

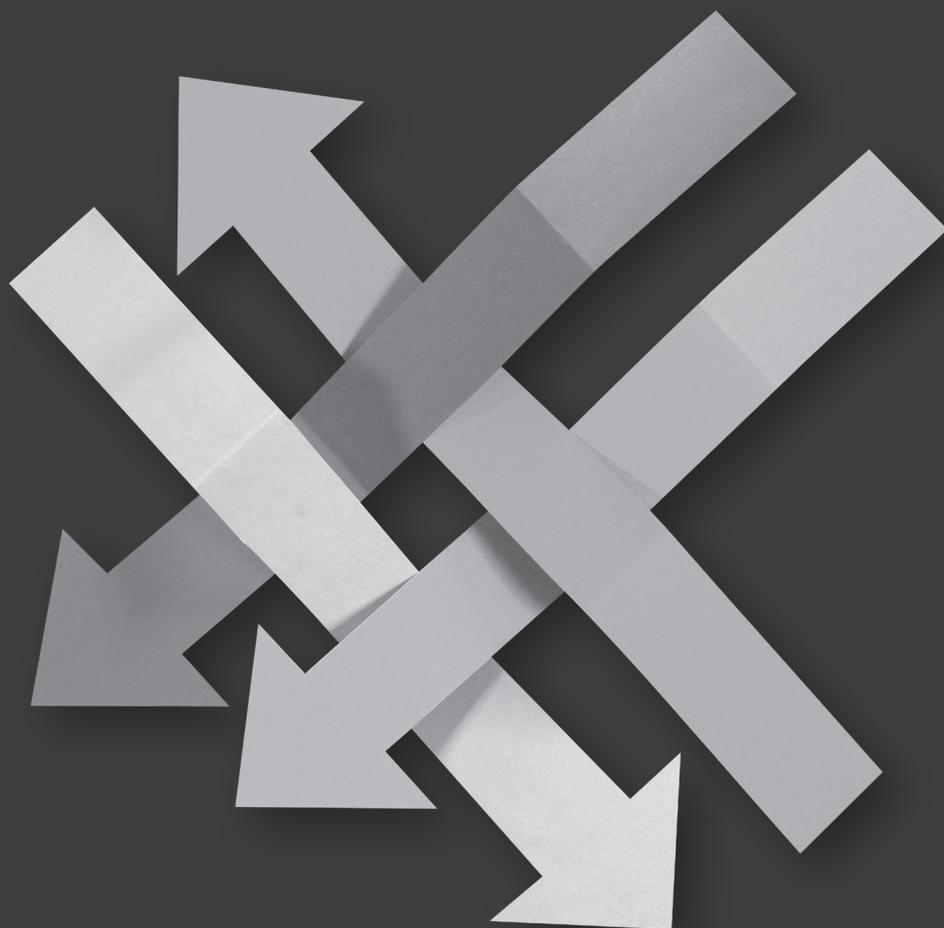
ESSENTIAL



Mathematics

Primary 6

Teacher's Guide



CAMBRIDGE
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ESSENTIAL Mathematics Primary 6

Teacher's Guide

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Introduction

Mathematics Curriculum for Primary Schools (Basic 4–6)

The new *Mathematics Curriculum for Primary Schools (Basic 4–6)* is standards-based, which means that the Ministry of Education wants to place learning at the heart of every classroom and ensure that every learner receives quality education. Quality education should be accessible to everyone, without exception, so that the human capital needs of our country can be met.

This Teacher’s Guide clearly sets out the learning areas recorded in the curriculum, how they should be taught and how they should be assessed. It provides a set of core competencies and standards that learners should know, understand and demonstrate as they progress through the content standards and phases.

Mathematics Curriculum for Primary Schools (Basic 4–6) promotes the fundamental belief of the curriculum that education should be inclusive and gender-responsive within the context of learning-centred teaching methods, so that every learner can participate and enjoy learning.

The role of the teacher is vital to make these books work for the intended purpose – to teach the core competencies and values, to make learning happen and thereby improve learning outcomes.

Rationale for Primary Mathematics

Mathematics forms an integral part of our everyday lives. It is a never-ending creative process that serves to promote discovery and understanding. We consider Mathematics to be vital to the country’s future development.

To provide quality Mathematics education, teachers must facilitate learning in the Mathematics classroom. This will provide the foundations for discovering and understanding the world around us and provide the basics for further studies in this field. This Teacher’s Guide will help you to guide learners to understand how Mathematics can be used to explain what is occurring, predict how things will behave and analyse causes and origins of things in our environment. It considers the desired outcomes of education for learners at the basic level, in terms of the new curriculum. In order to ensure that the learners are mathematically and technologically literate, Mathematics ought to be taught using hands-on and minds-on approaches that learners will find as fun and will remember for the rest of their lives.

Philosophy

The Ministry of Education promotes two basic philosophies:

Teaching philosophy	Learning philosophy
<ul style="list-style-type: none">• An effective Mathematics education should be inquiry-based.• It must provide learners with opportunities to expand, change, enhance and modify the ways in which they view the world.• It should be pivoted on learner-centred Mathematics teaching and learning approaches that engage learners physically and cognitively in the knowledge-acquiring process in a rich and rigorous inquiry-driven environment.	<ul style="list-style-type: none">• Mathematics learning is an active contextualised process of constructing knowledge based on learners' experiences rather than acquiring it.• Learners are information constructors who operate as researchers.• Teachers serve as facilitators by providing the enabling environment that promotes the construction of learners' own knowledge, based on their previous experiences.• This makes learning more relevant to the learner and leads to the development of critical thinkers and problem solvers.

General aims

This Teacher's Guide works in conjunction with the new curriculum to develop individuals to become mathematically literate, good problem solvers, have the ability to think creatively and have both the confidence and competence to participate fully in society as responsible local and global citizens.

Subject aims

The Teacher's Guide follows the curriculum guidelines to help learners to:

- recognise that Mathematics permeates the world around us
- appreciate the usefulness, power and beauty of Mathematics
- enjoy Mathematics and develop patience and persistence when solving problems
- understand and be able to use the language, symbols and notation of Mathematics
- develop mathematical curiosity and use inductive and deductive reasoning when solving problems
- become confident in using Mathematics to analyse and solve problems both in school and in real-life situations
- develop the knowledge, skills and attitudes necessary to pursue further studies in Mathematics
- develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others.

Instructional expectations

This Teacher's Guide will help you, the teacher, to:

- guide and facilitate learning by encouraging discussions among learners and challenging them to accept and share responsibility for their own learning
- select Mathematics content, adapt and plan lessons to meet the interests, knowledge, understanding, abilities and experiences of your class
- work together with colleagues within and across disciplines and grade levels to develop communities of Mathematics learners who exhibit the skills of mathematical inquiry and the attitudes and social values conducive to Mathematics learning
- use multiple methods and systematically gather data about learners' understanding and ability to guide Mathematics teaching and learning
- arrange to provide feedback to both learners and parents
- design and manage learning environments that provide learners with the time, space and resources needed for learning Mathematics.

Core competencies

The core competencies are a set of skills that teachers need to develop in their learners. These are ways in which teachers and learners engage with the subject matter as they learn the subject. These competencies form a connected body of core skills that are acquired throughout the processes of teaching and learning.

Critical thinking and problem solving (CP)	This skill develops learners' cognitive and reasoning abilities to enable them analyse and solve problems. The CP skill enables learners to draw on their own experiences to analyse situations and choose the most appropriate out of a number of possible solutions.
Creativity and innovation (CI)	This skill promotes entrepreneurial skills in learners through their ability to think of new ways of solving problems and developing technologies for addressing the problem at hand. It requires ingenuity of ideas, arts, technology and enterprise. Learners are also able to think independently and creatively.
Communication and collaboration (CC)	This promotes the skills to use language, symbols and text to exchange information about themselves and their life experiences. Learners actively participate in sharing their ideas. They engage in dialogue with others by listening to and learning from them. They also respect and value the views of others.

Cultural identity and global citizenship (CG)	Learners learn how to put country and service foremost by understanding what it means to be active citizens. They develop a strong sense of social and economic awareness and use their skills to contribute effectively towards the socioeconomic development of the country and on the global stage. They build skills to critically identify and analyse cultural and global trends.
Personal development and leadership (PL)	PL improves self-awareness and builds self-esteem. It also entails identifying and developing talents, fulfilling dreams and aspirations, and learning from mistakes and failures of the past. They recognise the importance of values, such as honesty and empathy, seeking the well-being of others and to distinguish between right and wrong. PL helps them acquire the skill of leadership, self-regulation and responsibility.
Digital literacy (DL)	DL helps learners to discover, acquire, and communicate through ICT to support their learning. It also makes them use digital media responsibly.

Learning domains (expected learning behaviours)

There are three integral learning domains that should be the basis for instruction and assessment:

- Knowledge, understanding and application
- Process skills
- Attitudes and values.

Knowledge, understanding and application

Under this domain, learners may acquire some knowledge through learning experiences. They may also show understanding of concepts by comparing, summarising, rewriting etc. in their own words and constructing meaning from instruction. The learner may also apply the knowledge acquired in some new contexts.

See the new *Mathematics Curriculum for Primary Schools (Basic 4–6)* pages ix–x for a more detailed description.

Skills and processes

The mathematical method is the means by which a mathematician solves problems or seeks to gain information about events. Learners should be exposed to situations that challenge them to raise questions and attempt to solve problems. The more often they are faced with these challenges, the more likely they are to develop a positive attitude toward Mathematics, and the more likely they are to develop the relevant process skills.

See the new *Mathematics Curriculum for Primary Schools (Basic 4–6)* pages x–xi for a more detailed description.

Attitudes

To be effective, competent and reflective citizens who are capable of solving personal and societal problems, learners should be exposed to situations that challenge them to raise questions and attempt to solve problems. Learners therefore need to acquire positive attitudes, values and psychosocial skills that will enable them participate in debates and take a stand on issues affecting them and others.

See the new *Mathematics Curriculum for Primary Schools (Basic 4–6)* page xii for a more detailed description.

Values

At the heart of this curriculum is the belief in nurturing honest, creative and responsible citizens. As such, every part of this curriculum, including the related pedagogy should be consistent with a certain set of values.

See the new *Mathematics Curriculum for Primary Schools (Basic 4–6)* page xiii for a more detailed description.

Assessment

Assessment is a process of collecting and evaluating information about learners and using the information to make decisions to improve their learning.

In the curriculum, it is suggested that assessment is used to promote learning. Its purpose is to identify the strengths and weaknesses of learners to enable teachers ascertain their learner’s response to instruction. This Teacher’s Guide contains a Teacher Assessment section to guide you how to assess the concepts taught. See the new *Mathematics Curriculum for Primary Schools (Basic 4–6)* page xiv, that provides a detailed outline of the difference between formative and summative assessment and how to apply it to your classroom.

It is important to remember that, when developing assessment procedures, try to select indicators in such a way that you will be able to assess a representative sample from a given strand. Each indicator in the curriculum is considered a criterion to be achieved by the learners. When you develop assessment items or questions that are based on a representative sample of the indicators taught, the assessment is referred to as a “Criterion-Referenced Assessment”. In many cases, a teacher cannot assess all the indicators taught in a term or year. The assessment procedure you use, for example, class assessments, homework, projects, and so on, has to be developed in such a way that the various procedures complement one another to provide a representative sample of indicators taught over a period.

Suggested time allocation

Two periods per day (two 30-minute periods)

Pedagogical approaches

These include the approaches, methods, strategies, appropriate relevant teaching and learning resources for ensuring that every learner benefits from teaching and learning process. The teacher should:

- create learning-centred classrooms through the use of creative approaches
- position inclusion and equity at the centre of quality teaching and learning
- use differentiation and scaffolding as teaching and learning strategies
- use Information Communications Technology (ICT) as a pedagogical tool
- identify subject specific instructional expectations to make the subject relevant
- integrate all assessment strategies
- use questioning techniques that promote deep learning.

This Teacher's Guide provides teaching methodology for each lesson and concept to ensure that the correct pedagogical approach is used. However, this may need to change based on the skills levels of your class in any year, so use your own experience and discretion to adapt these methodologies accordingly.

Learning-centred pedagogy

A learning-centred classroom creates the opportunity for learners to engage in meaningful hands-on activities that relate what they are learning with the real world. Learners have to discuss ideas, become actively engaged in looking for answers, and work in groups to solve problems. They also research for information, analyse and evaluate information. The aim of the learning-centred classroom is to enable learners to take ownership of their learning.

Inclusion

Inclusion is ensuring access and learning for all learners, especially the disadvantaged learners. Each lesson in this Teacher's Guide contains advice on how to teach that particular concept to large classes, and to learners with special needs.

Differentiation and scaffolding

Differentiation is a process by which differences (learning styles, interest and readiness to learn) between learners are accommodated, so that all learners in a group have the best possible chance of learning. Differentiation could be by content, tasks, questions, outcome, groupings and support.

Technique	Process	Example
Differentiation by task	Teachers set different tasks for learners of different abilities.	When sketching the plan and shape of their classroom, some learners could be made to sketch with free hand while others would be made to trace the outline of the plan.
Differentiation by support	The teacher gives needed support.	The teacher refers weak learners to the Guidance and Counselling Unit for academic support.
Differentiation by outcome	The teacher allows learners to respond at different levels.	Weaker learners are allowed more time for complicated tasks.
Scaffolding	The teacher uses a variety of instructional techniques to progress learners towards stronger understanding.	Break up the learning task, experience or concept into smaller parts and then provide learners with the support they need to learn each part.

Information and communication technology (ICT)

ICT has been integrated into the Mathematics curriculum as part of the core of education, alongside reading, writing and numeracy. Teachers are encouraged to use ICT as a teaching and learning tool to enhance deep and independent learning. If your school has internet access, these functions can be done online. Alternatively, download the clips or games to use offline in the classroom.

Examples of ICT in the Mathematics classroom

Use calculators to solve problems.

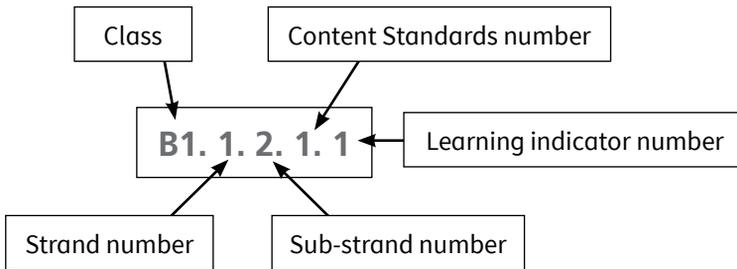
- Use cameras to record results and steps in a problem-solving process.
- Use multimedia to support the teaching and learning process.
- Show YouTube videos to explain certain concepts visually.
- Search for grade-appropriate online Mathematics games for each concept.
- Encourage learners to play the game online in groups, pairs or individually.
- Learners research data online to bring to school when required.
- Start teaching the basic skills of MS Office, using basic word processing skills, spreadsheets and PowerPoint presentations.

The use of ICT as a teaching and learning tool is to provide learners with access to large quantities of information online and offline. It also provides the framework for analysing data to investigate patterns and relationships. Once learners have made their findings, ICT can help them organise, edit and print the information in many different ways.

The exposure that learners are given at the primary school level to use ICT in exploiting learning will build their confidence and will increase their level of motivation to apply ICT use in later years, both within and outside of education. ICT use for teaching and learning is expected to enhance the quality and competence level of learners.

Organisation and structure of the curriculum

Mathematics Curriculum for Primary Schools (Basic 4–6) follows the curriculum in organising its content under key headings and annotations as shown in the figure below.



