Area of pool = Area rectangle + 2(area semi-circles) = Area rectangle + (area cricle radius 2 m) = (7 m × 4 $textm$) + $(\pi(2)^2)$ = 28 m^2 + 12,568 m^2 = 40,57 m^2

iv. Cost of fence = R 25,00 × 39,14 m = R 9785

v. Cost of netting = R 199,99 × 40,57 m^2 = R 8113,59

7. Below is the plan of Phumza's property. Homeowners pay rates to the municipality which are calculated according to the area of the property.



a) Calculate the area of this house. Round your answer to the nearest whole metre.

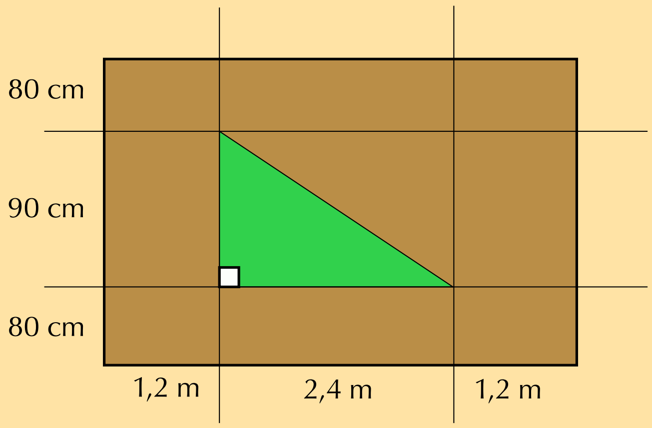
b) The basic municipal rate is calculated using the following formula:
R 15,05 per m^2 of the property per year.
What would Phumza's **monthly** rate bill be?

Solution:

a) Area $=$ (Area small rectangle) $+$ (area big rectangle) $=$ ($4,7$ m $\times$ $4,3$ m) $+$ ($10,8$ m $\times$ $12,8$ m) $=$ $20,21$ m^2 $+$ $138,24$ m^2 $=$ $158,45$ m^2

b) Rate per year $=$ Area $\times$ R $15,05$ $=$ $158,45$ m^2 $\times$ R $15,05$ $=$ R $2384,6725$ per year. Per month $=$ R $2384,6725 \div 12$ $=$ R $198,72$ per month.

8. Lebo wants to put paving around her new, triangular vegetable garden as shown in the diagram:



a) What is the area of the vegetable garden in metres squared?

b) What is the area of the paving, in metres squared? (excluding he vegetable garden!)

c) If the paving is going to cost R 24,65 per metre squared, how much will the total cost of the paving be?

d) Lebo wants to build a fence around her garden. To do this, she needs to calculate the perimeter of the triangular garden. Is this possible with the information provided in the diagram? Explain your answer.

Solution:

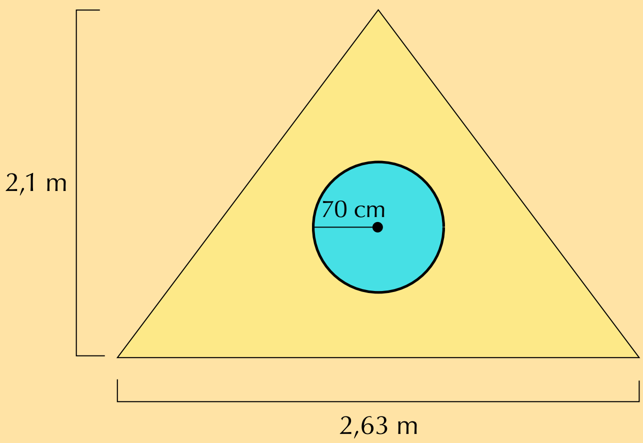
a) Area $= \frac{1}{2}(2,4 \text{ m})(90 \text{ cm}) = \frac{1}{2}(2,4)(0,9 \text{ m}) = 1,08 \text{ m}^2$

b) Area = (Area of rectangle) - (area of triangle) = [(80 + 90 + 80 cm) × (1,2 + 2,4 + 1,2 m)] - 1,08 m^2 = [2,5 m × 4,8 m] - 1,08 m^2 = 12 m^2 -1,08 m^2 = 10,92 m^2

c) 10,92 m^2 × R 24,65 = R 269,18

d) No. We do not know the length of the third side of the triangle so we cannot calculate the perimeter.

9. As a decorative feature, Jan builds a round window into the attic of his house.



a) Jan needs to paint the triangular wall around the window. What is the area of the triangular piece of wall in m^2? (Use the formula: Area = $\frac{1}{2}$× base × height)

b) Assume it takes 1 litre of paint to cover 0,5 m^2 of wall. How many litres of paint will Jan need to buy?

c) If the hardware store only sells paint in 2 litre tins, how many tins will Jan need to buy?

Solution:

a) Area of triangle = $\frac{1}{2}$× base × height = $\frac{1}{2}$(2,63 m)(2,1 m) = 2,76 m^2

b) 2,76 m^2÷ 0,5 m^2 = 5,52 litres of paint

c) 5,52 ÷ 2 = 2,76 tins. He cannot buy 0,76 of a tin, so he will have to buy 3 tins.

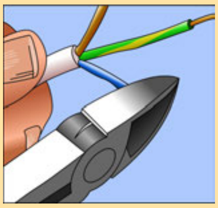
CHAPTER 10

Assembly diagrams, floor plans and packaging

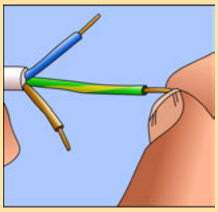
10.2 Assembly diagrams

Activity 10 – 1: Wiring a plug

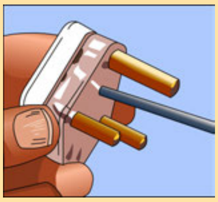
Study the assembly instructions given below to wire a plug and answer the questions that follow.



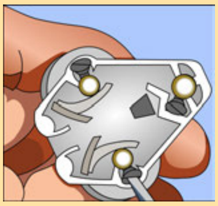
1. Using pliers, carefully bare the ends of the three wires inside the electrical cord for about half a centimeter, by cutting away the plastic insulation.



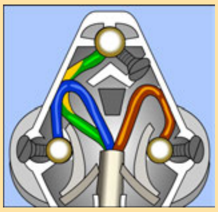
2. Gently twist the strands of copper wire with your fingers until each strand is tight.



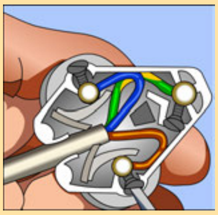
3. Remove the new plug cover by either "snapping" it open or unscrewing it.



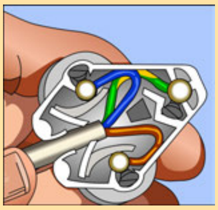
4. Unscrew the little screws on each of the plug's prongs.



5. Insert the twisted copper wires into the holes in the prongs. The green and yellow wire must **always** be inserted into the top (largest) prong.
The blue wire is inserted into the left prong (sometimes marked with a blue spot or the letter N).
The brown wire is inserted into the right prong (sometimes marked with a brown spot or the letter L)



6. Tighten the little screw on each of the plug's prongs.



7. Make sure the electrical cord is firmly gripped by the arrester clips at the bottom of the plug.

8. Replace the cover of the plug.

1. What colour wire must be inserted into the top prong?

   Solution:

   The green and yellow wire.

2. What colour wire must be inserted into the left prong?

   Solution:

   The blue wire.

3. What colour wire must be inserted into the right prong?

   Solution:

   The brown wire.

4. What is the main difference between a 2 prong plug and a 3 prong plug?

   Solution:

   A 2 prong plug only has two wires, unlike a 3 prong plug, which has 3 wires. A two prong plug is also not earthed.

5. Why do you think it important to wire an electrical appliance correctly?

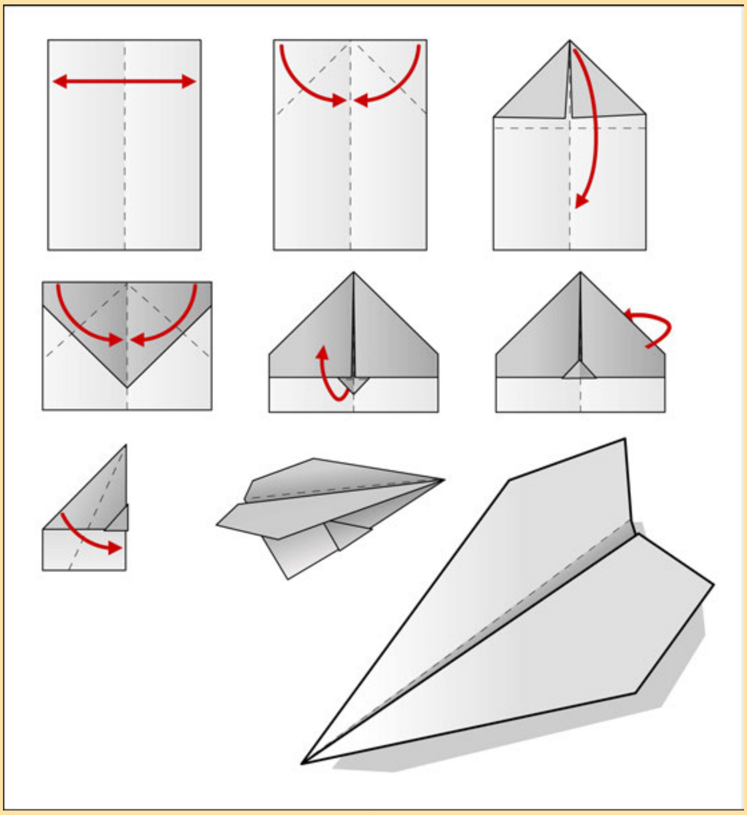
   Solution:

   Appliances that aren't wired correctly can short, and shock you if you touch them. This can be fatal!

Once the learners have completed the questions based on this activity's assembly instructions, we suggest giving a demonstration of how to wire a plug in class. Only undertake this if you are confident to do so, however. Any demonstration must be accompanied with an explanation to the learners of the dangers involved in working with electrical wires (for example, the appliance must be unplugged before you open the plug!)

Activity 10 – 2: Making a paper glider

In a group, follow the instructions given below to make a paper glider and answer the questions that follow.



1. For each step, write down a description of what you had to do.

   Solution:

   Learner-dependent answer but descriptions should be clear and concise.