The content standards in this document are organised by grade level. Within each grade level, the contents are grouped first by strands. Each strand is further subdivided into sub-strands of related indicators.

- **Class** is the level/year being studied.
- **Indicators** are learning outcomes that define what learners should know and be able to do.
- **Content Standards** are groups of related indicators. Note that indicators from different standards may sometimes be closely related, because Mathematics is a connected subject.
- **Strands** are the main branches of the Mathematics content to be studied.
- **Sub-strands** are larger groups of related indicators (or Mathematics topics to be studied). Indicators from different sub-strands may sometimes be closely related.

The Standards are organised under four strands:

1. Number
2. Algebra
3. Geometry and Measurement
4. Data

The following table shows the scope and sequence of the strands addressed at the B4–B6 phase. The remaining part of the document presents the details of the standards and indicators for each grade level.

Structure of the Curriculum

STRANDS	SUB-STRANDS		
	B4	B5	B6
Number (Counting, Representation, Cardinality and Operations)	Whole Numbers Counting and Representation	Whole Numbers Counting and Representation	Whole Numbers Counting and Representation
	Whole Numbers Operations	Whole Numbers Operations	Whole Numbers Operations
	Fractions, Representation and Relationship	Fractions, Representation and Relationship	Fractions, Representation and Relationship
Algebra	Patterns and Relationships	Patterns and Relationships	Patterns and Relationships
	Functions and Unknowns	Functions and Unknowns	Functions and Unknowns
	Expressions	Expressions	Expressions
	Equations and Inequalities	Equations and Inequalities	Equations and Inequalities
Geometry and Measurement	Lines and Shapes	Lines and Shapes	Lines and Shapes
	Measurements	Measurements	Measurements
	Geometric Reasoning	Geometric Reasoning	Geometric Reasoning
Data	Data (Collection, organisation, interpreting analysis)	Data	Data
	Chance (Probability)	Data	Data

Scope and sequence

STRANDS	SUB-STRANDS	B4	B5	B6
Number	Whole Numbers Counting and Representation	✓	✓	✓
	Whole Numbers Operations	✓	✓	✓
	Fractions, Representation and Relationship	✓	✓	✓
Algebra	Patterns and Relationships	✓	✓	✓
	Functions and Unknowns	✓	✓	✓
	Expressions	✓	✓	✓
	Equations and Inequalities	✓	✓	✓
Geometry and Measurement	Lines and Shapes	✓	✓	✓
	Measurements	✓	✓	✓
	Geometric Reasoning	✓	✓	✓
Data	Data (Collection, organisation, interpreting analysis)	✓	✓	✓
	Chance (Probability)	✓	✓	✓

SCHEME OF WORK

Strand 1: Number			
Sub-strand 1: Counting, representation, cardinality & ordinality			
Content standard	Indicator	Page references	
		LB	TG
B6.1.1.1 Demonstrate an understanding of quantities and place value for multi-digit numerals up to 1,000,000,000 or 1 billion Refer to Workbook pages 1–11 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.1.1.1.1 Model number quantities up to 1,000,000 using graph sheets and multi-base block	1–3	1–10
	B6.1.1.1.2 Read and write numbers in figures and in words up to 1,000,000,000	4–8	
	B6.1.1.1.3 Identify numbers in different positions around a given number in a number chart	11	
	B6.1.1.1.4 Compare and order whole numbers up to 100,000 and represent the comparison using $>$, $<$, or $=$	9–13	
	B6.1.1.1.6 Skip count forwards and backwards in 5,000s, 10,000s etc. up to and from 1,000,000.	14–18	
B6.1.1.2 Demonstrate understanding of Roman numerals up to C (i.e. 100) Refer to Workbook pages 12–14 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.1.1.2.1 Recognise Roman numerals system up to C (i.e. 100)	19	11–13
	B6.1.1.2.2 Count and convert Hindu Arabic numbers to Roman numerals up to 100 (C) and vice versa	20–24	
B6.1.1.3 Demonstrate understanding of factors, multiples and prime numbers from 1 to 100 Refer to Workbook pages 15–18 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.1.1.3.1 Determine the HCF and the LCM of two or three numbers using prime factors	24–32	13–15

Sub-strand 2: Number operations			
Content standard	Indicator	Page references	
		LB	TG
<p>B6.1.2.1 Describe and apply mental mathematics strategies and number properties to determine answers for basic multiplication facts to 144 and related division facts</p> <p>Refer to Workbook pages 19–20 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.</p>	<p>B6.1.2.1.1 Apply mental mathematics strategies and number properties, such as skip counting from a known fact, using doubling or halving, using patterns in the 9s and 11s facts, using repeated doubling or halving, to determine answers for basic multiplication facts to 81 and related division facts</p>	33–38	16–18
	<p>B6.1.2.1.2 Apply mental mathematics strategies for multiplication, such as annexing then adding zero halving and doubling using the distributive property</p>		
<p>B6.1.2.2 Demonstrate understanding of multiplication of a 2- or 3-digit number by a 2- or 3-digit number</p> <p>Refer to Workbook pages 21–24 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.</p>	<p>B6.1.2.2.1 Multiply multi-digit numbers by 2- or 3-digit numbers efficiently</p>	38–42	18–23
<p>B6.1.2.3 Manipulate numbers, using basic division fact up to 144</p> <p>Refer to Workbook pages 25–26 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.</p>	<p>B6.1.2.3.1 Determine basic division facts up to 81</p>	43–45	23–25
<p>B6.1.2.4 Demonstrate understanding of division of a 2- or 3-digit number by a 1- or 2-digit number</p> <p>Refer to Workbook page 27 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.</p>	<p>B6.1.2.4.1 Divide 3-digit numbers by 1-digit numbers</p>	45–46	26–27

B6.1.2.5 Translate word problems into mathematical sentences and solve Refer to Workbook page 28 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.1.2.5.1 Solve multi-step word problems involving the four basic operations	47–50	27–29
B6.1.2.6 Demonstrate an understanding of integers Refer to Workbook pages 29–43 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.1.1.6.1 Locate, compare and order sets of integers using the number line and symbols " $<$ " or " $>$ "	50–58	29–36
	B6.1.2.6.2 Solve simple addition and subtraction problems involving integers (excluding subtraction of negative numbers)	58–64	
	B6.1.1.4.3 Perform simple multiplication with integers	64–67	
Sub-strand 3: Fractions			
Content standard	Indicator	Page references	
		LB	TG
B6.1.3.1 Demonstrate an understanding of strategies for comparing, adding, subtracting, multiplying and dividing common, decimal and percent fractions Refer to Workbook pages 44–52 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.1.3.1.1 Compare and order a mixture of fractions: common, percent and decimal fractions (up to thousandths)	68–79	37–44
	B6.1.3.1.2 Add and subtract unlike and mixed fractions	79–84	
	B6.1.3.1.3 Use models to explain the result of multiplying a fraction by whole number, a whole number by a fraction and a fraction by fraction	85–88	
Sub-strand 4: Ratios and proportion			
Content standard	Indicator	Page references	
		LB	TG
B6.1.4.1 Demonstrate understanding of the concept of ratios and its relationship to fractions and to the multiplication and division of whole numbers Refer to Workbook pages 53–62 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.1.4.1.1 Use concrete models and pictorial representations to explain a ratio as a concept that shows the number of times one quantity can be obtained in another and write this symbolically and in its simplest form	89–96	44–47
	B6.1.4.1.2 Express ratios in equivalent forms, compare and order ratios	96–101	

B6.1.4.2 Understand the concept of proportion and its relationship to ratios and rates. Use proportional reasoning and rates to solve real-world and mathematical problems. Refer to Workbook pages 63–66 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.1.4.2.1 Use models to explain proportion as a comparison between quantities with equal ratios	102–105	48–49
	B6.1.4.2.3 Use various strategies to solve proportional reasoning problems involving rates and scales	106–108	
Strand 2: Algebra			
Sub-strand 1: Pattern and relationships			
Content standard	Indicator	Page references	
		LB	TG
B6.2.1.1 Determine the pattern rule to make predictions about subsequent elements. Refer to Workbook pages 67–71 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.2.1.1.4 Represent a given pattern visually to verify predictions	109–115	50–55
	B6.2.1.1.7 Write a rule in words and in algebra to represent a given pattern	116–121	
	B6.2.1.1.8 Describe the relationship in a given table or chart, using a mathematical expression	121–124	
Sub-strand 2: Algebraic expressions			
Content standard	Indicator	Page references	
		LB	TG
B6.2.2.1 Demonstrate understanding of algebraic expressions. Refer to Workbook pages 72–77 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.2.2.1.1 Demonstrate understanding of algebraic expressions as mathematical phrases that can contain letters which represent ordinary numbers and operators (like add, subtract, multiply, and divide)	125–136	56–59

Sub-strand 3: Variables and equations			
Content standard	Indicator	Page references	
		LB	TG
B6.2.3.1 Solve problems involving single-variable, one-step equations with whole number coefficients Refer to Workbook pages 78–84 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.2.3.1.2 Identify the unknown in a problem; represent the problem with an equation; and solve the problem concretely, pictorially or symbolically	137–145	59–61
	B6.2.3.1.3 Create a problem for a given equation		
Strand 3: Geometry and measurement			
Sub-strand 1: 2D shapes and 3D shapes			
Content standard	Indicator	Page references	
		LB	TG
B6.3.1.1 Demonstrate understanding of prisms Refer to Workbook pages 85–92 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.3.1.1.1 Identify examples of rectangular and triangular prisms in the classroom and the community	146–151	62–65
Sub-strand 2: Measurement			
Content standard	Indicator	Page references	
		LB	TG
B6.3.1.1 Demonstrate understanding of prisms Refer to Workbook pages 93–96 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.3.1.1.2 Construct rectangular and triangular prisms from their nets	152–156	66–69

Sub-strand 3: Geometric reasoning			
Content standard	Indicator	Page references	
		LB	TG
B6.3.3.1 Describe the position of objects in space using the cardinal points	B6.3.3.5.1 Tell the position and motion of objects in space using the cardinal points north-east, north-west, south-east and south-west	157–165	69–71
B6.3.3.5 Perform a single transformation (i.e. reflection translation) on a 2D shape Refer to Workbook pages 97–108 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.3.3.5.1 Perform and identify images of a single transformation (i.e. reflection) on 2D shapes in a plane	166–175	72–81
	B6.3.3.5.2 Identify images of a single transformation (i.e. reflection and translation) of a 2D shape in a plane	176–188	
Strand 4: Data			
Sub-strand 1: Data collection, organisation, presentation, interpretation and analysis			
Content standard	Indicator	Page references	
		LB	TG
B6.4.1.1 Create, label, and interpret line graphs to draw conclusions Refer to Workbook pages 109–116 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.4.1.1.1 Draw a line graph by determining the common attributes (title, axes and intervals) and draw the graph for a given table of values	189–193, 198–201	82–86
	B6.4.1.1.2 Determine whether a given set of data can be represented by a line graph (continuous data) or a series of points (discrete data) and explain why	193–197	
	B6.4.1.1.3 Apply understanding of how to create a line graph by using a given table of values (or set of data) to draw a line graph and answer questions based on them to interpret and draw conclusions	190–193 198–201	

B6.4.1.2 Select, justify, and use appropriate methods of collecting data, including questionnaires, interview, observation, experiments, databases, electronic media, etc. Refer to Workbook pages 117–118 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.4.1.2.1 Select a method for collecting data to answer a given question and justify the choice	202–208	86–89
	B6.5.2.2 Design and administer a questionnaire for collecting data to answer a given question and record the results		
	B6.4.1.2.3 Design and administer a questionnaire for collecting data to answer given question(s), record the data, analyse and graph the results to solve problems		
Sub-strand 2: Chance or probability			
Content standard	Indicator	Page references	
		LB	TG
B6.4.2.2 Demonstrate an understanding of probability by identifying all possible outcomes of a probability experiment, determining the theoretical and experimental probability of outcomes in a probability experiment Refer to Workbook pages 119–123 for additional exercises. You can assign these for Homework. Alternatively, you can assign the exercises as Extension exercises.	B6.4.2.2.1 List the possible outcomes of a probability experiment, such as tossing a coin, rolling a die with a given number of sides, spinning a spinner with a given number of sectors and determine the theoretical probability of an outcome occurring for a given probability experiment	209–215	90–92
	B6.4.2.2.2 Predict the probability of a given outcome occurring for a given probability experiment by using theoretical probability		
	B6.4.2.2.3 Explain that the experimental probability approaches the theoretical probability of a particular outcome as the number of trials in an experiment increases		

**Sub-strand 1:
Counting, representation, cardinality and ordinality****Content standard****B6.1.1.1 Quantities and place value up to 1,000,000****1. Learning outcomes**

Learners will be able to recognise, describe and represent numbers and their relationships, and to count, estimate with competence and confidence in solving problems.

2. Essential for learning

Learners should have prior experience with counting forwards and backwards on number lines and number grids, place value, factors and multiples, ordering and comparing up to 6-digit numbers, rounding to the nearest number, working on number lines, as well as number patterns or sequences.

Consider a baseline test, so that you can determine your learners' level of knowledge.

3. Key words

Place value, digits, expanded form, multiples, whole numbers, equivalence symbols ($<$, $>$, or $=$), ascending order, descending order, less than/smaller than, greater than/bigger than, equal to, rounding up/down, rounding off, less than/smaller than, greater than/bigger than, equal to

4. Resources used in this chapter

Learner's Book, Workbook, graph sheets, multi-base blocks, number cards, beads, plastic straws, number bonds, place

value charts number wheel, number chart, abacus, pictures of animals, see-saw, number line, number cards

5. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition for logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

6. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps.

Develop a balance between individual teaching, peer teaching, cooperative learning and whole class teaching. If you see learners who are struggling, allow them more time to complete the task.

When the learners attempt word problems, first help them to explore the vocabulary in word problems. Make sure the learners understand the language and vocabulary used.

The learners should be able to explain their comparisons in the examples that follow: 258,214,879 and 265,321,897; 658,122,140 and 658,122,411 Learners should also be able to explain their skills in determining the placing of whole numbers in relationship with the other.

7. Additional content for the teacher

Review the different systems that were used to represent numbers, for example, the systems used by the tallies used by the olden days traders, cocoa / cattle farmers and Barter traders and the Hindu-Arabic number system.

If you have access to the Internet, explore YouTube for video material on multiples and factors, ordering whole numbers and equivalence, rounding off, up or down, as well as number patterns or sequences.

8. Teaching methodology

Ask learners to count in 1s, 2s, 3s and 4s, as far as possible, and revise multiplication up to 12×12 . Play games and have a class competition to encourage learner participation.

Prepare a Place value chart, up to millions, and ask the learners to read off numbers from the chart. Use concrete, semi-concrete and abstract sequence. Make use of peer-assisted learning.

Ask learners to count in multiples of 10,000. Prepare a number chart and ask learners, in pairs, to identify and read off numbers from the chart in different positions around a given number. Ask them to count forwards and backwards, in different sequences. The learners should be able to identify the rules in each sequence, for example, adding 25 each time to get next number.

When the learners progress to ordering numbers in ascending or descending order, start with the first three digits, before moving to the next digits. Let them use a number line to say whether the number is nearer to a lower or higher value. Ask pairs to use number cards as a starting point, then skipping forwards or backwards to reach the next whole number.

9. Assessment

Assessment should take many forms. Use a baseline test as a diagnostic assessment (numbers in words and numerals, odd, even, skipping numbers forwards and backwards, place value, and so on). Also assess the learners on mental maths. This can take the form of teacher assessment, class work, or self- or peer assessment.

10. Answers

Exercise 1

LB page 2

1.
 - a) 4 Blocks, 2 Flats, 3 Rods, 7 Cubes
 - b) 6 Blocks, 3 Flats, 4 Rods, 5 Cubes
 - c) 5 Blocks, 1 Flat, 2 Rods, 8 Cubes
 - d) 3 Blocks, 2 Flats, 3 Rods, 0 Cubes
 - e) 2 Blocks, 0 Flats, 5 Rods, 2 Cubes, 6 Hundreds
 - f) 8 Flats, 4 Rods, 3 Cubes, 5 Hundreds
 - g) 7 Flats, 4 Rods, 6 Cubes, 2 Hundreds
 - h) 1 Block, 5 Flats, 2 Rods, 3 Cubes, 4 Hundreds
- 2.

	MILLIONS	THOUSANDS			HUNDREDS	TENS	ONES
a)		3	5	3	0	0	0
b)	5	6	3	2	0	0	0
c)	6	4	0	2	0	0	0
d)	2	4	0	0	0	0	0
e)		3	8	6	0	0	0

Exercise 2

LB page 3

1.
 - a) 2 Hundreds, 5 Tens, 7 Ones
 - b) 1 Hundred, 4 Tens, 5 Ones
 - c) 5 Hundreds, 0 Tens, 5 Ones
 - d) 2 Hundreds, 2 Tens, 4 Ones
 - e) 1 Thousand, 0 Hundreds, 4 Tens, 0 Ones
 - f) 2 Thousands, 1 Hundred, 5 Tens, 0 Ones
 - g) 6 Thousands, 5 Hundreds, 2 Tens, 0 Ones
 - h) 8 Thousands, 3 Hundreds, 6 Tens, 0 Ones
 - i) 4 Ten thousands, 5 Thousands, 0 Hundreds, 0 Tens, 0 Ones
 - j) 1 Ten thousand, 2 Thousands, 5 Hundreds, 0 Tens, 0 Ones
 - k) 1 Ten thousand, 4 Thousands, 5 Hundreds, 0 Tens, 0 Ones

- l) 3 Ten thousands, 1 Thousand, 2 Hundreds, 0 Tens, 0 Ones
- m) 2 Ten thousands, 6 Thousands, 2 Hundreds, 0 Tens, 0 Ones
- n) 3 Hundred thousands, 6 Ten thousands, 5 Thousands, 0 Hundreds, 0 Tens, 0 Ones
- o) 1 Hundred thousands, 2 Ten thousands, 3 Thousands, 0 Hundreds, 0 Tens, 0 Ones
- p) 8 Hundred thousands, 1 Ten thousand, 2 Thousands, 0 Hundreds, 0 Tens, 0 Ones
- q) 6 Ten thousands, 5 Thousands, 9 Hundreds, 0 Tens, 0 Ones
- r) 5 Ten thousands, 2 Thousands, 0 Hundreds, 0 Tens, 0 Ones

2. Learners' own answers

Exercise 3

LB page 5

1. a) 78,564 b) 128,953 c) 257,143
 d) 5,890,648 e) 7,637,642 f) 3,586,201
 g) 6,532,005 h) 8,590,012 i) 9,008,423
 j) 4,025,069

2. Learners' own answers

3. a) Two million three hundred and fifty-six thousand seven hundred and eighty
 b) Ninety-nine million one hundred and twenty-five thousand one hundred and twenty-five
 c) Forty-seven million nine hundred and seventy-seven thousand one hundred and twenty-five
 d) Twenty-seven million two hundred and seventy-two thousand three hundred and sixty-nine
 e) Three hundred and seventy-eight thousand two hundred and eighty-nine
 f) One million two hundred and fifty-one thousand six hundred and thirty-eight
 g) One billion four hundred and eighty-three million two hundred and four thousand three hundred
 h) Two hundred and thirty-five million nine hundred and forty-nine thousand two hundred and ninety-two
4. a) Three hundred thousand
 b) Four million
 c) Ninety million
 d) Two billion

- e) Five thousand
 - f) Twenty million
 - g) Four hundred thousand
 - h) Zero
5. 197,353,319: One hundred and ninety-seven million three hundred and fifty-three thousand, three hundred and nineteen
 465,735,974: Four hundred and sixty-five thousand seven hundred and thirty-five, nine hundred and seventy-four
 644,416: Six hundred forty-four thousand four hundred and sixteen
 6,886,761,426: Six billion eight hundred and eighty-six million seven hundred and sixty-one thousand four hundred and twenty-six
 742,952,392: Seven hundred and forty million, nine hundred and fifty-two thousand, three hundred and ninety-two
 472,623,852: Four hundred and seventy-two six hundred and twenty-three eight hundred and fifty-two

Exercise 4

LB page 7

1. a) $4,000 + 500 + 20 + 1$
 b) $20,000 + 1,000 + 300 + 50 + 6$
 c) $90,000 + 2,000 + 700 + 40 + 1$
 d) $800,000 + 4,000 + 700 + 90 + 6$
 e) $2,000,000 + 800,000 + 70,000 + 4,000 + 600 + 40 + 4$
 f) $30,000,000 + 7,000,000 + 100,000 + 1,000 + 600 + 10 + 2$
 g) $8,000,000,000 + 400,000,000 + 50,000,000 + 7,000,000 + 800,000 + 20,000 + 2,000 + 300 + 50 + 4$
 h) $4,000,000,000 + 900,000,000 + 60,000,000 + 5,000,000 + 200,000 + 10,000 + 7,000 + 800 + 90 + 1$
 i) $4,000,000,000 + 200,000,000 + 10,000,000 + 5,000,000 + 800,000 + 70,000 + 6,000 + 300 + 90 + 2$
 j) $8,000,000,000 + 600,000,000 + 50,000,000 + 4,000,000 + 700,000 + 10,000 + 2,000 + 300 + 90$
 k) $300,000,000 + 60,000,000 + 5,000,000 + 200,000 + 50,000 + 4,000 + 200 + 30 + 1$
2. a) 86,421 b) 87,763 c) 9,877,241
 d) 986,533 e) 7,774,420 f) 7,766,650
 g) 9,887,321

3. a) 13,567 b) 11,388 c) 123,567
 d) 1,334,457 e) 2,355,668 f) 2,236,789
4. a) 123,683 b) 43,254
 c) 35,974,133 d) 7,823,152
 e) 954,617,235 f) 6,618,925,314

Exercise 5

LB page 11

1.

	Number	10 less than	10 more than	100 less than	100 more than	1,000 less than	1,000 more than	10,000 less than	10,000 more than
a)	135,789	135,779	135,799	135,689	135,889	134,789	136,789	125,789	145,789
b)	584,631	584,621	584,641	584,531	584,731	583,631	585,631	574,631	594,631
c)	257,843	257,833	257,853	257,743	257,943	256,843	258,843	247,843	267,843
d)	684,569	684,559	684,579	684,469	684,669	683,569	685,569	674,569	694,569
e)	247,754	247,744	247,764	247,654	247,854	246,754	248,754	237,754	257,754
f)	328,761	328,751	328,771	328,661	328,861	327,761	329,761	318,761	338,761
g)	148,690	148,680	148,700	148,590	148,790	147,690	149,690	138,690	158,690
h)	474,628	474,218	474,638	474,528	474,728	473,628	475,628	464,628	484,628

2. a) $178,916 > 89,056$ b) $80,732 = 80,732$
 c) $8,826 < 9,039$ d) $25,143 > 235,662$
 e) $65,041 < 65,082$ f) $66,378 > 59,784$
 g) $3,021 = 3,021$ h) $98,622 < 986,341$
 i) $46,941 < 986,341$ j) $905,631 > 904,932$
 k) $716,829 < 758,691$ l) $315,282 < 315,782$
3. a) $183,614 = 180,000 + 3,000 + 614$
 b) $932,406 > 900,000 + 32,000 + 174$
 c) $320,000 + 179 < 320,000 + 989$
 d) $106,000 + 341 > 100,000 + 7,000 + 329$
 e) $260,000 + 2,090 < 260,000 + 1,190$

Exercise 6

LB page 12

1. a) 13,512 ; 36,251 ; 80,725 ; 93,676
 b) 84,321 ; 228,476 ; 251,869 ; 432,761 ; 643,871
 c) 124,578 ; 232,416 ; 457,861 ; 567,390 ; 567,491
 d) 2,634,653 ; 2,637,890 ; 3,481,206 ; 4,378,212 ;
 4,837,611
 e) 108,746 ; 108,931 ; 127,489 ; 143,352 ; 161,452

Tens (10s)	Hundreds (100s)	Thousands (1,000s)	Ten thousands (10,000s)
100	1,000	10,000	152,00
110	1,100	11,000	162,000
120	1,200	12,000	172,000

2. a) 180; 190; 200 b) 600; 670; 680
c) 1,020; 1,030; 1,040 d) 152,040; 152,050; 152,060
e) Ten
3. a) 13,700; 13,800; 13,900
b) 1,200; 1,300; 1,400
c) 754,300; 754,400; 754,500
e) 973,100; 973,200; 973,300
f) One hundred
4. a) 34,000; 35,000; 36,000
b) 61,000; 62,000; 63,000
c) 888,000; 889,000; 890,000
d) 997,000; 998,000; 999,000
e) One thousand
5. a) 200,000; 250,000; 300,000
b) 220,000; 270,000; 320,000
c) 400,000; 450,000; 500,000
d) 850,000; 900,000; 950,000
e) Fifty thousand
6. a) 700,000; 900,000; 1,100,000
b) 800,000; 1,000,000; 1,200,000
c) Two hundred thousand
7. a) 57; 47; 37. Ten
b) 205; 105; 5. Hundred
c) 73,000; 72,500; 72,000. Five hundred
d) 973,821; 973,721; 973,621. One hundred
e) 934,321; 924,321; 914,321. Ten thousand
8. a) 670; 370
b) 754; 784
c) 94,729; 91,729; 90,729
d) 110,000; 140,000; 150,000
e) 689,749; 689,719
f) 792,989; 492,989

Exercise 9

LB page 17

1. 4,000,000; 5,000,000. Counted forwards
2. 8,000,000; 9,000,000. Counted forwards
3. 5,500,000; 6,500,000. Counted forwards
4. 3,000,004; 4,000,004. Counted forwards
5. 3,099,999; 4,099,999. Counted forwards
6. 17,000,450; 16,000,450. Counted backwards
7. 271,269,271; 271,268,271. Counted backwards
8. 888,888,888; 858,888,888. Counted backwards

Exercise 10

LB page 18

1. 800,000,000; 900,000,000
2. 1,000,004,000; 1,000,005,000
3. 1,534,567,890; 1,634,567,890
4. 1,000,000; 100,000
5. 1,000,000,000; 1,010,000,000
6. 1,452,456,456; 1,453,456,456

Exercise 11

LB page 18

1. a) Two hundred and one, seven hundred and twenty seven, four thousand, thirty one thousand
b) Six hundred and seventeen, five thousand and seventeen, twelve thousand, seventeen million, twenty-one million
2. a) 612,000
b) 27,683,316

11. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 1 to 11 as Extension exercises. You can also choose any Exercises from pages 1 to 11 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

1. Learning outcomes

Learners will demonstrate an understanding of Roman numerals up to C. They will investigate the relationship between Roman numerals and Hindu-Arabic numerals and develop problem-solving skills.

2. Essential for learning

Learners should have a good understanding of the binary number system. They should also have encountered Roman numerals in previous years.

3. Key words

Numerals, vertically, zigzag, diagonally

4. Resources used in this chapter

Learner's Book, Workbook, Roman numeral and symbols

5. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning.

Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

6. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps.

7. Additional content for the teacher

Consult your learners' History curriculum for additional material on counting methods. If you have access to the Internet, explore YouTube for material on Hindu Arabic numbers and Roman numerals.

8. Teaching methodology

Use a wall chart to familiarise the learners with Roman numeration. Learners should use the chart to place numbers in a sequential order. Then, they should use the wall chart to convert Roman numerals to the Hindu Arabic numeral system and vice versa.

9. Assessment

Assessment can take many forms, for example teacher assessment (class work activity), self or peer assessment.

10. Answers

Exercise 12

LB page 20

- | | | |
|--------|--------|--------|
| 1. 11 | 2. 16 | 3. 23 |
| 4. 93 | 5. 39 | 6. 69 |
| 7. 40 | 8. 24 | 9. 72 |
| 10. 95 | 11. 34 | 12. 49 |
| 13. 70 | 14. 52 | 15. 59 |

Exercise 13

LB page 22

- | | | |
|-----------|------------|---------|
| 1. XVI | 2. VIII | 3. XLI |
| 4. LXXXVI | 5. XLIX | 6. LIII |
| 7. LXVIII | 8. LXXIII | 9. XXI |
| 10. XXXV | 11. XXIV | 12. VII |
| 13. XIX | 14. XCVIII | 15. XLV |

Exercise 14

LB page 22

- | | | |
|-----------|------------|------------|
| 1. VIII | 2. XII | 3. V |
| 4. XII | 5. VII | 6. II |
| 7. XIX | 8. XI | 9. XII |
| 10. III | 11. X | 12. XXV |
| 13. XXXIX | 14. XXXI | 15. XXXIV |
| 16. XII | 17. XXVIII | 18. XXXVII |

Exercise 15

LB page 24

- | | | |
|-----------|---------|---------|
| 1. V | 2. VIII | 3. VII |
| 4. VI | 5. IXX | 6. XXV |
| 7. V | 8. XV | 9. IV |
| 10. XX | 11. IXX | 12. XL |
| 13. XVIII | 14. IXX | 15. XXI |

11. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 12 to 14 as Extension exercises. You can also choose any Exercises from pages 12 to 14 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Content standard

B6.1.1.3 Factors, multiples and prime numbers from 1 to 100

1. Learning outcomes

The learners will be able to recognise, describe and represent numbers and their relationships, and to count, estimate with competence and confidence in solving problems.

2. Essential for learning

Learners should have prior experience with prime numbers.

3. Key words

Highest common factor (HCF), lowest common multiples (LCM), prime factors

4. Resources used in this chapter

Learner's Book, Workbook, hundreds chart

5. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning.

Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

6. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Make sure that learners understand the vocabulary in word problems.

7. Additional content for the teacher

Videos on prime factors and the prime factorisation method. Consult YouTube.

8. Teaching methodology

Revise the use of the factor tree method to determine prime factors. Learners use this method above to express numbers as product of their prime. Use concrete, semi concrete and abstract sequence. Make use of peer-assisted learning.

9. Assessment

Teacher assessment, for example, a class work activity. Also include self and peer assessment.