2. Write down one advantage and one disadvantage of instructions without words.

   Solution:

   Advantage: you don't have to translate the instructions into another language. Disadvantage: Sometimes words can add meaningful explanations to the instructions, so pictures only can be less easy to understand.

3. Do all the paper gliders made by your class look the same? What could have been added to the diagrams to ensure that they all look the same?

   Solution:

   Learner-dependent answer.

4. Can you think of a better design for a paper glider? Experiment with your glider and see if there are other ways you could assemble it.

   Solution:

   Learner-dependent answer.

5. Write assembly instructions and draw diagrams to explain how to make your new and improved paper glider.

Solution:

Learner-dependent answer.

You will need to provide paper in class for this activity. The objective is for the learners to describe the visual steps given and to master the technique shown, as well as to experiment with assembling. They also need to write and draw their assembly instructions/diagrams for a new and improved model.

10.3 Floor plans

Understanding floor plan layout

Activity 10 – 3: Understanding floor layout

1. The following diagrams show two different kitchen layouts. The arrows on the diagrams indicate the movements required to cook dinner, which includes meat, vegetables, a starch (potatoes or rice) and a salad.

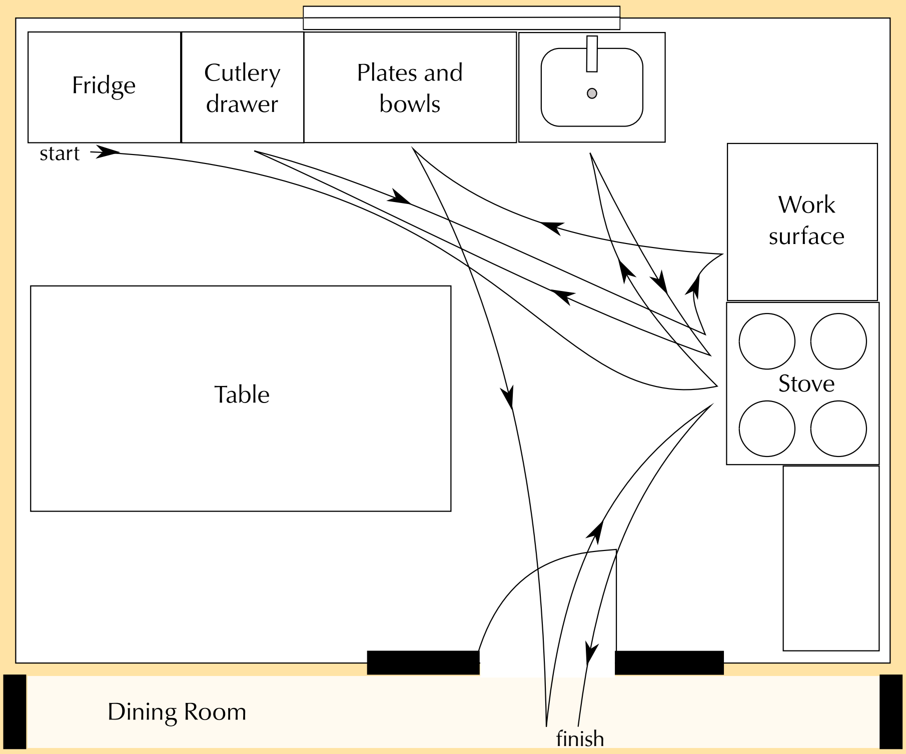


Figure 10.1: Diagram 1

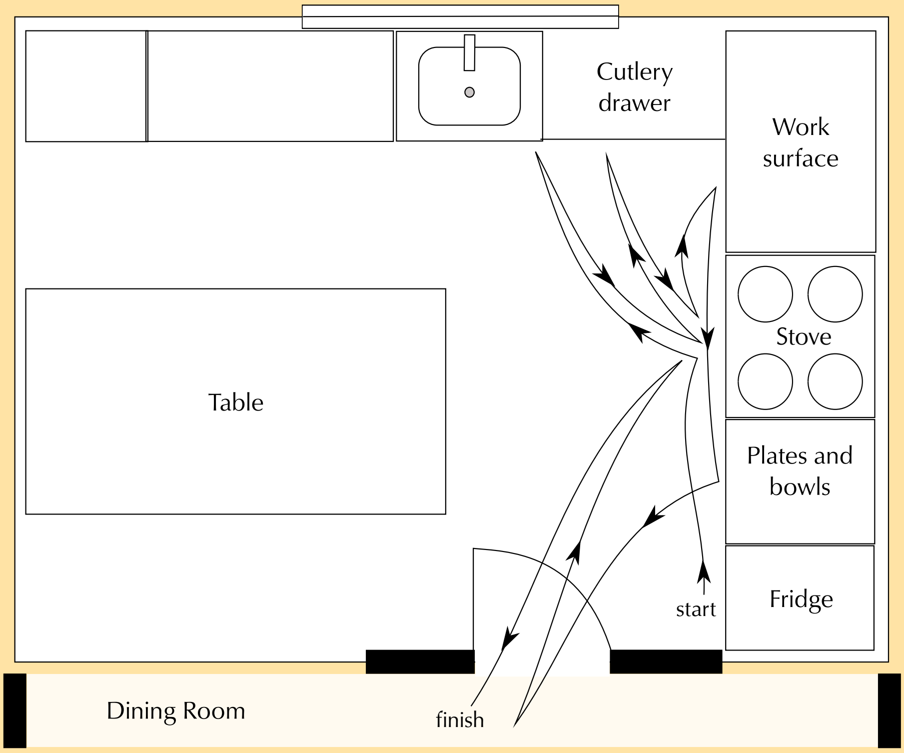


Figure 10.2: Diagram 2

a) Compare the direction that the door opens for Diagram 1 and Diagram 2. Why would the direction that the door opens in be better in Diagram 2 than in Diagram 1?

b) Why is the stove not placed under the window in either diagram?

c) Which layout is better when you are cooking food? Give reasons for your answer.

d) Which layout is better when you are washing dishes and cleaning up after dinner? Give reasons for your answer.

e) Design your own kitchen that will keep the distance you have to walk to a minimum when cooking and cleaning up. Your kitchen has to have the same elements in it as are found in the diagrams.

Solution:

a) In Diagram 1 the stove is almost behind the open door, so every time a person turns around from the stove, they will be bumping into the door.

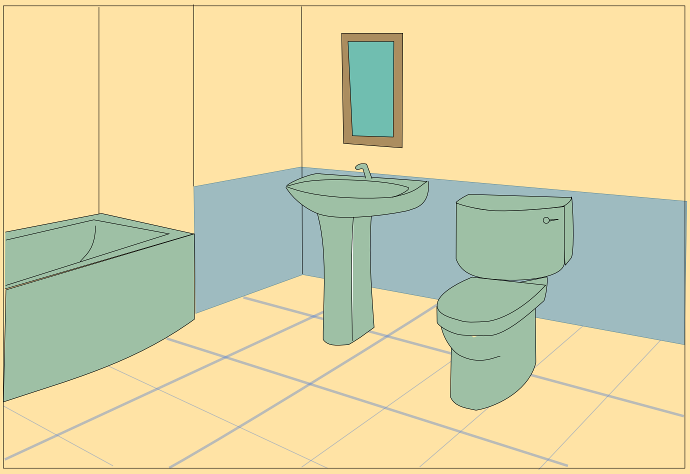
b) If there are curtains or blinds over the window this could become a fire hazard if something cooking on the stove caught alight.

c) Diagram 2: The fridge and work surface are close to the stove.

d) Diagram 1: the area for plates and bowls is close to the sink so it is easy to put dry dishes away.

e) Learner-dependent answer.

2.

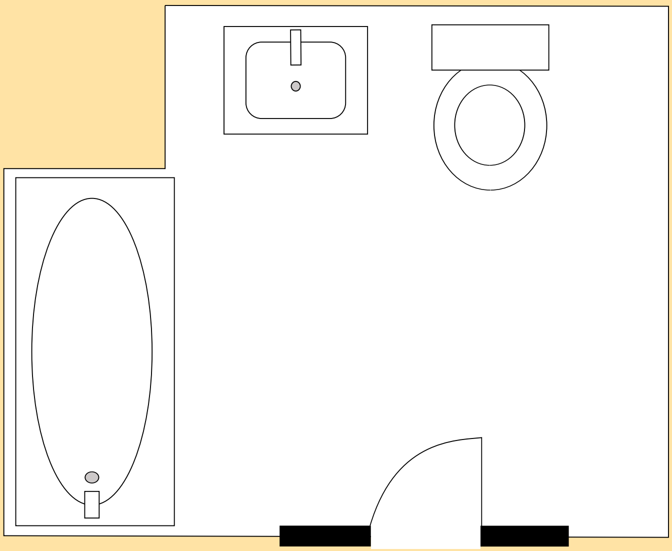


a) Draw a rough floor plan of the room in the illustration. Use the symbols given above at the beginning of this chapter. The plan does not have to be to scale but the relative size of the contents must be accurate. Add a door to your floorplan in any place you think is appropriate.

b) There are no windows shown on the diagram. The two walls that aren't visible in the illustration are inside the house. Where would you place a window? Provide reasons for your answer.

Solution:

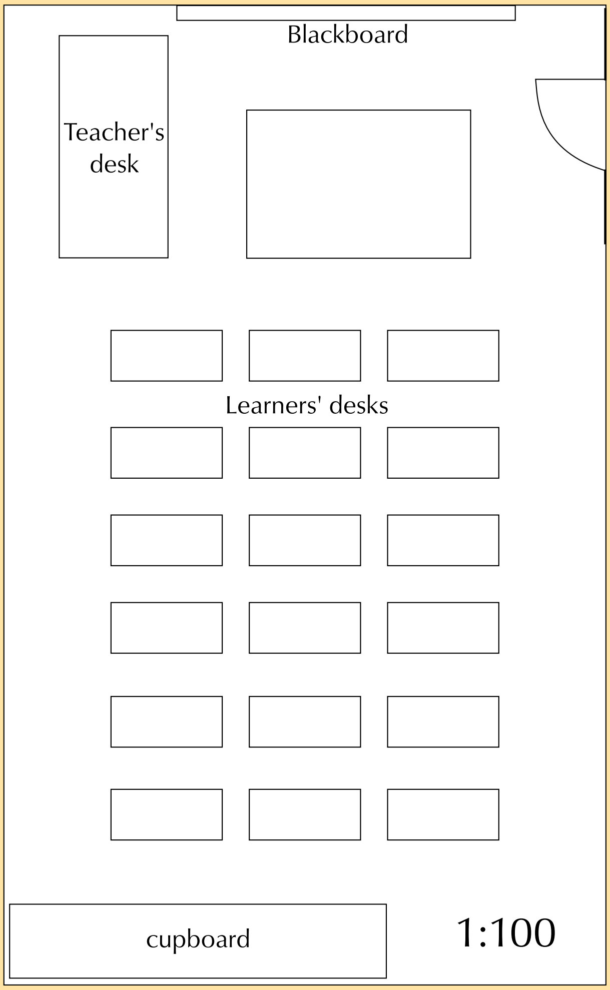
a)



b) Place the window above the bath. The other two walls are inside the house.