10. Answers

Exercise 16

LB page 26

- | | |
|--|-----------------------------------|
| 1. a) $28 = 2 \times 2 \times 7$ | b) $18 = 2 \times 3 \times 3$ |
| c) $45 = 3 \times 3 \times 5$ | |
| 2. a) $2 \times 2 \times 2 \times 2$ | b) 2×17 |
| c) $2 \times 2 \times 3$ | d) $2 \times 2 \times 2 \times 3$ |
| e) $2 \times 2 \times 2 \times 2 \times 3$ | f) $3 \times 3 \times 3 \times 2$ |
| g) $3 \times 2 \times 7$ | h) $2 \times 3 \times 5$ |
| i) $2 \times 2 \times 2 \times 5$ | j) $2 \times 3 \times 11$ |
| k) $3 \times 3 \times 3$ | l) $3 \times 3 \times 3 \times 3$ |
| m) 5×7 | n) $2 \times 2 \times 19$ |
| o) 7×7 | |

Exercise 17

LB page 28

1. a) 6 b) 12 c) 4
 d) 7 e) 18 f) 12
2. 9
3. GH¢ 7
4. 3
5. a) True
 b) True

Exercise 18

LB page 30

1. a) 3 b) 3 c) 7
2. a) 36 b) 456 c) 30
 d) 40 e) 20 f) 120

Exercise 19

LB page 31

1. HCF = 6, LCM = 126
2. HCF = 25, LCM = 75
3. HCF = 3, LCM = 30
4. HCF = 6, LCM = 120
5. HCF = 4, LCM = 40
6. HCF = 2, LCM = 528
7. HCF = 2, LCM = 600
8. HCF = 28, LCM = 84

Exercise 20

LB page 32

1. HCF = 2, LCM = 80
2. HCF = 6, LCM = 72
3. HCF = 3, LCM = 180
4. HCF = 6, LCM = 432
5. HCF = 5, LCM = 120

11. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 15 to 18 as Extension exercises. You can also choose any Exercises from pages 15 to 18 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Sub-strand 2: Number operations

Content standard

B6.1.2.1 Apply mental mathematics strategies and number properties for multiplication and division

1. Learning outcomes

The learners will be able to use a range of strategies to perform written and mental calculations with whole numbers, with competence and confidence in solving problems.

2. Essential for learning

Learners should have prior experience with the different multiplication strategies.

3. Key words

Multiplier, multiplicand, product, doubling, halving, factors

4. Resources used in this chapter

Learner's Book, Workbook, multiplication tables, distributive and associative property charts

5. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

6. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into

small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

7. Additional content for the teacher

You tube videos on multiplication bonds, and multiplication using the vertical column method

8. Teaching methodology

Use addition and subtraction to split numbers inside brackets (distributive property). Use factors to split up numbers, and use doubling and halving. Encourage peer-assisted learning using the vertical column method.

9. Assessment

Teacher assessment, for example, a class work activity. Also make use of self or peer assessment.

10. Answers

Exercise 1

LB page 34

- | | | |
|----------|-------|-------|
| 1. a) 24 | b) 32 | c) 25 |
| d) 20 | e) 30 | f) 30 |
| g) 35 | h) 40 | i) 42 |
| j) 56 | k) 10 | l) 40 |
| m) 72 | n) 30 | o) 49 |
| p) 64 | q) 81 | r) 36 |
2. Learners' own answers
3. a) $3 \times 4 = 12$; $6 \times 4 = 24$
b) $3 \times 5 = 15$; $6 \times 5 = 30$
c) $2 \times 7 = 14$; $4 \times 7 = 28$
d) $4 \times 8 = 32$; $8 \times 8 = 64$
e) $2 \times 8 = 16$; $4 \times 8 = 32$
f) $2 \times 5 = 10$; $4 \times 5 = 20$
g) $4 \times 6 = 24$; $8 \times 6 = 48$
h) $3 \times 9 = 27$; $6 \times 9 = 54$

4.

If $5 \times 10 = 50$	then $5 \times 9 = 45$	then $5 \times 11 = 55$
If $4 \times 10 = 40$	then $4 \times 9 = 36$	then $4 \times 11 = 44$
If $7 \times 10 = 70$	then $7 \times 9 = 63$	then $9 \times 11 = 99$
If $8 \times 10 = 80$	then $8 \times 9 = 72$	then $8 \times 11 = 88$

11. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 19 to 21 as Extension exercises. You can also choose any Exercises from pages 19 to 21 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Content standard

B6.1.2.2 Multiply multi-digit numbers

1. Learning outcomes

The learners will be able to use a range of strategies to perform written and mental calculations with whole numbers, with competence and confidence in solving problems.

2. Essential for learning

Learners should have prior experience of the different multiplication strategies.

3. Key words

Expand and box method, column, vertical, distributive property, lattice method

4. Resources used in this chapter

Learner's Book, Workbook, expand box, lattice box

5. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logistical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

6. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

7. Additional content for the teacher

Consult YouTube for content on the various methods used in this module.

8. Teaching methodology

Split numbers inside brackets to make them smaller and easier to multiply. Use the distributive method to split the numbers. Use doubling and halving and make use of peer-assisted learning using the vertical column method.

9. Assessment

Teacher assessment, for example, a class work activity. Self or peer assessment.

10. Answers

Exercise 2

LB page 36

1. a) $46 \times 1,000 = 46,000$ b) $28 \times 10 = 280$
c) $100 \times 263 = 26,300$ d) $10 \times 22 = 220$

- e) $1,000 \times 343 = 343,000$ f) $304 \times 10 = 3,040$
 g) $69 \times 100 = 6,900$ h) $1,000 \times 79 = 79,000$
2. a) 4,260 b) 3,910 c) 1,900
 d) 250,000 e) 35,000 f) 2,800
 g) 1,200 h) 62,000 i) 89,000
 j) 520
3. $36 \times 10 = 360$. There are 360 boxes altogether.
4. $26 \times 100 = 2,600$. 2,600 planes land at the airport after 100 hours.
5. $30 \times 100 = 3,000$. The length of all the rulers will be 3,000 cm.

Exercise 3

LB page 37

1. a) $7 \times (5 + 2) = (7 \times 5) + (7 \times 2) = 35 + 14$
 b) $(3 \times 8) - (3 \times 4) = 24 - 12 = 12$
 c) $4 \times 35 = (4 \times 30) + (4 \times 5) = 120 + 20 = 140$
 d) $14 \times 6 = 6 \times (10 + 4) = (6 \times 10) + (6 \times 4)$
 $= 60 + 24 = 84$
2. a) 128 b) 115 c) 96
 d) 96 e) 84 f) 85
 g) 168 h) 144 i) 144
 j) 120 k) 72 l) 207
 m) 105 n) 198

Exercise 4

LB page 38

1. Group of 8 items multiplied by 1 = 8
2. $5 \times 0 = 0$
 $0 + 0 + 0 + 0 + 0 = 0$

Exercise 5

LB page 42

1. a) $48 \times 6 = 288$

×	40	8
6	240	48

- b) $583 \times 6 = 3,498$

×	500	80	3
6	3,000	480	18

c) $489 \times 5 = 2,445$

×	400	80	9
5	2,000	400	45

d) $279 \times 4 = 1,116$

×	200	70	9
4	800	280	36

e) $634 \times 16 = 10,144$

×	600	30	4
10	6,000	300	40
6	3,600	180	24

f) $126 \times 17 = 2,142$

×	100	20	6
10	1,000	200	60
7	700	140	42

2. a) $24 \times 16 = 384$

	2	4	
×	1	6	
	1	4	4
+	2	4	0
	3	8	4

b) $37 \times 23 = 851$

	3	7	
×	2	3	
	1	1	1
+	7	4	0
	8	5	1

c) $562 \times 31 = 17,422$

	5	6	2	
×		3	1	
	5	6	2	
+	1	6	,	8
	1	7	,	4
				2

d) $257 \times 21 = 5,397$

	2	5	7	
×		2	1	
	2	5	7	
+	5	,	1	4
	5	,	3	9
				7

e) $879 \times 62 = 54,498$

	8	7	9	
×		6	2	
	1	,	7	5
+	5	2	,	7
	5	4	,	4
				9
				8

f) $236 \times 41 = 9,676$

	2	3	6	
×		4	1	
	2	3	6	
+	9	,	4	4
	9	,	6	7
				6

3. a) 74

b) 76

c) 2,064

d) 2,142

e) 5,894

f) 7,452

11. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 21 to 24 as Extension exercises. You can also choose any Exercises from pages 21 to 24 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Content standard

B6.1.2.3 Manipulate numbers using division facts

1. Learning outcomes

The learners will be able to use a range of strategies to perform written and mental calculations with whole numbers, with competence and confidence in solving problems.

2. Essential for learning

Learners should have prior experience with the different multiplication strategies.

3. Key words

Dividend, divisor, quotient

4. Resources used in this chapter

Learner's Book, Workbook, divisibility chart test, multiplication chart, dice, playing cards

5. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

6. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

7. Additional content for the teacher

YouTube video on using the divisibility rule

8. Teaching methodology

Use the divisibility rule to determine the multiples of 6, 8, 9, 11. Draw a 6×6 multiplication chart and use it as a game to play the 3-in-line game. Include peer-assisted learning using the vertical column method.

9. Assessment

Teacher assessment, for example, a class work activity

10. Answers

Exercise 6

LB page 44

- Yes. The last number is 8, and 8 is an even number.
 - No. The last number is 5. 5 is an odd number and not divisible by 2.
 - Yes. The last number is 6, and 6 is an even number.
 - No. The last number is 5. 5 is an odd number and not divisible by 2.
- Yes. The last two digits, 40, is divisible by 4.
 - Yes. The last two digits, 48, is divisible by 4.
 - No. The last number is 5. 5 is an odd number and not divisible by 4.
 - Yes. The last two digits, 24, is divisible by 4.
 - No. $26 \div 4 = 6.5$. It leaves behind a remainder.
- No, it is not divisible by 3, 6 or 9. They leave behind remainders.
 - No, it is not divisible by 3, 6 or 9. They leave behind remainders.

- c) No, it is not divisible by 3, 6 or 9. They leave behind remainders.
- d) Yes. $108 \div 3 = 36$. $108 \div 6 = 18$. $108 \div 9 = 12$
4. 42: 2; 3; 6
 162: 2; 3; 6; 9
 354: 2; 3; 6
 245: 5
 16,852: 2; 4
 857: not divisible by any of the numbers
 916: 2; 4
 240: 2; 3; 4; 5; 6; 10
 342: 2; 3; 6; 9;
 2,286: 2; 3; 6; 9
 4,992: 2; 3; 4; 6
 62,370: 2; 3; 5; 6; 9; 10
 432: 2; 3; 4; 6; 9
 38,385: 3, 5, 9
 723: 3
5. a) The number 1,536 is divisible by 6.
 b) The number 81 is divisible by 3.
 d) The number 72 is divisible by 4.
 e) The number 22 is divisible by 2.

11. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 25 to 26 as Extension exercises. You can also choose any Exercises from pages 25 to 26 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Content standard

B6.1.2.4 Divide 2- or 3-digit numbers by 1- or 2-digit numbers

1. Learning outcomes

The learners will be able to use a range of strategies to perform written and mental calculations with whole numbers, with competence and confidence in solving problems.

2. Essential for learning

Learners should have experience with using different strategies to perform the four basic operations.

3. Key words

Order of operations

4. Resources used in this chapter

Learner's Book, Workbook

5. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logistical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

6. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

7. Additional content for the teacher

YouTube videos on division techniques

8. Teaching methodology

Model mathematical statements from a given word problem, using the long division method. Role-play a given word problem involving division and subtraction and solve using an appropriate strategy.

Assessment

Teacher assessment, for example, class work activity

9. Answers

Exercise 7

LB page 46

1. a) 66, remainder 6 b) 228, remainder 1
c) 109, remainder 1 d) 14, remainder 20
e) 73 f) 10
g) 915 h) 604
i) 692 j) 211
2. a) $966 \div 69 = 14$. So, $14 \times 69 = 966$
b) $4,182 \div 41 = 102$. So, $102 \times 41 = 4,182$
c) $2,880 \div 24 = 120$. So, $120 \times 24 = 2,880$
d) $3,150 \div 15 = 210$. So, $210 \times 15 = 3,150$

11. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook page 27 as Extension exercises. You can also choose any Exercises from page 27 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Content standard

B6.1.2.5 Translate word problems to mathematical sentences and solve

1. Essential for learning

Learners should have prior experience of using different strategies to perform the four basic operations.

2. Key words

Integers, whole numbers, ascending, descending

3. Resources used in this chapter

Learner's Book, Workbook, number lines

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

6. Additional content for the teacher

YouTube videos on rounding off, up or down

7. Teaching methodology

Use the number line to compare and order a set of integers. Take care that learners are able to precisely locate integers on the number line.

8. Assessment

Teacher assessment

9. Answers

Exercise 8

LB page 49

1. $24 \times 12 = 288$
2. 7 days = 1 week and 2 weeks = 14 days. So, $260 \times 14 = 3,640$. Yao consumes 3,640 calories eating chocolate.
3. $84 \div 12 = 7$. The baker will need to prepare 7 boxes.

4. $30 \times 4 = 120$. $120 + 40 = 160$. $200 - 160 = 40$. Ebor will give her mom GH¢ 40.00 change.
5. $24 \times 3 = 72$. $72 + 24 = 96$. They picked 96 mangoes altogether.
 $96 \div 3 = 32$. They each get 32 mangoes.
6. $12 \times 12 = 144$
 - a) $144 - 90 = 54$. She has GH¢ 54.00 remaining after purchasing jeans
 - b) $126 - 54 = 72$. $72 \div 12 = 6$. Anaika needs to save for 6 more weeks.

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook page 28 as Extension exercises. You can also choose any Exercises from page 28 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Content standard
B6.1.2.6 Understand integers

1. Learning outcomes

Learners will be able to use a range of strategies to perform written and mental calculations with whole numbers, with competence and confidence in solving problems.

2. Essential for learning

Learners should have prior experience of using different strategies to perform the four basic operations.

3. Key words

Integers, whole numbers, ascending, descending

4. Resources used in this chapter

Learner's Book, Workbook, number lines

5. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logistical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

6. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

7. Additional content for the teacher

YouTube video on rounding off, up or down

8. Teaching methodology

Use a number line to compare and order a set of integers. Also solve word problems involving integers using number lines. Take care that the learners are able to locate numbers on the number line.

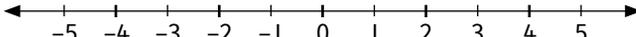
9. Assessment

Teacher assessment, for example, class work activity. Self or peer assessment.

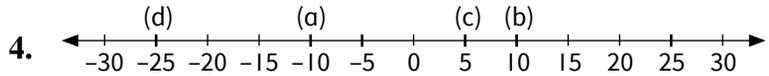
10. Answers

Exercise 9

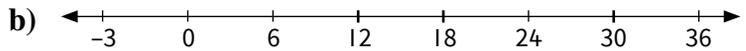
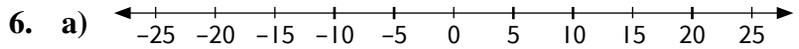
LB page 53

1. 
2. a) 6 b) -6 c) 8
d) Ones

3. a) 14 b) 4 c) -14



5. a) 5 units b) 5 units
c) Distance is the same.



7. a) $-1 > -2$ b) $5 < 6$ c) $-1 < 0$
d) $-4 < -3$ e) $-8 = -8$ f) $-5 < -4$
g) $-10 < -9$ h) $-8 > -9$ i) $-5 > -6$
8. a) $-3 > -10$ b) $3 < 5$ c) $-2 < 6$
d) $8 > -8$ e) $12 < 13$ f) $-7 < 6$
g) $-22 > -25$ h) $-26 < -19$ i) $-33 > -39$
9. a) -8 b) 5 c) -3
d) 0 e) 1 f) -1
g) -3 h) 1 i) 10

Exercise 10

LB page 56

1. a) -4; -2; 0; 3; 6; 8 b) -10; -8; -4; 4; 6
c) -9; -5; 2; 4 d) -10; -6; -2; 0; 4
e) -7; -4; 3; 4; 6
2. a) 6; 2; 0; -3; -7 b) 8; 7; 3; -4; -9
c) 8; 2; 0; -6; -10 d) 25; 10; -5; -10; -15
e) 12; 8; 0; -4; -8; -16 f) 4; 0; -2; -12
3. a) -9; -4; -1; 7; 8 b) -8; -4; 0; 2; 4
c) -10; -7; -5; 0; 2; 6 d) -25; -18; -6; 0; 3; 12
e) -46; -16; -5; 7; 33
4. a) 6; 4; 0; -2; -8 b) 9; 6; 6; 3; -3
c) 12; 8; 5; 3; -8; -10 d) 9; 8; 4; -1; -5; -10
e) 12; 3; -4; -6; -8 f) 3; 0; -2; -6; -8
g) 10; 9; 0; -14; -16 h) 11; 9; 7; 5; 0; -3; -5; -6
5. a) -50 b) -80 c) -18 d) -32
6. a) 50 b) 66 c) 57 d) 0

Exercise 11

LB page 57

1. a) -10 b) 15 c) -12 d) 10
e) -12 f) -15 g) -20 h) 35

2.

	Integer	One more	One less
a)	2	3	1
b)	0	1	-1
c)	-4	-3	-5
d)	-11	-10	-12
e)	5	6	4
f)	-6	-5	-7
g)	-8	-7	-9
h)	18	19	17
i)	12	13	14
j)	-12	-11	-13
k)	-4	-3	-5

Exercise 12

LB page 61

- $-3 + 6 = 3$
 - $4 + (-7) = -3$
 - $-5 + 9 = 4$
 - $8 + (-6) = 2$
 - $4 + 9 = 13$
 - $0 + (-8) = -8$
 - $-5 + (-2) = -7$
 - $-6 + 10 = 4$
 - $-7 + 4 = -3$
 - $-6 + 9 = 3$
 - $-7 + 12 = 5$
 - $-4 + 4 = 0$
- $-15 + 20 = 5$
 - $-9 + (12) = 3$
 - $4 + (-10) = -6$
 - $-12 + 24 = 12$
 - $12 + (-9) = 3$
 - $-30 + 25 = -5$
- $-1 - 8 = -9$
 - $5 - 7 = -2$
 - $4 - 8 = -4$
 - $5 - 8 = -3$
 - $-10 - 5 = -15$
 - $-7 - 3 = -10$
 - $8 - 10 = -2$
 - $16 - 20 = -4$
 - $-6 - 1 = -7$
 - $-2 - 4 = -6$
 - $-8 - 5 = -13$
 - $-4 - 5 = -9$
 - $6 - 8 = -2$
 - $4 - 12 = -8$
 - $7 - 12 = -5$

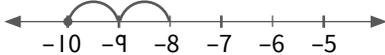
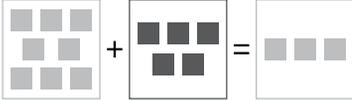
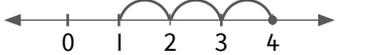
Exercise 13

LB page 62

- $-4 + 2 = -2$
 - $1 + (-6) = -5$
 - $-2 + 5 = 3$
 - $4 + (-6) = -2$
 - $-9 + 4 = -5$
 - $-1 + 7 = 6$
 - $-6 + 4 = -2$
 - $7 + (-9) = -2$

- i) $12 + (14) = 26$ j) $13 + (10) = 23$
 k) $5 + (-3) = 2$ l) $-8 + 10 = 2$
 m) $-7 + 12 = 5$ n) $-10 + 6 = -4$
 o) $12 + (-16) = -4$ p) $5 + (-9) = -4$
 q) $8 + (-8) = 0$ r) $-6 + 7 = 1$
2. a) $2 - 6 = -4$ b) $7 - 9 = -2$
 c) $6 - 8 = -2$ d) $5 - 7 = -2$
 e) $-1 - 3 = -4$ f) $-1 - 8 = -9$
 g) $-6 - 4 = -10$ h) $8 - 7 = 1$
 i) $-4 - 4 = -8$ j) $-8 - 6 = -14$
 k) $12 - 15 = -3$ l) $9 - 14 = -5$
 m) $6 - 12 = -6$ n) $3 - 6 = -3$
 o) $7 - 9 = -2$ p) $12 - 18 = -6$

3.

Sum of ...	Model	Number line
a) $-10 + 2$		 $-10 + 2 = -8$
b) $-8 + 5$		 $-8 + 5 = -3$
c) $4 + (-3)$		 $4 + (-3) = 1$
d) $7 + (-9)$		 $7 + (-9) = -2$
e) $6 + (-10)$		 $6 + (-10) = -4$
f) $12 + (-5)$		 $12 + (-5) = 7$
g) $-4 + 7$		 $-4 + 7 = 3$

4.

Add	Subtract
a) $3 + (-8) = -5$	h) $3 - (4) = -1$
b) $-10 + (-3) = -13$	i) $6 - (5) = 1$
c) $5 + (-7) = -2$	j) $-8 - (3) = -11$
d) $(8) - 6 = 2$	k) $-20 - (-4) = -16$
e) $(8) + (-6) = 2$	l) $-2 - (4) = -6$
f) $-7 + (7) = 0$	m) $(4) - 1 = 3$
g) $(-8) + 4 = -4$	n) $(-5) - 3 = -8$

Exercise 14

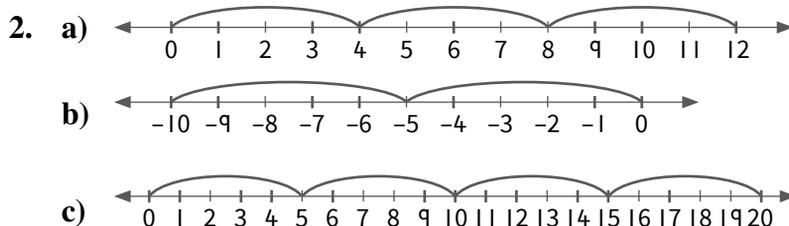
LB page 64

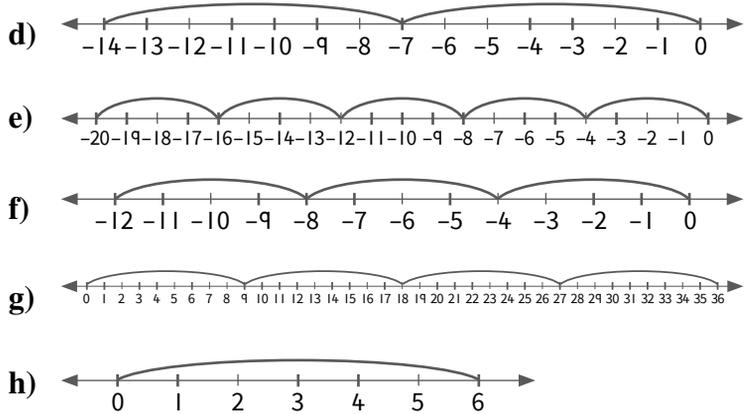
	Initial temperature	Changing temperature (dropped or increased?)	Calculation	Final temperature
1.	10 °C	Dropped by 6 = (-6 °C)	$10 - 6 = 4$	4 °C
2.	-3 °C	Dropped by 2 = (-2 °C)	$-3 + (-2) = -5$	5 °C
3.	-4 °C	Increased by 4 = (4 °C)	$(-4) + (4) = (0)$	0 °C
4.	-5 °C	Increased by 8 = (+8 °C)	$-5 + 8 = 3$	3 °C
5.	-8 °C	Temperature remained the same	$-8 + 0 = -8$	-8 °C
6.	-9 °C	Dropped by 3 = (-3 °C)	$-9 + (-3) = -12$	-12 °C
7.	8 °C	Dropped by 22 = (-22 °C)	$8 - 22 = -14$	-14 °C
8.	-1 °C	Increased by 21 = (21 °C)	$-1 + 21 = 20$	20 °C

Exercise 15

LB page 66

1. a) $4 \times 4 = 16$ b) $-2 \times 2 = -4$
 c) $7 \times 3 = 21$ d) $-3 \times 4 = -12$
 e) $-6 \times 3 = -18$ f) $-4 \times 6 = -24$





3. a) $3 \times (-2) = -6$ b) $-4 \times 3 = -12$
 c) $8 \times 2 = 16$ d) $8 \times (-2) = -16$
 e) $5 \times (-3) = -15$ f) $4 \times (-9) = -36$
4. a) $2 \times (-5) = -10$ b) $-3 \times 6 = -18$
 c) $5 \times (-10) = -50$ d) $-8 \times 10 = -80$
 e) $0 \times (-4) = 0$ f) $-2 \times 10 = -20$
 g) $4 \times 6 = 24$ h) $5 \times (-4) = -20$
 i) $6 \times 6 = 36$ j) $9 \times (-6) = -54$
 k) $8 \times (-4) = -32$ l) $-3 \times 11 = -33$
5. a) -4
 b) $-4 \times 5 = -20$. The bird's height changes by -20 m after 5 seconds.
 c) $100 - 20 = 80$. The bird's height must change by -80 m before it reaches the ground.
 d) $-80 \div (-4) = 20$. It will take 20 seconds for the bird to reach the ground.
6. a) -6
 b) $-6 \times 6 = -36$
 c) 6 laps = 36 litres of petrol. $54 - 36 = 18$. The car has 18 litres of petrol after 6 laps.
 d) $18 \div 6 = 3$. It will be able to do 3 more laps.
7. a) $7 \times 8 = 56$. The change in depth is 56 m after 8 minutes.
 b) A negative integer
 c) The submarine submerges below sea level.

11. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly,

select questions from Workbook pages 29 to 43 as Extension exercises. You can also choose any Exercises from pages 29 to 43 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Sub-strand 3: Fractions

Content standard

B6.1.3.1 Compare, add, subtract, multiply and divide fractions

1. Essential for learning

Learners should have experience with objects that are whole and objects of which there are parts missing. They should also have experience of using different strategies to perform the four basic operations on whole numbers.

2. Key words

Common fractions, decimals, percentages, part of a whole, numerator, denominator, improper fractions, mixed numbers, common denominator, equivalent

3. Resources used in this chapter

Learner's Book, Workbook, fraction charts, number cards, counters

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logistical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

6. Additional content for the teacher

YouTube videos on comparing fractions, addition and subtraction of fractions, multiplication and division of fractions

7. Teaching methodology

Cut concrete objects (e.g. fruit and sheets of card/papers) into parts and state the part as a fraction of the whole. Ask the learners to draw whole items and then partition them according to your instruction. Ask learners to shade fractions of shapes that they have drawn. Also use concrete objects to add and subtract fractions of a whole. Use a fraction chart to make these operations easier.

When teaching multiplication of fractions, express the whole number as a fraction and multiply the numerators, then denominators. Change all fractions into common fractions, then multiply them separately (numerators first then denominators). Stress that the learners should always simplify the products to their simplest form.

8. Assessment

Teacher assessment, for example, a class work activity, or end of unit test. Also create work sheets for extra practise.

9. Answers

Exercise 1

LB page 71

1. a) $\frac{2}{3} = \frac{6}{9}$

c) $\frac{4}{16} = \frac{1}{4}$

e) $\frac{5}{9} = \frac{15}{27}$

b) $\frac{2}{5} = \frac{6}{15}$

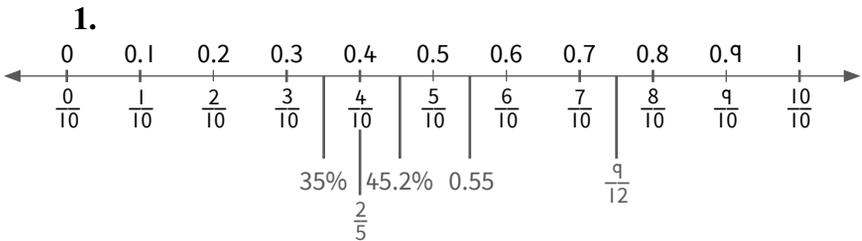
d) $\frac{9}{12} = \frac{3}{4}$

f) $\frac{4}{5} = \frac{16}{20}$

- d) 10% e) 80%
3. a) $\frac{58}{100} = \frac{29}{50}$ b) $\frac{74}{100} = \frac{37}{50}$ c) $\frac{77}{100}$
 d) $\frac{9}{100}$ e) $\frac{54}{100} = \frac{27}{50}$ f) $\frac{28}{100} = \frac{14}{50}$
 g) $\frac{36}{100} = \frac{18}{50} = \frac{9}{25}$ h) $\frac{92}{100}$
4. a) $\frac{86}{100} = \frac{43}{50}$ b) $\frac{21}{100}$
 c) $\frac{229}{1000}$ d) $\frac{33}{100}$
 e) $\frac{50}{100} = \frac{1}{2}$ f) $\frac{25}{100} = \frac{1}{4}$
 g) $\frac{23}{100}$
5. a) 0.48 b) 0.159 c) 0.94
 d) 0.11 e) 0.30 f) 0.18
 g) 0.85 h) 0.65

Exercise 4

LB page 79



2. a) $\frac{1}{4}$; 30%; 0.45 b) 20%; $\frac{1}{5}$; 25%; 0.4
 c) $\frac{4}{20}$; 65%; $\frac{8}{10}$; 0.85 d) 20%; $\frac{5}{20}$; $\frac{4}{10}$; 0.65

Exercise 5

LB page 83

1. a) $2\frac{2}{3} - \frac{6}{5}$
 $= 2\frac{2}{3} - 1\frac{1}{5}$
 $= (2 - 1) + (\frac{2}{3} - \frac{1}{5})$
 $= (2 - 1) + (\frac{10}{15} - \frac{3}{15})$
 $= 1\frac{7}{15}$
- b) $3\frac{1}{4} - 2\frac{1}{5}$
 $= (3 - 2) + (\frac{1}{4} - \frac{1}{5})$
 $= (3 - 2) + (\frac{5}{20} - \frac{4}{20})$
 $= 1\frac{1}{20}$
- c) $4\frac{1}{2} + 2\frac{2}{3}$
 $= (4 + 2) + (\frac{1}{2} + \frac{2}{3})$
 $= (4 + 2) + (\frac{3}{6} + \frac{4}{6})$
 $= 6 + 1\frac{1}{6}$
 $= 7\frac{1}{6}$
- d) $\frac{1}{3} + \frac{1}{5}$
 $= \frac{5}{15} + \frac{3}{15}$
 $= \frac{8}{15}$

$$\begin{aligned}
 \text{e)} \quad & \frac{17}{5} - 2\frac{2}{3} \\
 & = 3\frac{2}{5} - 2\frac{2}{3} \\
 & = (3 - 2) + \left(\frac{2}{5} - \frac{2}{3}\right) \\
 & = (3 - 2) + \left(\frac{6}{15} - \frac{10}{15}\right) \\
 & = 1 - \frac{4}{15} \\
 & = \frac{15}{15} - \frac{4}{15} \\
 & = \frac{11}{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{f)} \quad & \frac{16}{3} + 4\frac{1}{2} \\
 & = 5\frac{1}{3} + 4\frac{1}{2} \\
 & = (5 + 4) + \left(\frac{1}{3} + \frac{1}{2}\right) \\
 & = (5 + 4) + \left(\frac{2}{6} + \frac{3}{6}\right) \\
 & = 9\frac{5}{6}
 \end{aligned}$$

$$\begin{aligned}
 \text{g)} \quad & 5\frac{1}{3} + 2\frac{3}{4} \\
 & = (5 + 2) + \left(\frac{1}{3} + \frac{3}{4}\right) \\
 & = (5 + 2) + \left(\frac{4}{12} + \frac{9}{12}\right) \\
 & = 7 + \frac{13}{12} \\
 & = 8\frac{1}{12}
 \end{aligned}$$