Working with scale on floor plans

Activity 10 – 4: Working with scaled floor plans



The diagram shows a classroom that has been drawn with a scale of 1 : 100.

1. Complete the following table:

	Measurement on the plan	Calculation	Measurement in real life
Length of the classroom			
Width of the classroom			
Length of the checkered rug			
Width of the checkered rug			

Solution:

	Measurement on the plan	**Calculation**	**Measurement in real life**
Length of the classroom	13 cm	13×100 cm $=$ 1300 cm	1300 cm$\div$100 cm $=$ 13 m
Width of the classroom	8 cm	8×100 cm $=$ 800 cm	800 cm$\div$100 cm $=$ 8 m
Length of the checkered rug	3 cm	3×100 cm $=$ 300 cm	300 cm$\div$100 cm $=$ 3 m
Width of the checkered rug	2 cm	2×100 cm $=$ 200 cm	200 cm$\div$100 cm $=$ 2 m

2. The teacher wants to replace the checkered rug. Calculate how big the new rug must be in m^2.

   Solution:

   New rug: Area $=$ length $\times$ width $=$ 3 m $\times$ 2 m $=$ 6 m^2

3. If the rug cost R 800 in total, determine the cost per m^2.

   Solution:

   Cost per m^2 $=$ R 800 $\div$ 6 m^2 $=$ R 133,3333... $=$ R 133,33 per m^2

10.4 Packaging and models

Activity 10 – 5: Investigating packaging arrangements

For this activity you will need collect a number cans and at least three boxes of different sizes.

1. Measure the area of the bottom of the boxes, and the diameter of the cans. Using the length and width calculation method from the previous worked example, estimate how many cans you should be able to fit into each box.

   Solution:

   learner-dependent answer

2. Through trial and error find the best way to fit as many cans as possible into each box without damaging either the cans or the box.

   Solution:

   learner-dependent answer

3. Draw a top view of your final packing arrangement.

   Solution:

   learner-dependent answer

4. Compare your layout with the rest of your class.

Solution:

learner-dependent answer

5. Would it have been easier to pack boxes than cans? Motivate your answer.

Solution:

learner-dependent answer

6. How do you know that the cans are cylindrical rather than box-shaped? (Hint: Look at the shapes of the bases.)

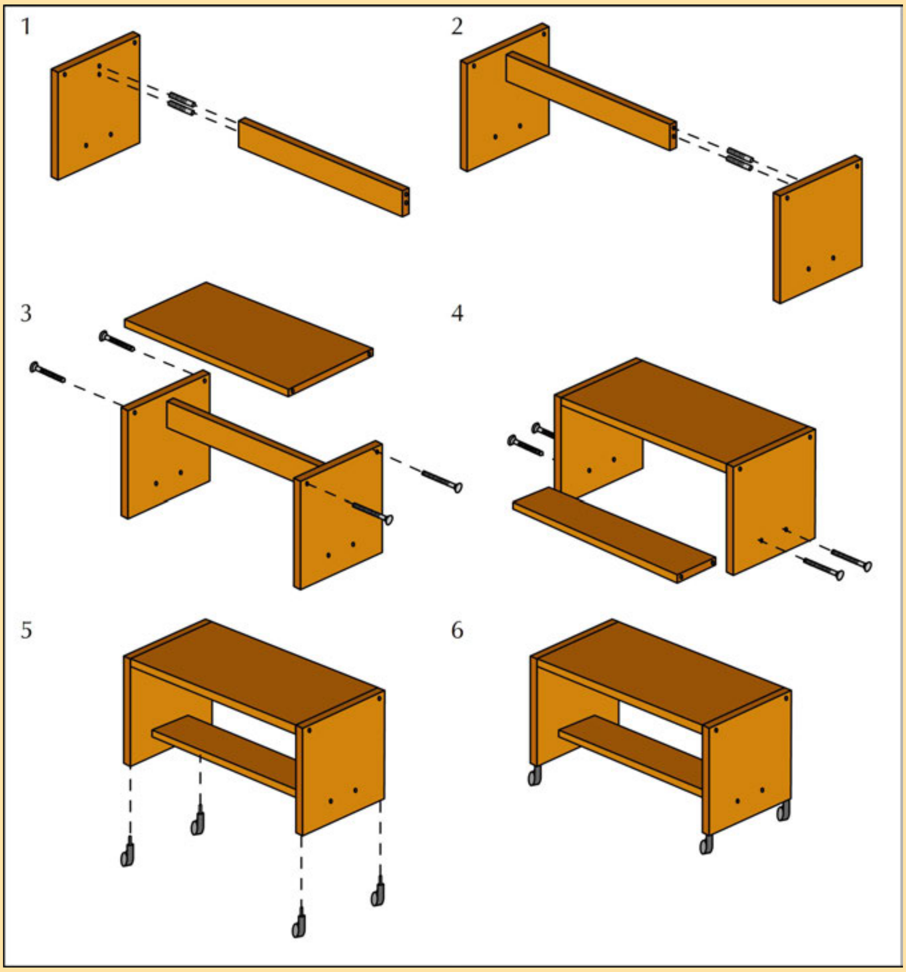
Solution:

learner-dependent answer.

10.5 End of chapter activity

Activity 10 – 6: End of chapter activity

1. Robert buys a new TV cabinet that comes with the following pictoral assembly instructions:



a) How many pieces of wood should Robert expect to find in the box that the cabinet came in?

b) How many wheels should be in the box?

c) If the cabinet did not come with screws, how may screws will Robert need to put the cabinet together?

d) The assembly diagram does not indicate what tools Robert may need. List two tools you think he may need to assemble the cabinet.

e) For each step (1 - 6) give a written description explaining what to do.

f) Could the cabinet be assembled if Robert completes the steps in a different order? Explain your answer.

Solution:

a) 5 pieces

b) 4 wheels

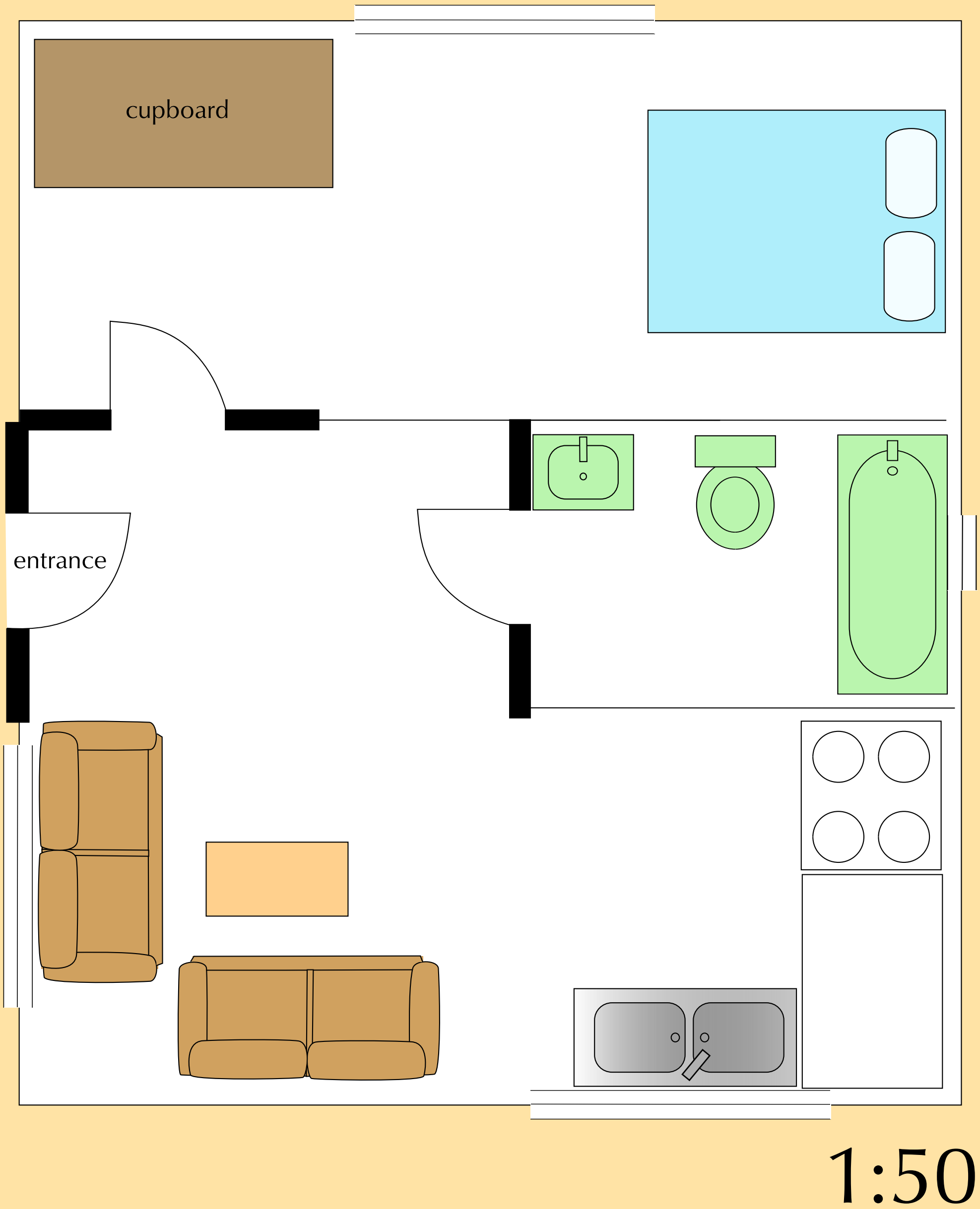
c) 12 screws

d) He will need a screwdriver and possibly a hammer

e) 1. Screw the cabinet top support piece into the left side panel of the cabinet. 2. screw the top support piece into the right side panel of the cabinet. 3. Attach the top of the cabinet to the sides, screwing it in. 4. Slide the bottom piece into the cabinet. Screw it in place. 5. Attach the wheels to the base of the cabinet. 6. The cabinet assembly is complete!

f) Yes. Robert could assemble it in a different order (e.g. he could put the bottom piece in before the top piece) but it will probably be more difficult.