$$\begin{aligned}
 \text{h)} \quad & 2 + \frac{2}{3} + \frac{8}{5} \\
 & = 2 + \frac{2}{3} + 1\frac{3}{5} \\
 & = (2 + 1) + \left(\frac{2}{3} + \frac{3}{5}\right) \\
 & = (2 + 1) + \left(\frac{10}{15} + \frac{9}{15}\right) \\
 & = 3 + \frac{19}{15} \\
 & = 4\frac{4}{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{i)} \quad & \frac{9}{4} - 1\frac{2}{3} \\
 & = 2\frac{1}{4} - 1\frac{2}{3} \\
 & = (2 - 1) + \left(\frac{1}{4} - \frac{2}{3}\right) \\
 & = (2 - 1) + \left(\frac{3}{12} - \frac{8}{12}\right) \\
 & = 1 - \frac{5}{12} \\
 & = \frac{7}{12}
 \end{aligned}$$

$$\begin{aligned}
 \text{j)} \quad & \frac{5}{2} + \frac{5}{3} \\
 & = 2\frac{1}{2} + 1\frac{2}{3} \\
 & = (2 + 1) + \left(\frac{1}{2} + \frac{2}{3}\right) \\
 & = (2 + 1) + \left(\frac{3}{6} + \frac{4}{6}\right) \\
 & = 3 + \frac{7}{6} \\
 & = 4\frac{1}{6}
 \end{aligned}$$

$$\begin{aligned}
 \text{k)} \quad & 4\frac{1}{5} - \frac{11}{3} \\
 & = 4\frac{1}{5} - 3\frac{2}{3} \\
 & = (4 - 3) + \left(\frac{1}{5} - \frac{2}{3}\right) \\
 & = (4 - 3) + \left(\frac{3}{15} - \frac{10}{15}\right) \\
 & = 1 - \frac{7}{15} \\
 & = \frac{8}{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{l)} \quad & \frac{9}{2} + 3\frac{3}{5} \\
 & = 4\frac{1}{2} + 3\frac{3}{5} \\
 & = (4 + 3) + \left(\frac{1}{2} + \frac{3}{5}\right) \\
 & = (4 + 3) + \left(\frac{5}{10} + \frac{6}{10}\right) \\
 & = 7 + \frac{11}{10} \\
 & = 8\frac{1}{10}
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & 5\frac{2}{6} - 3\frac{1}{3} \\
 & = (5 - 3) + \left(\frac{2}{6} - \frac{1}{3}\right) \\
 & = (5 - 3) + \left(\frac{1}{3} - \frac{1}{3}\right) \\
 & = 2
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & 3\frac{7}{10} + 3\frac{5}{10} \\
 & = (3 + 3) + \left(\frac{7}{10} + \frac{5}{10}\right) \\
 & = 6 + \frac{12}{10} \\
 & = 7\frac{1}{5}
 \end{aligned}$$

$$\begin{aligned}
 4. \quad & 5\frac{2}{3} + 3\frac{2}{3} \\
 & = (5 + 3) + \left(\frac{2}{3} + \frac{2}{3}\right) \\
 & = 8 + \frac{4}{3} \\
 & = 9\frac{1}{3}
 \end{aligned}$$

$$\begin{aligned}
 5. \quad & 7\frac{2}{8} - 2\frac{3}{8} \\
 & = (7 - 2) + \left(\frac{2}{8} - \frac{3}{8}\right) \\
 & = 5 - \frac{1}{8} \\
 & = 4\frac{7}{8}
 \end{aligned}$$

$$\begin{aligned}
 6. \quad & 7\frac{1}{6} + 5\frac{6}{7} \\
 & = (7 + 5) + \left(\frac{1}{6} + \frac{6}{7}\right) \\
 & = 12 + \frac{7}{7} \\
 & = 13
 \end{aligned}$$

$$\begin{aligned}
 7. \quad & 2\frac{3}{7} + 1\frac{3}{5} \\
 & = (2 + 3) + \left(\frac{3}{7} + \frac{3}{5}\right) \\
 & = (2 + 3) + \left(\frac{15}{35} + \frac{21}{35}\right) \\
 & = 5 + \frac{36}{35} \\
 & = 6\frac{1}{35}
 \end{aligned}$$

Exercise 6

1. $\frac{1}{7}$

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

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

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

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

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

7. $\frac{5}{9}$

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

LB page 87

Exercise 7

1. a) 14

b) 21

c) 28

d) $1\frac{1}{5}$

e) $8\frac{1}{3}$

f) 14

g) 3

h) 25

LB page 88

2. a) $\frac{3}{14}$ b) $\frac{1}{6}$ c) $\frac{10}{33}$
 d) $\frac{3}{10}$
3. a) $3\frac{3}{5}$ b) $8\frac{1}{8}$ c) $\frac{49}{66}$
 d) $\frac{220}{27}$

Exercise 8

LB page 88

- The correct answer is 4.
- 9
- a) $8\frac{2}{5}$ hours b) 32 hours
- $1\frac{19}{20}$ litre, so it is 1 litre 950 ml of paint
- 1 book

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 44 to 52 as Extension exercises. You can also choose any Exercises from pages 44 to 52 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Sub-strand 4: Ratios and proportion

Content standard

B6.1.4.1 Ratio and its relationship to fractions, multiplication and division

1. Essential for learning

Learners should have experience of making comparisons of similar units, for example, ml to ml, as well as different units, for example, kg and cedis. Learners should also have experience of common fractions, whole numbers and ratios.

2. Key words

Ratio, simplest form, comparisons

3. Resources used in this chapter

Learner's Book, Workbook, fraction charts, boxes

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logistical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

6. Additional content for the teacher

Newspaper advertisements showing the prices of articles, YouTube videos, for example, on the relationship between ratio and fractions, directions on how to mix concentrate with water

7. Teaching methodology

Use catalogues that state the price of goods to calculate the cost of a unit or more items. Investigate the ratios on concentrate bottles, to calculate the quantity of water to add to juice concentrate, or fabric softener, and so on. Plan a practical activity, where learners can mix various quantities of concentrate and water, and taste which one is stronger. Allow peer-assisted learning or group activities.

8. Assessment

Teacher assessment, for example, classwork activity and a short test at the end of the unit.

9. Answers

Exercise 1

LB page 91

- a) i) 3 ii) $\frac{1}{3}$ iii) 1 : 3

b) i) 4 ii) $\frac{1}{4}$ iii) 1 : 4

c) i) No ii) Group in 3s. 1 : 3
- a) 1 : 4. There are four sets of set 1 in set 2.

b) 7 c) 1 : 7 d) 4 : 7
- a) 2 : 7 b) 1 : 1 c) 5 : 9

d) 1 : 2 e) 4 : 3
- Learners' own answers
- Learners' own answers
- a) For every 1 broiler, there are 2 layers.

b) Part to part comparison
- a) $12 - 4 = 8$ b) 4 : 12

c) Part to whole comparison

Exercise 2

LB page 94

- a) 1 : 3 b) 1 : 3 c) 1 : 5

d) 3 : 4 e) 1 : 4
- a) 1 apple to 3 apples b) 3 eggs to 5 eggs

c) 1 bird to 2 wings d) 1 chicken to 2 legs
- a) 2 : 3 b) 2 : 1 c) 1 : 6

d) 4 : 5 e) 4 : 7 f) 7 : 9

g) 6 : 1 h) 9 : 8 i) 3 : 8

j) 1 : 4 k) 3 : 9 l) 1 : 8

Exercise 3

LB page 97

- 5 : 3
- a) 5 : 12 b) 5 : 7
- a) $\frac{24}{50} = \frac{12}{25}$ b) $8 : 50 = 4 : 25$

c) 4 : 3
- 3 : 4
- 12 : 19
- 9 : 4

7. $126 \div 7 = 18$

$18 \times 2 = 36$

$18 \times 5 = 90$

Cebu will either get GH¢ 36.00 or GH¢ 90.00.

Exercise 4

LB page 100

1. a) $7 : 2 = 14 : 4$ b) $4 : 5 = 8 : 10$
c) $6 : 4 = 3 : 2$ d) $9 : 7 = 18 : 14$
e) $3 : 5 = 6 : 10$ f) $9 : 10 = 18 : 20$
2. a) $2 : 3 = 14 : 21$
b) 9 : 4 is not equivalent to 11 : 9
c) 4 : 5 is not equivalent to $\frac{2}{3}$
d) $\frac{7}{4} = \frac{21}{12}$
e) GH¢ 20 for four loaves of bread not equal to GH¢ 24 for six loaves of bread
f) Three t-shirts for GH¢ 45 is equal to five t-shirts for GH¢ 75
g) $\frac{42}{7} = \frac{54}{9}$
3. 16 girls
4. 18
5. 6 pairs of sandals
6. 8 problems uncompleted. 22 homework problems in total.
7. a) 7 b) 2 c) 10
d) 12 e) 12 f) 32
g) 36 h) 42 i) 10
j) 5
8. 100 : 1
9. a) 2 : 3 b) 4 : 3 c) 3 : 2
d) 7 : 16 e) 2 : 1
10. GH¢ 3,428.57 to one daughter, GH¢ 4,571.43 to the other

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 53 to 63 as Extension exercises. You can also choose any Exercises from pages 53 to 63 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

1. Essential for learning

Learners should have experience of comparing quantities and expressing them in ratio and rate.

2. Key words

Ratio, simplest form

3. Resources used in this chapter

Learner's Book, Workbook, fraction charts, pizza boxes

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logistical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

6. Additional content for the teacher

Modelling and mapping diagrams, especially house plans, as these help learners to understand the ratio between a drawing and the real object

7. Teaching methodology

Use work sheets from previous lessons to ensure that all learners understand the concepts and difference between ratio and rate. Give examples of ratio from real-life situations. Use peer-assisted learning for learners that battle to express ratios in their simplest forms.

8. Assessment

Teacher assessment, for example, classwork activity and a short test at the end of the unit.

9. Answers

Exercise 5

LB page 105

- $2 \times 10 = 20$. $5 \times 4 = 20$.
 - $3 \times 8 = 24$. $4 \times 6 = 24$.
- Not in proportion
 - In proportion
 - Not in proportion
 - Not in proportion
 - In proportion
 - Not in proportion

Exercise 6

LB page 106

- 320 g
 - 800 g
 - 960 g
 - 1,600 g
- 1 hour
 - 1 hour 20 minutes
 - 3 hours 20 minutes
-

Number of books	1	10	15	20	40	50	100
Price in GH¢	150	1,500	2,250	3,000	6,000	7,500	15,000

- GH¢ 100
 - GH¢ 150
 - GH¢ 350
- $\text{GH¢ } 375 \div 12 \text{ crates} = \text{GH¢ } 31.25 \text{ per crate}$
 $\text{GH¢ } 31.25 \times 6 = \text{GH¢ } 187.50$
- GH¢ 150
- GH¢ 96 this week. GH¢ 168 next week. GH¢ 246 in total.
- $\text{GH¢ } 20 \times 13 = \text{GH¢ } 260$
- $3 : 5 = 21 : 35$. They will win 21 games.
-

Minutes	1	2	3	10	200
Cost per minute	2.20	4.40	6.60	22.00	440.00

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 63 to 66 as Extension exercises. You can also choose any Exercises from pages 63 to 66 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

**Sub-strand 1:
Pattern and relationships****Content standard****B6.2.1.1 Determine the pattern rule to make predictions****1. Essential for learning**

Learners should know that geometric patterns are shapes arranged according to a rule. They need to understand that a numeric sequence is a pattern using numbers. The numbers 3, 5, 7, 9 is a pattern of uneven numbers. Each shape or number in a pattern is called a term. Each term has a value. So, we can assign numerical values to a geometric pattern.

2. Key words

Geometric patterns, sequence, numerical values, rule, predictions, subsequent element, pattern, relationship

3. Resources used in this chapter

Learner's Book, Workbook, objects for building patterns, for example, beads, match sticks, sticks and straws, tooth picks, ear buds

4. Large class teaching

Divide the class into small groups. Allow the learners to work practically, for example, cutting their drinking straws into lengths, counting out specific numbers and building patterns.

5. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners

understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

6. Additional content for the teacher

YouTube videos, patterns seen in the environment

7. Teaching methodology

Most learners will benefit from building patterns from objects and not merely looking at the drawings in the Learner's Book. Let them start by first building simple patterns, and gradually moving to more complex patterns.

8. Assessment

Self and peer assessment

9. Answers

Exercise 1

LB page 112

1. a) The pattern develops as follows: 1 square : 4 circles;
2 squares : 5 circles; 3 squares : 7 circles;
4 squares : 10 circles; 5 squares : 14 circles;
6 squares : 19 circles
- b) The pattern develops as follows: 2 dashes : 2 hearts;
3 dashes : 3 hearts; 4 dashes : 4 hearts;
5 dashes : 5 hearts; 6 dashes : 6 hearts
- c) The pattern develops as follows: 3 crosses : 2 lines;
5 crosses : 3 lines; 7 crosses : 4 lines;
9 crosses : 5 lines; 11 crosses : 6 lines
2. a) 2, 5, 8, 11, 14, 17, 20 b) 4, 7, 10, 13, 16, 19
c) 2, 8, 14, 20, 26, 32 d) 20, 17, 14, 11, 8, 5
e) 7, 11, 15, 19, 23, 27 f) 18, 13, 8, 3, -2, -7
g) -1, 4, 9, 14, 19, 24



b)

Shape	1	2	3	4	5	6
Number of matchsticks	3	6	9	12	15	18

We will use 15 matchsticks to go up to pattern 5, and 18 matchsticks to go up to pattern 6.



b) 10

c)

Pattern	1	2	3	4	5
Number of squares	1	2	3	4	5
Number of sides in the perimeter	4	6	8	10	12

d) The number of squares (k) is equal to the pattern number (n); $k = n$

e) The number of sides in the perimeter (l) is equal to twice the pattern number (n) plus 2; $l = 2n + 2$



b) 17

c) 21

d) $m = 4n + 1$; m is the number of matchsticks, n is the pattern number



6. a)

Pattern number	1	2	3	4	5
Number of toothpicks used	4	8	12	16	20

b) 24

c) The number of toothpicks used is 4 times the pattern number.

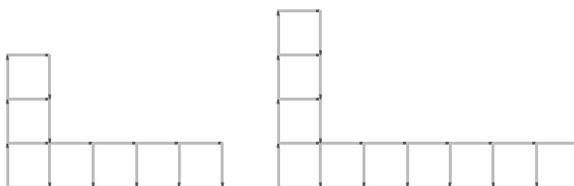


b) 7; 14; 21; 28

c) Learners' own answers

d) The number of triangles in each figure is equal to seven times the pattern number.

8. a)



b)

Shape	1	2	3	4	5
Total squares	1	4	7	10	13
Number of squares going vertically	1	2	3	4	5
Number of squares going horizontally	1	3	5	7	9

- c) Learners' own answers
 d) The number of horizontal squares is equal to twice the number of vertical squares minus one.
 e) The pattern does have a constant rule.
 f) The total number of squares is equal to three times the shape number minus two.

Exercise 2

LB page 120

- Non-linear, pattern changes between adding 2 and 3
 - Linear, pattern changes between adding 3, 5, and 7. (+2 to each previous addition)
 - Linear, pattern changes by adding 6 each time.
 - Linear, pattern changes by adding 3 each time.
 - Linear, pattern changes by adding 12 each time.
 - Linear, pattern changes by adding 8 each time.
- Constant difference is 3. No constant value is added.
 $3 \times n$
 - Constant difference is 3. Constant value of 4 is added. $3 \times n + 4$
 - Constant difference is 10. No constant value is added.
 $10 \times n$
 - Constant difference is -5 . Constant value of 26 is added. $-5 \times n + 26$
- $7(n) - 3$. (n times $7 - 3$)
 $4n + 5$. (n times $4 + 5$).
 - $4n + 2$. (n times $4 + 2$).