2. You are given the plan below for William's flat.



a) Identify five symbols used on this plan.

b) If the diagram above has been drawn on a scale of 1 : 50, complete the following table showing all calculations:

	Measurement on plan	**Calculation**	**Measurement in real life**
Bath (width)			
Bath (length)			
Main bedroom window (length)			
Kitchen sink (width)			
Bedroom (length)			
Bedroom (width)			

c) William wants to put tiles on the floor in the bedroom. Calculate how many m^2 of tiles he will need.

d) Calculate the cost of the tiles if one box contains 3 m^2 worth of tiles and costs R 120.

e) William's landlord is charging him R 90 per m^2 for the flat. How much is his rent in total?

f) For a birthday present William is given a new couch. The couch is 1,2 m wide and 2,5 m long. Will he be able to fit it through the front door of the flat?

Solution:

a) Stove, kitchen sink, couches, doors, windows, toilet, bath, basin, bed etc.

b)

	Measurement on plan	**Calculation**	**Measurement in real life**
Bath (width)	1,5 cm	1,5 cm × 50	75 cm
Bath (length)	3,5 cm	3,5 cm × 50	175 cm
Main bedroom window (length)	4 cm	4 cm × 50	200 cm
Kitchen sink (width)	3 cm	3 cm × 50	150 cm
Bedroom (length)	12 cm	12 cm × 50	600 cm
Bedroom (width)	5 cm	5 cm × 50	250 cm

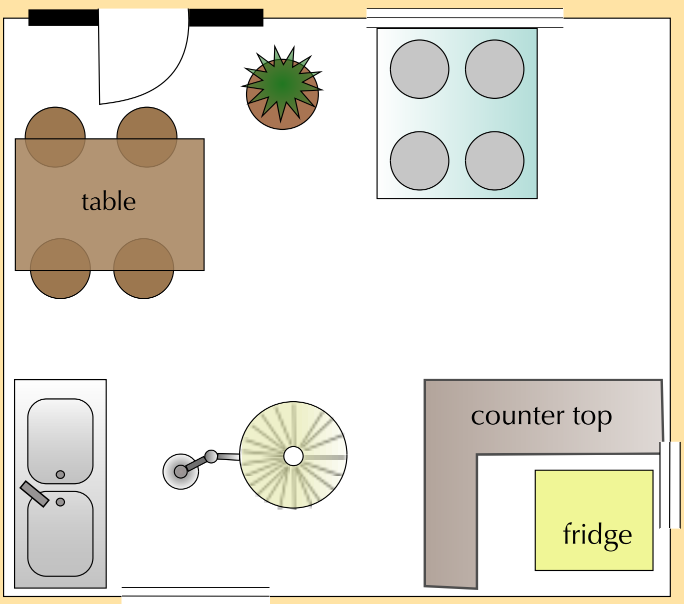
c) Dimensions = 600 cm × 250 cm = 6 m × 2,5 m = 15 m^2

d) 15 m^2 ÷ 3 = 5 boxes. 5 × R 120 = R 600

e) Dimensions of flat = 12 × 15 cm = 50(12 × 50) = 600 cm × 750 cm = 6 m × 7,5 m. So area = 45 m^2. R 90 × 45 m^2 = R 4050

f) Door is 1,5 cm wide. 1,5 × 50 = 75 cm. No - the new couch will not be able to fit through the front door.

3. The following plan is your friend's current layout for their kitchen.



a) Identify five problems with this layout in terms of the placement of the items. Motivate your answer.

b) Redraw the plan with an improved layout. All the elements present in the original diagram must be included in the improved plan.

Solution:

a) The stove is under the window (fire hazard if there are curtains), the door opens into the table and chairs, The fridge is inaccessible, there is a lamp in the middle of the floor and a pot plant in the middle of the floor.

b) Learner-dependent answer, but all the objects in the original diagram must be included and the layout problems must be resolved.

4. You want to post a package to your friend who lives in Botswana. The contents are a brand of chocolate that your friend is struggling to find in the shops where they live. The following diagram shows what the chocolate looks like.

You have to fit as many of the chocolates as possible into a rectangular cardboard box which is twice as long as it is wide.

a) Suggest at least four different ways that these chocolates can be packed. Make a sketch to illustrate each method.

b) The chocolates weigh 100 g each. If the maximum capacity of the cardboard box is 2,5 kg, how many of the chocolates can you pack?

c) If each chocolate costs R 11,99, and you buy enough chocolates to fill the box to it's maximum weight, how much will you spend on chocolates?

d) If the cardboard box cost you R 10,00, and shipping to Botswana costs R 40 per kg, how much will the parcel cost you in total, including the cost of the chocolates? Assume that the box weighs 2,5 kg.

e) What will be easier to pack: cylinders or triangular prisms? Give a reason for your answer.

Solution:

a) There are a number of combinations that can be used (e.g. vertically, horizontally, long side parallel or perpendicular to width of box).

b) 2,5 kg = 2500 g. 2500 ÷ 100 g = 25 chocolates.

c) 25 × R 11,99 = R 299,75

d) Total cost = cost of chocolates + cost of box + cost of shipping = R 299,75 + R 10,00 + (R 40 × 2,5 kg) = R 409,75

e) Triangular prisms are easier to pack because they have flat sides, so there will not be gaps between the chocolates.

CHAPTER 11

Banking, interest and taxation

11.2 Banking accounts and documents

Activity 11 – 1: Understanding a bank statement

Here is an incomplete bank statement for Koketso's savings account at the end of March:

Date	Transaction	Payment	Deposit	Balance
27/02/2013	OPENING BAL			2304,85
1/03/2013	INTEREST ON CREDIT BALANCE		13,95	
1/03/2013	CHEQUE (SALARY)		2100,00	
1/03/2013	ATM CASH	400,00		
5/03/2013	ATM CASH	800,00		
10/03/2013	ATM DEPOSIT		600,00	
22/3/2013	SPENDLESS DEBIT CARD PURCHASE	235,95		

1. How are the debits and credits indicated on this statement?

   Solution:

   As payments (debits) and deposits (credits) respectively.

2. Copy Koketso's statement and complete the balance column as a running total.

   Solution:

Date	Transaction	Payment	Deposit	Balance
27/02/2013	OPENING BAL			2304,85
1/03/2013	INTEREST ON CREDIT BALANCE		13,95	2318,80
1/03/2013	CHEQUE (SALARY)		2100,00	4418,80
1/03/2013	ATM CASH	400,00		4018,80
5/03/2013	ATM CASH	800,00		3218,80
10/03/2013	ATM DEPOSIT		600,00	3818,80
22/3/2013	SPENDLESS DEBIT CARD PURCHASE	235,95		3582,85

3. What is Koketso's balance at the end of March?

   Solution:

   R 3582,95

4. Koketso aims to keep a minimum balance of R 2500 in his account to earn interest. Is he succeeding?

   Solution:

   Yes.

Activity 11 – 2: Calculating banking fees

1. Mia has recently open a Global account at Capital Bank. She is concerned about her monthly bank charges. Use the provided brochure and the list of her account activities for the month of April to answer the questions below:

TRANSACTION	FEE
Monthly fees	
Monthly administration fee	4.50
Mobile banking subscription	FREE
Internet banking subscription	FREE
Cash withdrawals	
Supermarket tillpoints	1.00
Capital bank ATM	4.00
Other ATM	7.00
Balance enquiries	
Mobile banking	FREE
Cashier	FREE
Capital Bank ATM	FREE
Other ATM	4.00
Transfers/Payments/Purchases	
Debit card purchase	FREE
Debit order/recurring payment at branch	3.00
Debit order/recurring payment with internet banking	1.50
Payment to other Capital Bank account at branch	3.00
Payment to other Capital Bank account with internet banking	1.50
Other	
SMS notification	0.40
Statement in branch	3.00
Create, change or cancel recurring payment at branch	4.00
Returned debit order/ recurring payment (stop order)	4.00
Returned early debit order	FREE
Insufficient funds (other ATM)	4.00

The list of Mia's transactions for April is as follows:

Date	Activities	Amounts
1 Apr 2013	Balance of previous month carried forward	R 210,25
1 Apr 2013	Old Mutual Policy x74534: Debit order returned: insufficient funds*	R 254,39
1 Apr 2013	Balance enquiry (mobile)	R 0,00
2 Apr 2013	Davidsons Textiles: Salary deposit*	R 4500,00
2 Apr 2013	Shoprite: Purchases: Debit card*	R 847,21
2 Apr 2013	Shoprite: Cash withdrawal*.	R 250,00
7 Apr 2013	Old Mutual Policy x74534: Branch Payment	R 254,39
15 Apr 2013	Edgars: Purchases: Debit card*	R 149,59
20 Apr 2013	Capital Bank ATM Withdrawal*	R 200,00
23 Apr 2013	Shoprite: municipal account payment*	R 639,00
28 Apr 2013	FNB ATM Withdrawal*	R 500,00
29 Apr 2013	Balance statement at the branch	R 3,00
30 Apr 2013	Monthly Administration Fee	R 4,50

* denotes SMS notification for April

a) How many withdrawals did Mia make during this month?

b) Calculate the amount of money that was spent on monthly shop purchases

c) Use the relevant resources and calculate the amount of bank fees that Mia should pay for April.

d) Suggest how Mia can further reduce her banking charges.

Solution:

a) Three.

b) R 847,21 + R 149,59 = R 995,80

c) Returned debit order: R 4,00. Cash withdrawal at Shoprite: R 1,00. Old Mutual debit order payment at branch: R 3,00. Capital Bank ATM withdrawal: R 4,00. FNB ATM withdrawal: R 7,00. Balance query in branch: R 3,00. Monthly admin fee: R 4,50. 8 SMS notifications: R 3,20. Total: R 29,70

d) She could do away with SMS notifications, only draw cash at tillpoints, make sure her debit orders don't get returned and so on.

2. A bank uses the following formula to calculate the bank charges (transaction fee) on money deposited at a branch (inside the bank): **Transaction fee = R 2,50 + 0,95% of the amount deposited**.

   a) Use the above formula to calculate the bank fees on the following deposits:

      i. R 450

      ii. R 117,35

      iii. R 6 500 000

   b) Use this formula to see if the transaction fee of R 5,59 was correctly calculated from a deposit of R 325.

Solution:

a) i. R 2,50 + R 4,275 = R 6,78

   ii. R 2,50 + R 1,11 = R 3,61

iii. R 2,50 + R 61 750 = R 61 752,50

b) R 2,50 + R 3,0875 = R 5,59. Yes, it was calculated correctly.

3. Calculate the bank fee on the following deposits at the ATM if the transaction fee is R 0,90 for every R 100 (or part thereof) deposited:

   a) R 450
   b) R 637,14
   c) R 3500,05

   Solution:

   a) R 0,90 × 5 parts of R 100 = R 4,50
   b) R 0,90 × 7 parts of R 100 = R 6,30
   c) R 0,90 × 36 parts of R 100 = R 32,40

4. Tumi withdrew R 350 from her savings account, at the ATM. The withdrawal transaction fee is R 2,35 for the first R 100, plus R 1,15 for every additional R 100 (or part thereof). Calculate the bank fee.

   Solution:

   R 2,35 + 3 × R 1,15 = R 5,80

5. The transaction fee of a cash deposit at a branch is R 2,45 + 0,85% of the deposited amount. If Tumi deposits R 875,00 at the bank, calculate the bank charges.

   Solution:

   R 2,45 + (0,85% of R 875) = R 2,45 + R 7,44 = R 9,99

6. Demi wants to withdraw R 750,00 from her savings account at an ATM. The withdrawal transaction fee is R 1,20 for the first R 100 plus R 0,75 for every additional R 100 (or part thereof). Calculate the bank fee.

   Solution:

   R 1,20 + (6 × R 0,75) = R 5,70

7. A bank charges the following fees for cash deposits:

   Bank teller: 2,5% of deposit value

   ATM deposit: R 1 basic + R 1,20 per R 100 or part of R 100

   a) Is it more expensive to go into the bank or to do the transaction at an ATM? Why do you think this is?
   b) Using the formulae given above, fill in the table below to show the transaction fees for the given amounts of money:

Deposit amount (R)	500	1000	1500	2000	2500	3000	3500
Fee at teller							
Fee at ATM							

   c) Plot two graphs of the transaction fees for the different amounts of money given in the table.
   d) Read off the graph: how much money can you save by using an ATM if you need to deposit R 1250?

Solution:

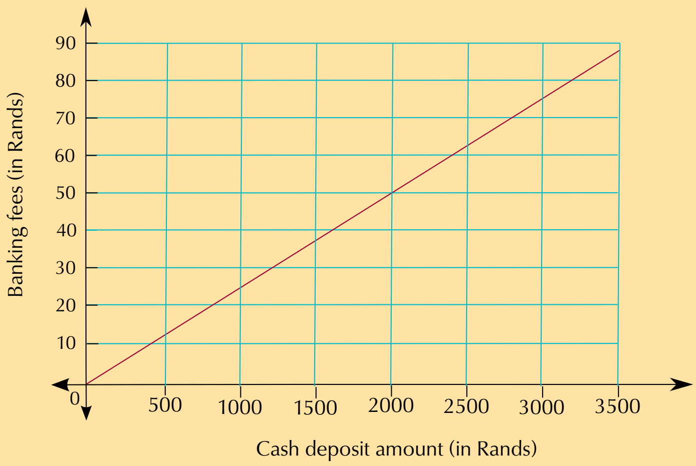
a) It is cheaper to use the ATM. If you deposited R 200, for example, the bank fees would be R 1 + R 2,40 = R 3,40. The same deposit at a teller would cost R 5,00. It is cheaper to deposit the cash at an ATM, because the process is automated and does not involve a skilled employee.

b)

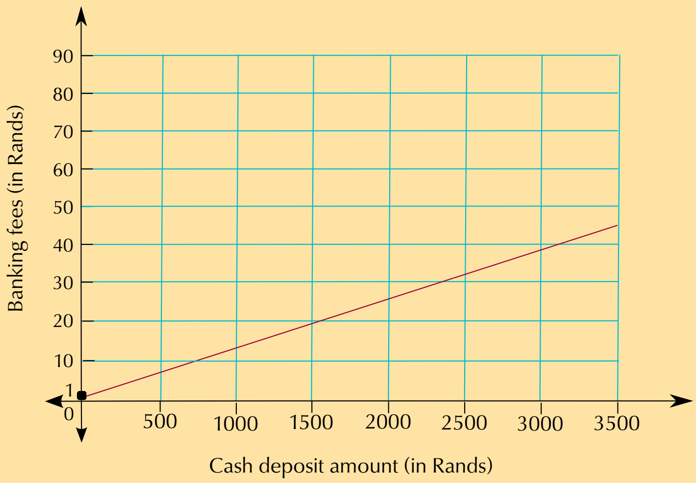
Deposit amount (R)	500	1000	1500	2000	2500	3000	3500
Fee at teller (R)	12,50	25,00	37,50	50,00	62,50	75,00	87,50
Fee at ATM (R)	7,00	13,00	19,00	25,00	31,00	37,00	45,00

c)

Banking fees when depositing cash at a teller



Banking fees when depositing cash at ATM



d) Approximately R 15

Calculating interest amounts and interest rates

Activity 11 – 3: Understanding interest

You found the following advertisement in a local newspaper. Answer the following questions.

1. Does the advertisement indicate the percentage of interest that will be charged if the TV is not paid for in cash?

   Solution:

   No.

2. What will the balance be once the deposit has been paid?

   Solution:

   Balance = Cash Price - Deposit = R 15 600 - R 1560 = R 14 040

3. Will the interest be charged on the full purchase price or on the balance?

   Solution:

   It will be charged on the account balance.

4. How much will the installments be per month?

   Solution:

   R 356,24

5. How much will you have to pay for the TV in total?
   Use the formula:
   Total to be paid = Deposit + (Installment amount $\times$ number of installments)

   Solution:

   Total Payable = Deposit + (Installment amount $\times$ number of installments) = 1560 + (356,24 $\times$ [(12 $\times$ 5)] = R 1560 + R 21 374,40 = R 22 934,40

6. How much interest (in Rands) will you have paid once you have completed paying off the TV ? Use the formula:

   $$\frac{\text{Total interest payable}}{\text{Value}} = (\text{Installment amount} \times \text{number of installments})$$

– Balance

Solution:

$\frac{\text{Total interest payable}}{\text{Value}}$

= (Installment amount × number of installments) – Balance
= R 356,24 × [12 × 5] – 14 040
= R 21 374,40 – R 14 040 = R 7334,40

11.4 Value Added Tax

Activity 11 – 4: Calculating VAT and checking till slips

1. Bongi decides to use the following formula to calculate the cost of the items before VAT, the VAT and the VAT inclusive price.

   Total cost (R) = Amount before VAT (R) + 14% of the amount before VAT (R).

   Complete the table below by calculating the values of a) to g). a) is the total of the Amount (R) and e) is the total of VAT (R). Show all your calculations.

Amount	8,76	8,76	21,92	6,13	0,35	17,54	24,55	28,06	**a)**
VAT	1,23	1,23	3,07	0,86	0,05	**b)**	**c)**	**d)**	**e)**
Total	9,99	9,99	**f)**	**g)**	**h)**	19,98	27,99	31,99	**132,32**

   Solution:

   a) = R 8,76 + R 8,76 + R 21,92 + R 6,13 + R 0,35 + R 17,54 + R 24,55 + R 28,06 = R 116,07

   b) =R 19,99 - R 17,54 = R 2,44

   c) =R 27,99 - R 24,44 = R 3,55

   d) = R 31,99 - R 28,06 = R 3,93

   e) = R 132,01 - 116,07 = R 15,94

   f) = R 21,92 + R 3,07 = R 24,99

   g) = R 6,13 + R 0,86 = R 6,99

   h) = R 0,35 + R 0,05 = R 0,40

2. Bongi's friends Nthabiseng and Thato calculated e) in this way:

   Nthabiseng: 14% of R 116,07 = $\frac{14}{100}$ × R 116,07 = R 16,24
   Thato: R 132,32 - R 116,07 = R 16,25

   Why do they get different answers?

   Solution:

   They have rounded numbers off differently. Nthabiseng incorrectly rounded down her answer of 16,2498 to 16,24.

3. Copy the slip and correct the mistakes:

```
DICEY STORES

61 11th Street, Dodgeville
Tel no. 061 333 9999

Tax invoice VAT No. 4423338888109

Milk 2L                    R17.99 *
Apples 2,5kg               R20.99 *
Carrier bag 24L            R 0.40
Carrier bag 24L            R 0.40
Sunflower oil 250ml        R14.99 *
Salted chips               R 7.99
Brown bread loaf           R 6.99 *
Brown bread loaf           R 6.99 *
Sauce Peri Peri            R13.99

Balance due               R90.73

EFT credit card           R90.73

TAX-CODE     TAXABLE     TAX VALUE
Zero VAT     R0          R0.00  *
VAT         R79.59       R11.14
Total tax                R11.14

CHANGE                    R0.00
```

Solution:

VAT exempt items total: R 67,95.
VAT inclusive items total: R 22,78.
VAT is 14% of R 22,78 = R 3,19.
Total VAT is R 3,19.
Total balance due is R 67,95 + R 22,78 + R 3,19 = R 93,92.

11.5 End of chapter activity

Activity 11 – 5: End of chapter activity

1. The TownBank current account charges R 3,30 plus R 1,20 per R 100 or part thereof for a cash withdrawal from a TownBank ATM. The first five withdrawals in a month are free. Determine the bank charges for a withdrawal of:

    a) R 400, the sixth withdrawal
    b) R 850, the fourth withdrawal
    c) R 3000, the tenth withdrawal

d) R 250, the seventh withdrawal

Solution:

a) R 3,30 + 4 × R 1,20 = R 8,10

b) Free

c) R 3,30 + 30 × R 1,20 = R 15,30

d) R 3,30 + 3 × R 1,20 = R 6,90

2. The Success Current Account charges R 3,75 plus R 0,75 per full R 100, to a maximum charge of R 25,00 for debit card purchases. Determine the charges for a purchase of:

a) R 374,55

b) R 990,87

c) R 2900,95

Solution:

a) R 3,75 + 3 × R 0,75 = R 6,00

b) R 3,75 + 9 × R 0,75 = R 10,50

c) 3,75 + 29 × R 0,75 = R 25,50. This exceeds the maximum charge or R 25, so the bank charge will be R 25,00.