Exercise 4

LB page 124

1. No
- 2.

n	1	2	3	4	5
Proportional	4	8	12	16	20
Linear	2	6	10	12	18

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 67 to 71 as Extension exercises. You can also choose any Exercises from pages 67 to 71 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Sub-strand 2: Algebraic expressions

Content standard

B6.2.2.1 Understand algebraic expressions

1. Essential for learning

Learners should have been exposed to addition, subtraction, multiplication and division, as well as the concepts of input and output. By now, they should be able to establish a given rule from a given pattern and represent it algebraically, as well as interpreting data from the given tables and formulating the rule.

2. Key words

Algebra, predictions, subsequent element, pattern, relationship, expressions, phrases, operators

3. Resources used in this chapter

Learner's Book, Workbook, matchsticks, straws

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Go from simple

concepts to more complex ones. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

6. Additional content for the teacher

More exercises on patterns, for example:

$$5 + 4z - 1 + 2z; 10s - 1 + 3 - 5s \text{ and } -9c + 7c + 8 - 3c$$

7. Teaching methodology

Introduce the learners to functional relationships by means of diagrams. The input-output diagrams are sometimes called function diagrams. Do plenty of exercises on writing algebraic expressions for the word problems, for example, “the sum of”, “take away”, and so on. Show the learners how to work in a step by step way. Simplify the meanings of new words, for example, “constant” and “unknown”.

8. Assessment

Teacher and peer assessment

9. Answers

Exercise 1

LB page 127

1. $8p$
2. $5x$
3. $\frac{1}{3}b$
4. $\frac{2}{5}(x + 6x + 6)$
5. $3 - y$
6. $4p + 3$
7. $n - 3$
8. $7 + x$
9. $m + 9$
10. $(z \times y) - 5$
11. $\frac{x}{24}$
12. $(6 \times y) + 2$
13. $\frac{6}{(3y)}$
14. $(\frac{n}{8}) - 6$

Exercise 2

LB page 129

1. a) $(5 \times 3) + 9 = 15 + 9 = 24$
 - b) $(\frac{15}{3}) + 2 = 5 + 2 = 7$
 - c) $18 - (\frac{15}{3}) = 18 - 5 = 13$
 - d) $(7 \times 3) + 4 - 5 = 21 + 4 - 5 = 20$
 - e) $(\frac{16}{4}) \times 4 + 2 = 16 + 2 = 18$
 - f) $(\frac{24}{6}) + (3 \times 12) = 4 + 36 = 40$
 - g) $4 \times (8 - 5) = 4 \times 3 = 12$
 - h) $182 - (24 \times 4) = 182 - 96 = 86$
 - i) $23 + (\frac{636}{6}) \times 8 = 23 + (106 \times 8) = 23 + 848 = 871$
 - j) $654 - (267 + 7) = 654 - 274 = 380$
 - k) $(\frac{750}{15}) + (\frac{50}{2}) = 50 + 25 = 75$
 - l) $\frac{2}{3}$ of $12 - 6 = \frac{2}{3} \times 12 - 6 = 8 - 6 = 2$
2. a) $3a$ b) $6d$ c) $5p$
 d) $6ab$ e) $16p$ f) $5x$
 g) $7p$ h) $5x$ i) $7x + 4$
 j) $2xy + 9x$ k) $11xy$ l) $10a + 4b + 4$
 m) $10a + 8$ n) $7a + 4b$

Exercise 3

LB page 133

1. a) $14x + 2$ b) $2x + 14$ c) $9y - 1$
 d) $18y$ e) $6x$
2. a) Shape A perimeter: $26x + 12$
 Shape B perimeter: $20x + 14$
 Shape C perimeter: $16x + 12$
 Shape D perimeter: $8x + 7$

Exercise 4

LB page 135

1.

Expression	Simplify	Number of terms	Coefficient of x	Evaluate if $x = 3$ and $y = 2$
$\frac{6x}{x}$	6	1	6	1
$3x - 4 + 2y$	$3x - 4 + 2y$	3	3	9
$2y - 7x + y - 4y + 6$	$-y - 7x + 6$	3	7	-17
$4x - 3y + 8x + 6$	$12x - 3y + 6$	3	12	36

2. a) $(2 \times 3) + 5 = 6 + 5 = 11$
 b) $2(2 \times 3 \times 5) = 2(30) = 60$
 c) $3(2) - 2(3) + 2(5) = 6 - 6 + 10 = 10$
 d) $\frac{3(3) + 5}{2} = \frac{14}{2} = 7$
 e) $(2 + 3)(2 + 3) = 5 \times 5 = 25$
 f) $3(2 + 3 + 5) = 3(10) = 30$
3. a) $3 + 6 + 2 = 11$
 b) $3(3) + 5(2) = 9 + 10 = 19$
 c) $2(6) + 4(3 \times 2) = 12 + 4(6) = 12 + 24 = 36$
 d) $\frac{2(3) + 6}{2(2)} = \frac{12}{4} = 3$

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 72 to 77 as extension exercises. You can also choose any Exercises from pages 72 to 77 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Content standard

B6.2.3.1 Solve problems with a single variable and a whole number coefficient

1. Essential for learning

Learners should be able to establish a given rule from a given pattern and represent it algebraically.

2. Key words

Expressions, phrases, operators

3. Resources used in this chapter

Learner's Book, Workbook, matchsticks, straws

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point

of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logistical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Go from simple concepts to more complex ones. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

6. Additional content for the teacher

More exercises on patterns, for example:

$$5 + 4z - 1 + 2z; 10s - 1 + 3 - 5s \text{ and } -9c + 7c + 8 - 3c$$

7. Teaching methodology

Introduce the learners to functional relationships by means of diagrams. The input-output diagrams are sometimes called function diagrams. Do plenty of exercises on writing algebraic expressions for the word problems, for example, “the sum of”, “take away”, and so on. Show the learners how to work in a step by step way. Simplify the meanings of new words, for example, “constant” and “unknown”.

8. Assessment

Teacher and peer assessment

9. Answers

Exercise 1

LB page 141

- | | | |
|----------------|------------|--------------|
| 1. a) $x = 11$ | b) $x = 8$ | c) $x = -12$ |
| d) $x = 11$ | e) $x = 5$ | f) $x = 20$ |
| g) $x = 3$ | h) $x = 8$ | |

- | | | |
|-----------------------|--------------|-----------------------|
| 2. a) $x = 8$ | b) $x = 6$ | c) $x = -6$ |
| d) $f = 10$ | e) $x = -5$ | f) $b = 5$ |
| g) $x = 12$ | h) $t = 7$ | i) $x = 6$ |
| j) $y = -8$ | k) $x = 16$ | l) $m = 4\frac{2}{3}$ |
| m) $m = -7$ | n) $y = -10$ | o) $d = 14$ |
| p) $x = 2\frac{2}{3}$ | q) $p = 4$ | r) $x = 10$ |
| s) $y = 4\frac{1}{2}$ | t) $x = 6$ | |

Exercise 2

LB page 143

- | | | |
|----------------------|---------------------------|-----------------------|
| 1. a) $7n - 1 = 13$ | b) $n + 16 = 34$ | c) $6n = 48$ |
| d) $\frac{7}{n} = 7$ | e) $12 + n = 38$ | f) $\frac{n}{15} = 3$ |
| g) $n - 3 = 4$ | h) $2n + 3 = 7$ | i) $4n - 6 = 10$ |
| j) $5(n + 4) = 16$ | k) $4 + \frac{n}{3} = 12$ | l) $4(n - 6) = 20$ |
| 2. a) $n = 2$ | b) $n = 18$ | c) $n = 1$ |
| d) $n = 26$ | e) $n = 7$ | f) $n = 2$ |

Exercise 3

LB page 144

- GH¢ 45 – GH¢ 19 = GH¢ 26
- GH¢ 14 × 3 = GH¢ 42. The pizza costs GH¢ 42.
- 42 ÷ 6 = 7. Each chocolate costs GH¢ 7.
- a) 226 – 56 = 170. He needs GH¢ 170 more.
b) 170 ÷ 12 = 14.16. He would have to save for 15 weeks.
- 9 + 2 = 11. Mawusi practices for 11 hours.
- 96 ÷ 32 = 3. Granny is able to buy 3 bags of rice.
- 148 ÷ 4 = 37. Each waiter earns GH¢ 37.
- Learners' own answers

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 78 to 84 as Extension exercises. You can also choose any Exercises from pages 78 to 84 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

**Sub-strand 1:
2D shapes and 3D shapes****Content standard****B6.3.1.1 Understand prisms****1. Essential for learning**

Learners should be able to recognise and name 3D objects / shapes so that they can move on to describing and comparing various shapes. Learners should be able to distinguish pyramids from prisms. Learners should also be able to measure objects of different shapes.

2. Key words

Construct, prisms, angles, equilateral, net, examine

3. Resources used in this chapter

Learner's Book, Workbook, cardboard, glue, clay, scissors, rulers, crayons, paper, graph sheets, multi-base blocks, number cards, plastic straws

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

You, as teacher, should facilitate and teach holistically through the use of visual aids, such as televisions and projectors.

6. Additional content for the teacher

YouTube videos on 3D shapes

7. Teaching methodology

Ask learners to bring 3D objects to school. Divide the class into small groups, and then ask them to sort their 3D objects. Ask the learners to record the number of shapes in their books. Allow learners to play games, for example, opening and closing boxes, counting shapes, faces and identifying shapes.

8. Assessment

Peer or self-assessment. Also include puzzles and a description will help, as well as games such as “Mastermind”.

9. Answers

Exercise 1

LB page 147

- | | |
|-----------------|------------------------------|
| 1. a) Square | b) Five |
| c) Eight | d) Five |
| 2. a) Square | b) Edges |
| c) Vertices | d) Cube |
| 3. a) Rectangle | b) Five |
| c) Edges | d) Six |
| 4. a) Flat | b) One |
| 5. a) Curved | b) Three faces and two edges |

Exercise 2

LB page 149

1. Learners' own answers

2.

3D shape	2D shape formed when cutting horizontally	2D shape formed when cutting vertically
Cuboid	Square	Square
Rectangular prism	Rectangle	Square
Cylinder	Circle	Rectangle
Triangular prism	Rectangle	Triangle
Square pyramid	Square	Triangle
Triangular pyramid	Rectangle	Triangle

3.

Shape	Yes/no	2D shape formed
Cuboid	Yes	Rectangle
Cylinder	Yes	Circle
Square pyramid	No	
Rectangular prism	Yes	Triangle and rectangle, depending on the cutting angle

4. Learners prepare posters. Assess them according to originality and creativity.

Shape	Base shape	Cross section formed by a vertical cut	Cross section formed by a horizontal cut
Rectangular prism	Rectangle	Triangle	Rectangle
cylinder	Circle	Rectangle	Circle
Triangular prism	Rectangle	Triangle	Rectangle
Square pyramid	Square	Triangle	Square
Triangular prism	Rectangle	Triangle	Rectangle
Hexagonal prism	Rectangle	Hexagon	Rectangle
Pentagonal prism	Rectangle	Pentagon	Rectangle
Cone	Circle	Triangle	Circle
Sphere	None	Circle	Circle

5.

Column A	Column B
3D shape	Cross section
Triangular prism standing on its base, cut parallel to its base	Rectangle
A rectangular prism, cut perpendicular to its base	Square
A cuboid, cut perpendicular to its base	Square
A hexagonal prism, cut perpendicular to its base	Hexagon
Triangular prism standing on its base, cut perpendicular	Triangle
A cylinder, cut perpendicular to its base	Rectangle
A triangular prism, cut perpendicular to its base	Triangle
A cone, cut perpendicular to its base	Triangle
A cylinder, cut parallel to its base	Circle
A hexagonal prism, cut parallel to its base	Rectangle

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 85 to 89 as Extension exercises. You can also choose any Exercises from pages 85 to 89 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Sub-strand 2: Measurements

Content standard

B6.3.2.1 Construct rectangular and triangular prisms from their nets

1. Essential for learning

Learners should have been exposed to properties of a rectangular prism (having 6 faces, 8 vertices, and 12 edges) and a triangular prism (5 faces, with a triangular base). Learners should be able to recognise and name 3D objects.

2. Key words

Construct, prisms, angles, equilateral, net, examine

3. Resources used in this chapter

Learner's Book, Workbook, cardboard, glue, clay, scissors, ruler, crayons, sheets of papers, graph paper

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

Allow learners who are comfortable with the visualisation of the nets, explain this to their peers.

6. Additional content for the teacher

YouTube videos on nets of 3D shapes

7. Teaching methodology

This part of the curriculum is best done “hands on”. It is very difficult to visualise a net if it is only a drawing on a page. Learners have to cut out the shapes and assemble their own nets.

8. Assessment

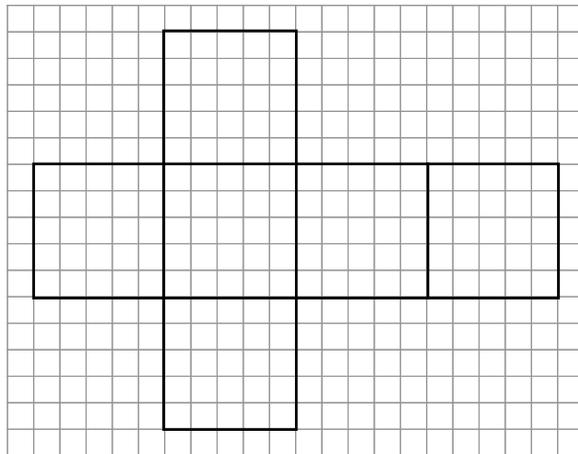
Work sheet and tests, homework, assignments projects and end of term/year examinations

9. Answers

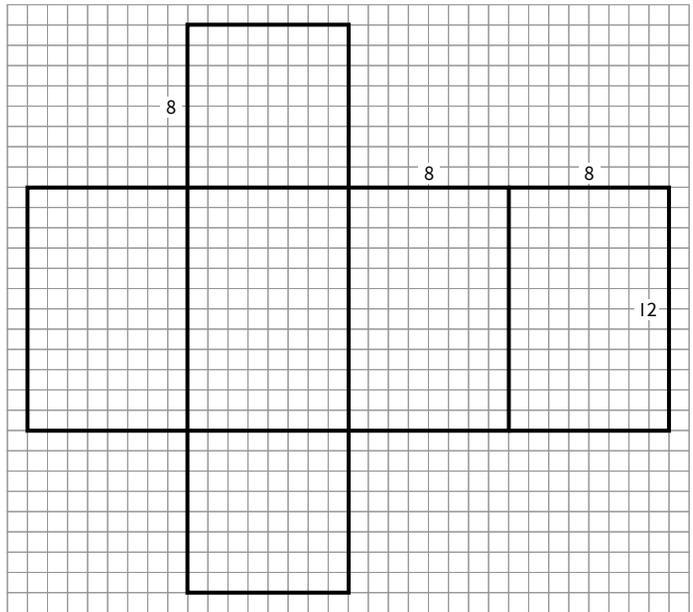
Exercise 3

LB page 155

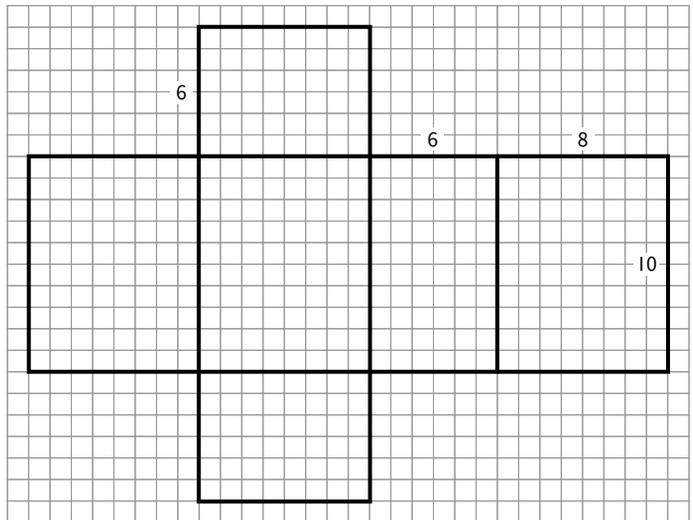
1. Learners' own answers
2.
 - a) Rectangular prism
 - b) Hexagonal prism
 - c) Square-based pyramid
 - d) Rectangular pyramid
 - e) Cylinder
3. a)