3. You are given the following information about bank charges for a TownBank current account.

Withdrawals

Over the counter: R 23,00 plus R 1,10 per R 100 or part thereof

TownBank ATM: R 3,50 plus R 1,10 per R 100 or part thereof

Another bank's ATM: R 5,50 plus R 3,50 plus R 1,10 per R 100 or part thereof

Tillpoint - cash only: R 3,65

Tillpoint - cash with purchase: R 5,50

a) Calculate the fee charged for a R 2500 withdrawal from a TownBank ATM.

b) Calculate the fee charged for a R 750 withdrawal from another bank's ATM.

c) Calculate the fee charged for a R 250 withdrawal from the teller at a branch.

d) What percentage of the R 250 withdrawal in question (c) is charged in fees?

e) Would it be cheaper to withdraw R 1500 at the bank, from a TownBank ATM or from a till point with a purchase?

Solution:

a) R 3,50 + 25 × R 1,10 = R 31,00

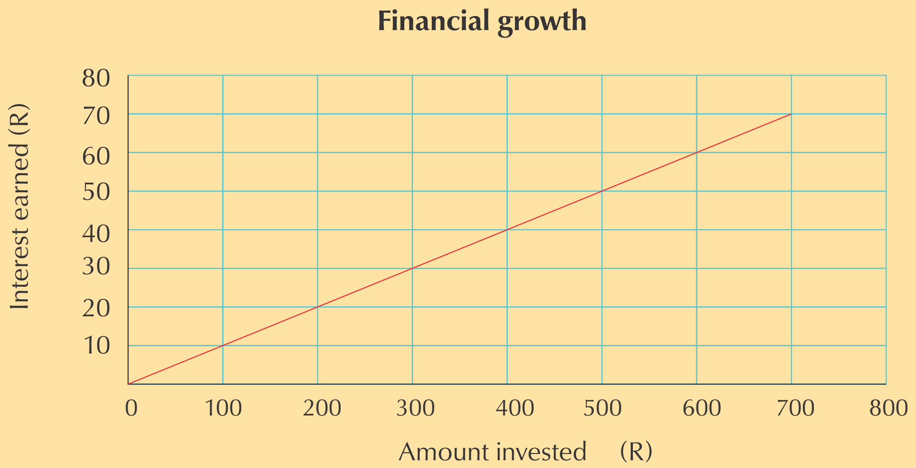
b) R 5,50 + R 3,50 + 8 × R 1,10 = R 17,80

c) R 23,00 + 3 × R 1,10 = R 26,30

d) $\frac{26,30}{250} \times 100 = 10,52\%$

e) At the bank: R 23 + 15 × R 1,10 = R 39,50. At a TownBank ATM: R 3,50 + 15 × R 1,10 = R 20,00. At a tillpoint with a purchase: R 5,50. So it will be cheapest to draw at a tillpoint, with a purchase.

4. Study the graph and answer the questions that follow:



a) Complete the table below: (Fill in all the missing spaces)

Amount invested (in Rands)	100	200	300	400	500	600	700
Interest Earned (in Rands)	10		30		50		70
Interest/Amount × 100 (Interest Rate)							

b) What kind of proportionality exists between the amount invested and the interest earned?

c) You decide to invest R 10 000. Calculate the amount of interest you can expect to earn.

Solution:

a)

Amount invested in Rands	100	200	300	400	500	600	700
Interest Earned in Rands	10	20	30	40	50	60	70
Interest/Amount × 100 (Interest Rate)	10%	10%	10%	10%	10%	10%	10%

b) Direct proportionality.

c) Interest rate is fixed at 10%. 10% of R 10 000 = R 1000 of interest earned.

5. Complete the table below by calculating the missing amounts.

Amount (R)	17,95			33,80	4,50		
VAT (R)	2,51	14,00	1,4				
Total (R)	20,46		11,40			221	404,00

Solution:

Amount (R)	17,95	100,00	10,00	33,80	4,50	193,86	354,39
VAT (R)	2,51	14,00	1,4	4,73	0,63	27,14	49,61
Total (R)	20,46	114,00	11,40	38,53	5,13	221,00	404,00

CHAPTER 12

Data handling

12.2 The data handling cycle

Different ways of collecting data

Activity 12 – 1: Deciding on the best way to collect data

1. Which method would you use to collect data for each of the following?
   a) The number of pens each learner in your class has.
   b) The number of hours each learner in your class slept last night.
   c) The weight of all learners in your class.
   d) Customers' opinions on the new design of a shop.

   Solution:

   a) Questionnaire or observation.
   b) Questionnaire
   c) Questionnaire or database (if this info is recorded, e.g. for Physical Education)
   d) Interview.
2. Develop two or three interview questions you can use to get information about:
   a) Learners' opinions about how their school uses technology in the classroom.
   b) Whether learners in your school have mobile phones.
   c) The brands of cell phones that learners have.

   Solution:

   a) Learner-dependent answer.
   b) Learner-dependent answer.
   c) Learner-dependent answer.

How to develop a good questionnaire

Activity 12 – 2: Developing a questionnaire

1. Collect information on the following topic: "the heights of learners in your class".

Base your data collection tool on one of the examples given below.

Choose one of the following three approaches:

a) Questionnaire: If there are a lot of learners to interview, this method would be too time consuming an option.

b) Observation: Appropriate for gathering a rough estimate.

c) Using a database: Height of each learner could be obtained from school or clinic records.

Questionnaire example

Hi there! We are conducting a survey to get information about the heights of learners in this school.
Please tick the correct box below.
Is your height:

Shorter than 140 cm?	
140 - 149 cm?	
150 - 159 cm?	
160 - 169 cm?	
170 cm or taller?	

Observation sheet for collecting measurement data

Range of heights (cm)	**Number of learners**
Shorter than 140 cm	
140 cm - 149 cm	
150 cm - 159 cm	
160 cm - 169 cm	
Taller than 170	

Solution:

Learner-dependent answer.

12.4 Classifying and organising data

Measures of central tendency and measures of spread

Activity 12 – 3: Calculating the mean

1. Find the mean of each of the following data sets:

a) 5; 7; 19; 24; 10; 17; 21; 6; 22; 5; 9

b) 4; 3; 1; 6; 1; 3; 8; 2; 4; 3

c) 24; 14; 41; 34; 26; 30; 25; 19; 27

d) 190; 215; 187; 208; 212; 202

Solution:

a) Mean = 13,18

b) Mean = 3,5

c) Mean = 26,67

d) Mean = 185,67

2. The heights, in centimetres, of boys in the first soccer team are: 175; 168; 175; 176; 173; 168; 169; 176; 169; 191; 176. Find the mean height of these boys.

Solution:

Mean = 174,18

3. A short test was marked out of 10. The marks of 14 learners are: 4; 5; 6; 7; 8; 8; 6; 9; 9; 2; 10; 3; 5; 6. Find the mean mark for this test.

Solution:

Mean = 6,29

4. The frequency table below shows the amount of pocket money, to the nearest Rand that Grade 10 learners are given each week. Calculate the mean amount of pocket money per week.

Pocket money (nearest Rand)	30	35	40	45	50
Frequency	5	5	10	8	2

Solution:

Mean = R 39,50

5. For each set of data given in the frequency tables below, find the mean.

a)

Time taken to complete class work (minutes)	6	9	10	13	15
Frequency	4	4	5	4	3

b)

Age of learners (in years)	14	15	16	17	18
Frequency	2	3	10	15	10

Solution:

a) Mean = 10,35 minutes

b) Mean = 16,7 years

Activity 12 – 4: Calculating the mean, mode, median and range

1. Find the mean, mode, median and range for each of the following data sets:

   a) 5; 7; 19; 24; 10; 17; 21; 6; 22; 5; 9

   b) 190; 215; 187; 208; 212; 202

   Solution:

   a) Mean: 13,18. Mode: 5. Median: 10. Range: 24 - 5 = 19.

   b) Mean: 202,33. Mode: none. Median: $\frac{202+208}{2}$ = 205. Range: 215 - 187 = 28.

2. The heights, in centimetres, of the girls in the cross-country running team are 175; 168; 175; 176; 173; 168; 169; 176; 169; 191; 176 cm. Find the mean, mode, median and range of the height of these girls.

   Solution:

   Mean: 174,18 cm. Mode: 176 cm. Median: 175 cm. Range: 215 - 187 = 23 cm.

3. Find the mean, median, mode and range of each of the following data sets:

   a) 46; 32; 18; 6; 19; 32; 81; 24; 49; 33

   b) 124; 214; 341; 134; 126; 130; 325; 319; 227

   Solution:

   a) Mean: 34,1. Mode: 32. Median: 32. Range: 81 - 6 = 75.

   b) Mean: 212,56. Mode: none. Median: 214. Range: 325 - 124 = 201.

4. Here is a list of the maximum temperatures for a week, in degrees Celsius:

   16; 3; 15; 25; 20; 19; 19

   a) Give the mean, median, mode and range of the temperatures.

   b) If the person who read the temperatures discovered that they had made a mistake and the 3 degrees was meant to be 23 degrees, how would this affect your summary of the data?

   Solution:

   a) Mean: 16,7. Mode: 19. Median: 19. Range: 25 - 3 = 22.

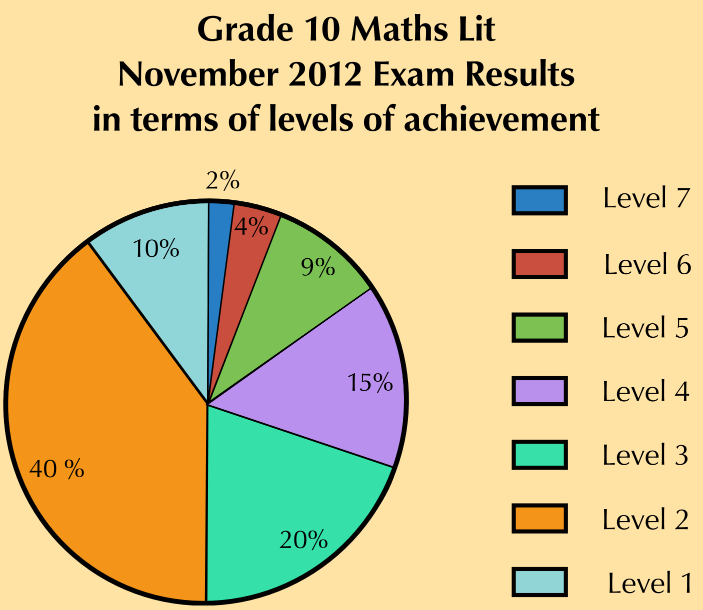
   b) It would affect the mean and the range. The mode and median would still be 19, however.

12.7 Representing data

Pie charts

Activity 12 – 5: Understanding pie charts

Consider the pie chart below and answer the questions that follow:



1. Which level did most of the learners obtain?

   Solution:

   Level 2

2. What was the percentage of learners who obtained this level?

   Solution:

   40 percent of learners obtained this level

3. Few learners achieved level 7. What was the percentage of learners at this level?

   Solution:

   2%

4. If there were 120 learners who wrote the examination, how many learners achieved level 4?

   Solution:

   15% of 120 learners = 18 learners who obtained level 4

5. Write the ratio of learners who achieved level 3 to those at level 2 in its simplest form.

   Solution:

   $20 : 40 = 1 : 2$.

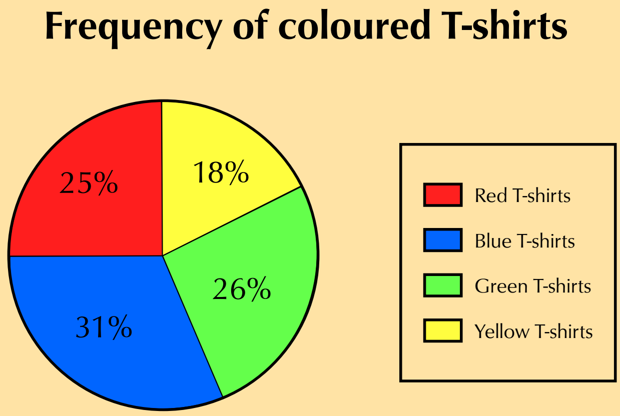
Activity 12 – 6: Representing data

1. There are 300 learners at a school sports day. There are four sports teams, represented by red, blue, green and yellow. Someone records the colours of the T-shirts the learners are wearing.

Colour of T-shirt	Red	Blue	Green	Yellow
Frequency	75	93	78	54

Represent this data in a pie chart.

Solution:



2. The following list gives the weights of the learners in a class in kilograms.
64; 83; 74; 77; 65; 55; 58; 61; 63; 98; 97; 53; 54; 102; 78; 82; 86; 95; 67; 72

   a) Draw a frequency table to order the data, grouping it into 10 kg intervals.

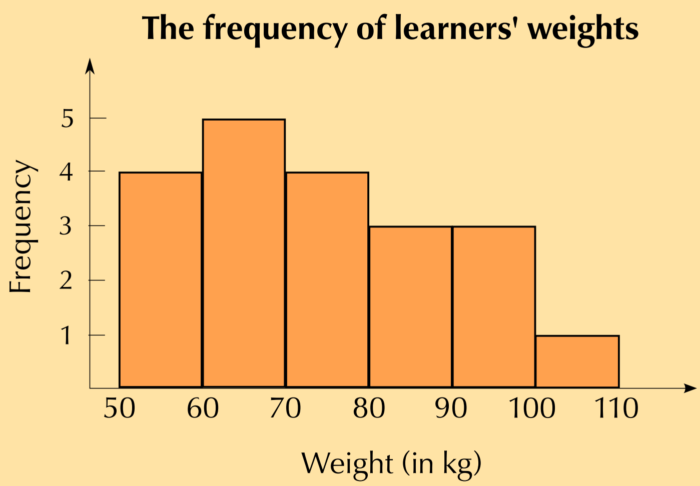
   b) Use the frequency table to draw a histogram of the data.

Solution:

a)

Interval (in kg)	Frequency
50 - 59	4
60 - 69	5
70 - 79	4
80 - 89	3
90 - 99	3
100 - 109	1

b)



3. The following table gives the maximum temperature (in °C) for each month in a year.

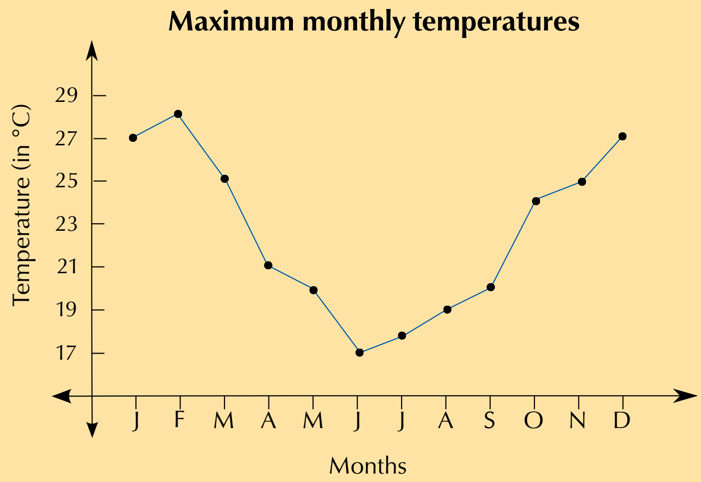
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max Temp (°C)	27	28	25	21	20	17	18	19	20	24	25	27

a) Draw a line graph of this data.

b) Describe the trends you see in the data.

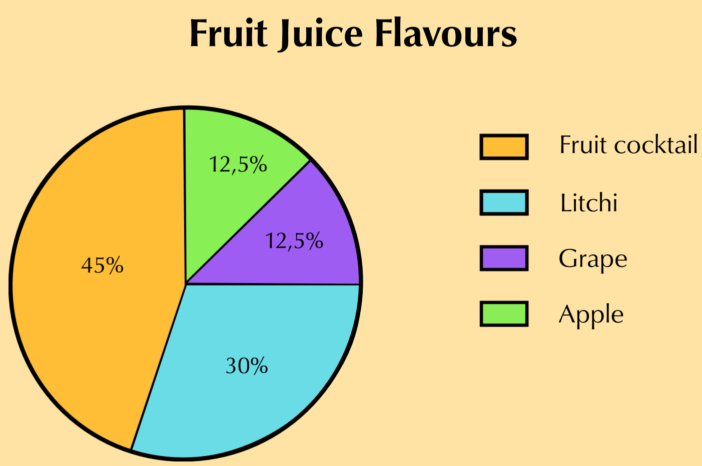
Solution:

a)



b) The maximum temperature drops towards the middle of the year, as we would expect during winter.

4. Answer the questions below about the following pie chart. The pie chart shows the favourite fruit juice flavours of a group of 120 learners.



a) Calculate how many learners chose each type of juice.

b) In what way does the pie chart work better than a bar graph to represent this data?

c) What information would a bar graph give you that this pie chart does not?

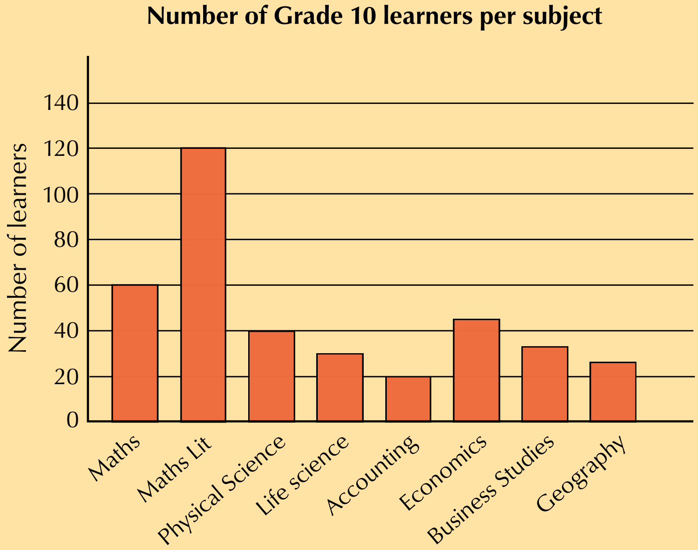
Solution:

a) 45% of 120 learners = 54 learners who chose fruit cocktail. 30% of 120 = 36 learners who chose litchi. 12,5% of 120 learners = 15 learners who chose grape. 12,5% of 120 = 15 learners who chose apple juice.

b) The pie chart is a simple, visual representation that works well for representing percentages. A pie chart allows us to see at a glance the relative proportions of the learners who prefer each flavour.

c) The number of learners who prefer each flavour.

5. Look at the bar graph below and answer the questions that follow.



a) Does this graph tell us how many Grade 10 learners there are in total?

b) Can we assume that none of the learners who take Accounting take Geography?

c) A pie graph of this data would not make sense. Explain why.

Solution:

a) No. It may look like there are 140 learners in total but we have no way of knowing if that is correct or just an arbitrary number. Also, learners take more than one subject, so we can't use the numbers of learners per subject to determine how many learners there are altogether.

b) No, we cannot assume this.

c) Learners do not only take one subject, therefore the data cannot be split into discrete percentages per subject and represented using a pie chart.

12.8 Analysing data

Activity 12 – 7: The whole data handling cycle

1. Design a data collection tool for recording the favourite sport of each of your classmates.

   Solution:

   Learner-dependent answer.

2. Record, organise, summarise and represent data on the favourite sport of each of your classmates.

   Solution:

   Learner-dependent answer.

3. Analyse the data to determine which sports are the most popular and which are the least popular.

   Solution:

   Learner-dependent answer.

12.9 End of chapter activity

Activity 12 – 8: End of chapter activity

1. In your school, collect (anonymous) data about learners' performance in Grade 10 Mathematical Literacy during the June 2012 examination. This must grouped be in terms of the levels that each learner has achieved, e.g Level 1 (0% - 29%), Level 2 (30% - 39%), and so on.

   a) Organise the data collected into a frequency table.
   b) Draw a histogram for the data collected, clearly label both axes and provide a meaningful heading.
   c) Refering to your histogram, clearly state which level most learners achieved, and what the reason for this trend could be.

   Solution:

   a) Learner-dependent answer.
   b) Learner-dependent answer.
   c) Learner-dependent answer.

2. After the first term Mathematical Literacy test was written at Lerato Secondary School, the Head of department sampled the scripts of 11 learners out of a class of 42. The results of these 11 learners were as follows (out of a total of 50 marks):

   22; 16; 45; 35; 40; 25; 42; 37; 41; 35; 27

a) Arrange the set of marks in an ascending order.

b) Determine the mean mark of the learners sampled.

c) Determine the median mark of the learners.

d) Determine the mode of the learners' marks.

e) Calculate the range of the learners' marks.

f) Convert the mean mark obtained above to a percentage (round off the answer to one decimal place).

Solution:

a) 16; 22; 25; 27; 35; 37; 40; 41; 42; 45

b) Mean $= 33{,}18$

c) Median $= 35$.

d) Mode $= 35$.

e) Range $= 45 - 16 = 29$.

f) $\frac{33{,}18}{50} \times 100 = 66{,}36\% = 66{,}4\%$

3. Gaab is a citrus farmer who grows orange trees. After one season of growth, he measures the height of a sample of his trees. 50 trees were chosen and the results were recorded.

Height in cm	Number of trees
0 - 139	3
140 - 149	7
150 - 159	20
160 - 169	12
170 - 179	5
180 - 189	2
190 - 199	1
Total	50

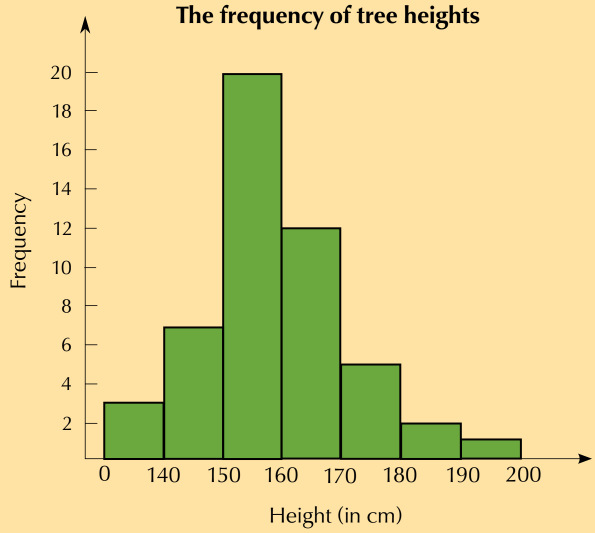
a) Use the above given information to draw a histogram. Label your graph with a heading and both axes labelled.

b) Use your histogram to determine the most common height interval.

c) Which height interval was the least common?

Solution:

a)



b) 150 - 159 cm

c) 190 - 199 cm

4. A survey was done at Thahameso Secondary School to determine which subjects learners enjoyed the most. A total of 100 learners were interviewed. Look at the table below:

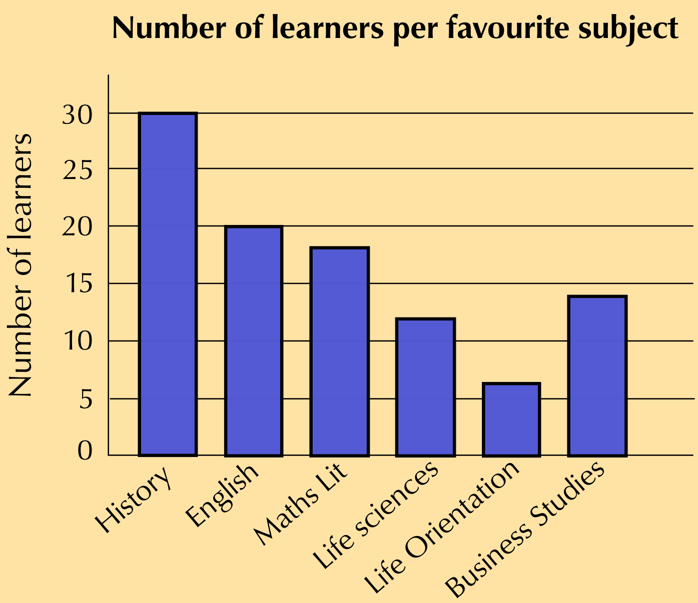
Subject	History	English	Maths Lit	Life Sciences	Life Orien-tation	Business Studies
Number of learners	30	20	18	12	6	14

a) Draw a neat bar graph to represent the above information. Clearly label your graph with a heading. Label both axes.

b) Which subject is the most popular and why do you think this is so?

Solution:

a)



b) History is the most popular subject. This could be because students like the history teacher the most.

5. The following table is a record of rainfall in mm for the town of Bethlehem during the month of January 2012. The data was collected over 7 days.

Day	1	2	3	4	5	6	7
Rainfall (mm)	15	25	10	40	20	20	45

a) Determine the mean rainfall for the town of Bethlehem for the 7 days of observation.

b) Calculate the mode.

c) Determine the median rainfall for the town of Bethlehem for this week.

d) Calculate the range of the data.

e) Draw a neat line graph for the above data. Label both axes and give the graph a heading.

Solution:

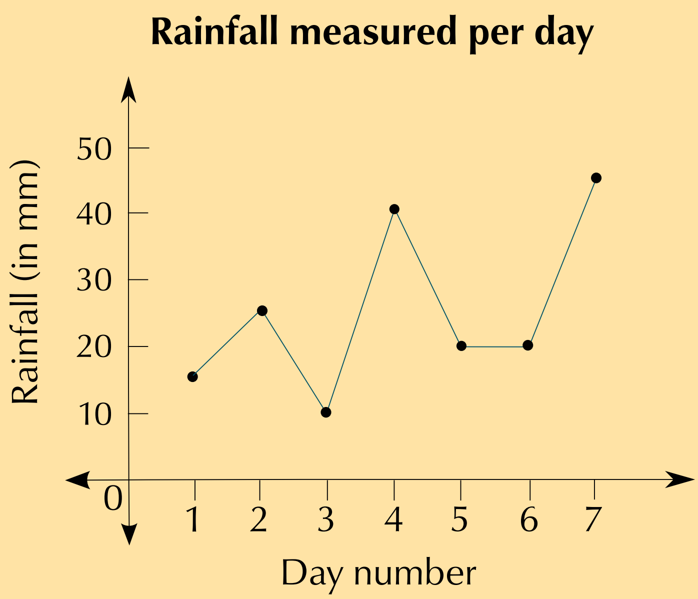
a) Mean = 25 mm.

b) Mode = 20 mm.

c) Median = 20 mm.

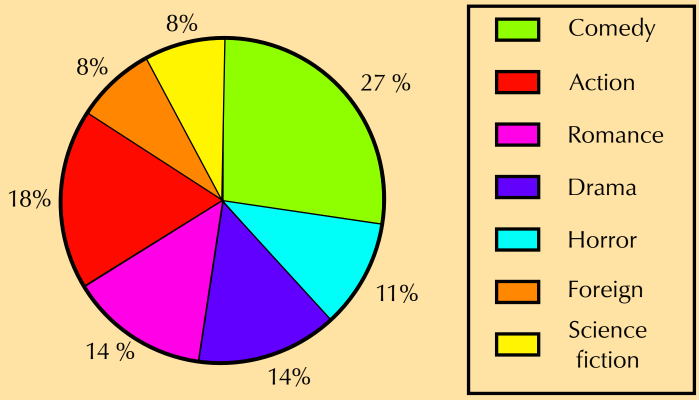
d) Range = 40 - 10 = 30 mm.

e)



6. The pie chart below represents data about what kinds (or genres) of movies people watch. This data was gathered by asking a sample of people to answer questions and their choice of films. Study the pie chart carefully and answer the questions that follow.

Different genres of movies watched



a) What kind of movie is watched the most?

b) What percentage of all the movies watched is this (the most watched movie)?

c) According to the pie chart, some kinds of movies are watched the same amount. Which two pairs of movies are watched the same amount?

d) Supposed a sample of 200 people were interviewed.

   i. What is the number of people in the sample who watch action movies?

   ii. What is the number of people who watch science fiction movies?

e) Write the number of people who watch action movies and the number of people who watch science fiction movies as a ratio in its simplest form.

f) Give two reasons for why you think the percentages of people watching science fiction movies and foreign movies are the lowest.

Solution:

a) Comedy movies.

b) 27%

c) Romance and Drama movies, and Foreign and Science Fiction movies

d) i. 18% of 200 people is 36 people.

   ii. 8% of 200 people is 16 people.

e) 18 : 8 = 9 : 4

f) There may be less science fiction and foreign movies made or screened, or they may simply be less popular.

7. Melissa measures her heart rate every half hour during the morning, and she draws up the following table of results:

Time of day	Heart rate
9:00 a.m.	65
9:30 a.m.	69
10:00 a.m.	72
10:30 a.m.	110
11:00 a.m.	90
11:30 a.m.	72
12:00 p.m.	75
12:30 p.m.	75
1:00 p.m.	69

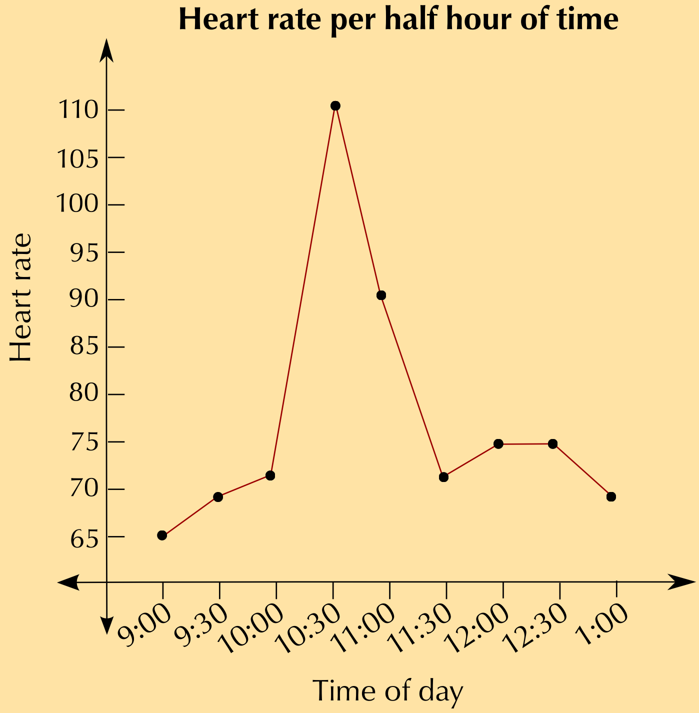
a) Plot a line graph of the data in the table.

b) Describe what you notice about the graph.

c) Why do you think that her heart rate increases suddenly during the day?

Solution:

a)



b) Melissa's heart rate increases suddenly at 10:30 a.m. Apart from this spike, it is fairly consistent, within a small range.

c) It may have increased if she exercised - e.g. if she went for a walk or a run.