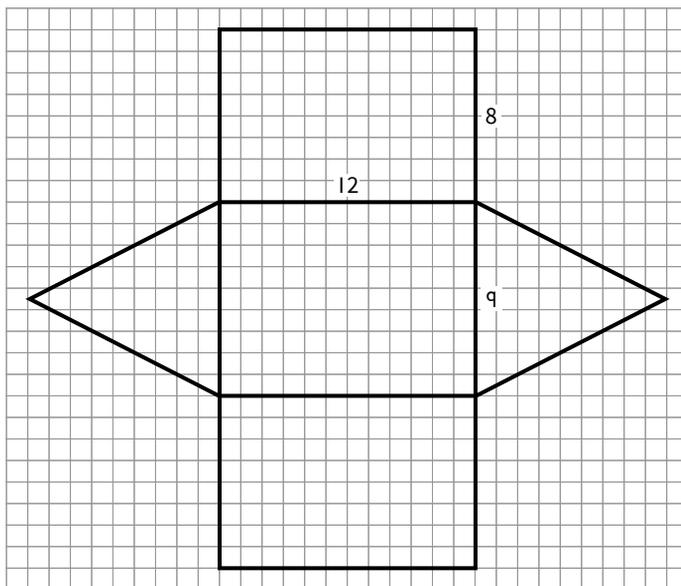
b)



c)



d)



4. Learners' own answers

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 90 to 92 as Extension exercises. You can also choose any Exercises from pages 90 to 92 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Sub-strand 3: Geometric reasoning

Content standard

B6.3.3.1 Describe the position and motion of objects in space using the cardinal points

1. Essential for learning

Learners should know the four basic cardinal points (north, east, west, and south) and describe positions using these points.

2. Key words

Compass, cardinal points, origin

3. Resources used for this chapter

Learner's Book, Workbook, compass, grid paper, pencils, rulers

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logistical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the positioning of whole numbers in relationship with other whole numbers.

6. Additional content for the teacher

YouTube videos on plotting points

7. Teaching methodology

Give the learners graph paper and give them instructions to move in various directions from a central point on the paper. The learners can also play games, encouraging them to move in response to instructions.

8. Assessments

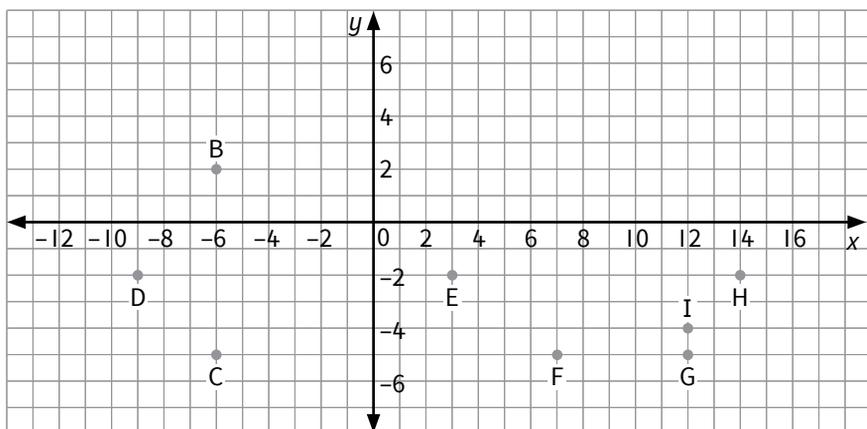
Teacher assessments as the learners do the activities

9. Answers

Exercise 4

LB page 160

- 1.1 a) A is north-east of C, but C is south of D
b) D is north-west of X, but X is south-east of H
- 1.2 a) A is north-west to M
b) B is south-east of which of the 'G's
c) G is north of E
d) E is south of G
e) M is south-east of H
f) E is south-west of A
g) A is east of D
h) G is south-west of H
2. Possible answers



3. a) SE
b) SW
c) SE
d) NW
f) Learners' own answers
4. a) From swim area, go north-east to camping area
b) From welcome centre, go north-east to forest
c) From welcome centre, go north to camp area
d) From camping area, go south-east to boats

Exercise 5

LB page 164

1.
 - b) McDonald's
 - d) Lake
 - e) Library
 - f) Ice-cream parlour
 - g) Move 5 squares east and 3 squares south
 - h) Move 4 squares east and 5 squares south
2.
 - a) 5 squares east, 2 squares north
 - b) South-west
 - c) 3 squares south, 3 squares east
 - d) 2 squares south, 3 squares west
 - e) 3 squares south, 2 squares east
 - f) No, the police station is to the north-east

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 93 to 96 as extension exercises. You can also choose any Exercises from pages 93 to 96 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Content standard

B6.3.3.5 Perform a single transformation on a 2D shape

1. Essential for learning

Learners should have prior experience of plotting x and y on a coordinate plane.

2. Key words

Line of symmetry, reflection, properties, vector and translation, compass, origin

3. Resources used for this chapter

Learner's Book, Workbook, graph sheets, pencils, rulers, hand mirrors

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies. Also integrate your work in the Mathematics class with other subjects.

When assessing, give learners recognition of Logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. Explore the vocabulary in word problems first in order to ensure that the learners understand the language and vocabulary used. The learners should be able to explain their skills in determining the place value of whole numbers in relationship with the other.

6. Additional content for the teacher

YouTube videos on reflection and translation, lines of reflection

7. Teaching methodology

Some learners struggle to imagine shapes being translated or reflected. Allow them to cut out shapes, and then physically move them across graph paper. Learners who struggle to grasp the concept of reflection, may benefit from using mirrors to see how shapes are reflected. Once again, it may help them to cut out shapes and physically flip them over on graph paper.

8. Assessment

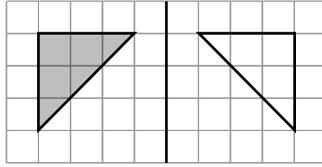
Teacher assessments as the learners do the activities. Self or peer assessment of homework

9. Answers

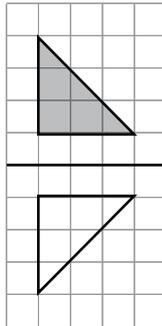
Exercise 6

LB page 170

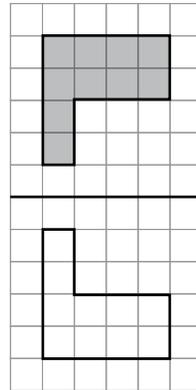
1. a)



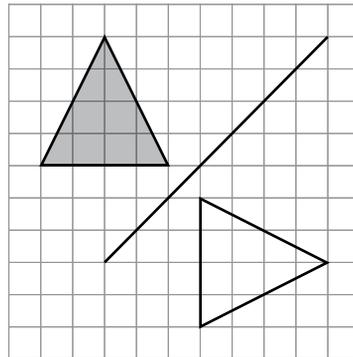
b)



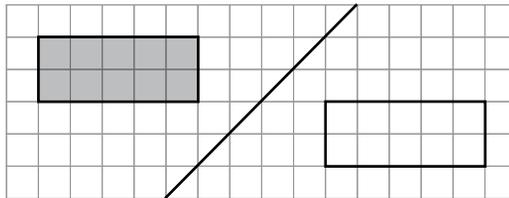
c)



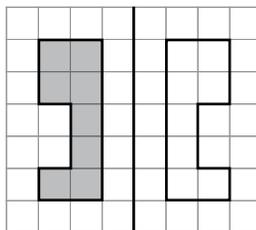
d)



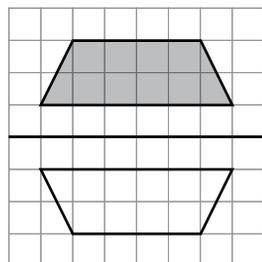
e)



f)



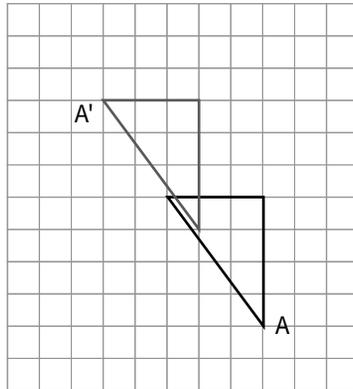
g)



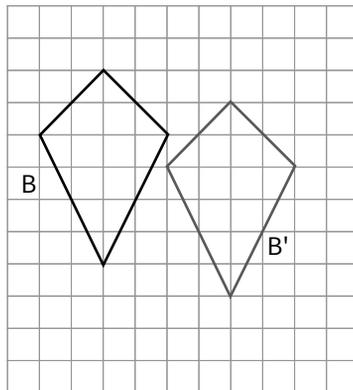
2. a) Horizontal
- b) Vertical
- c) Diagonal
- d) Horizontal
3. Learners' own answers

Exercise 7

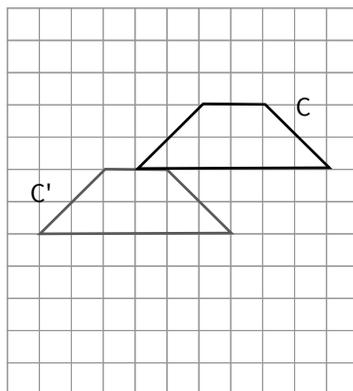
1. a)



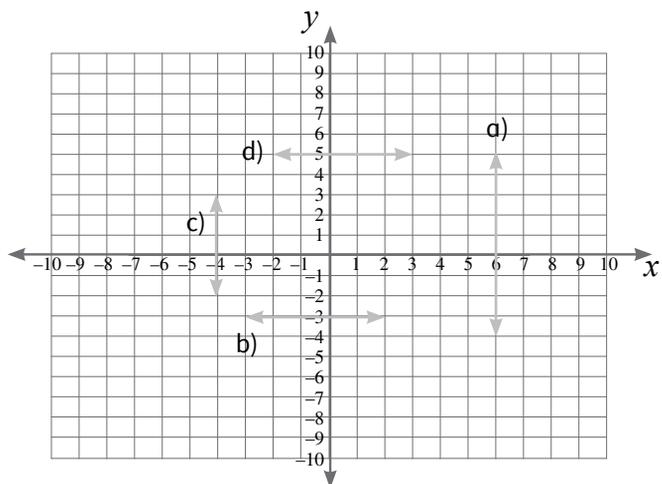
b)



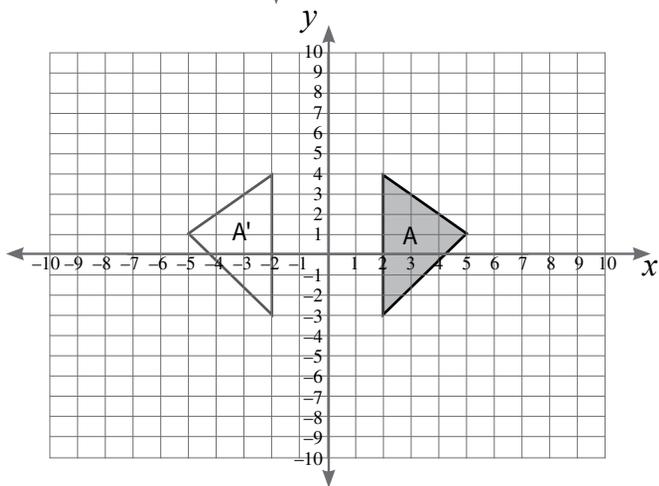
c)



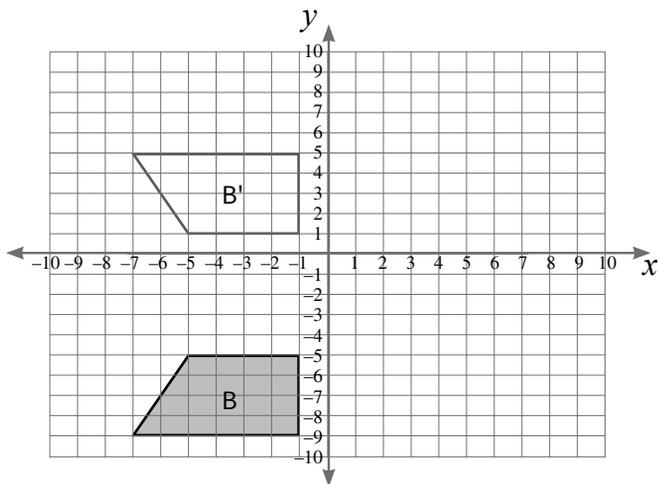
2.



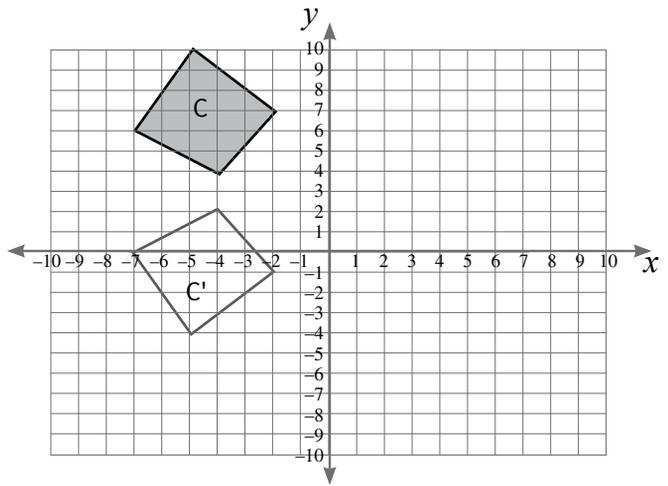
3. a)



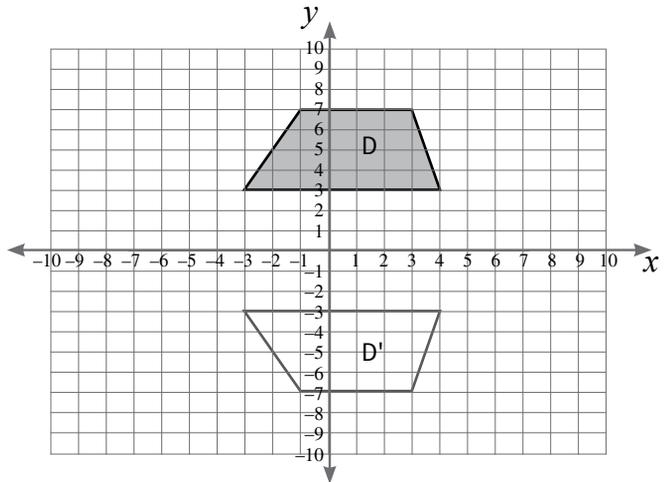
b)



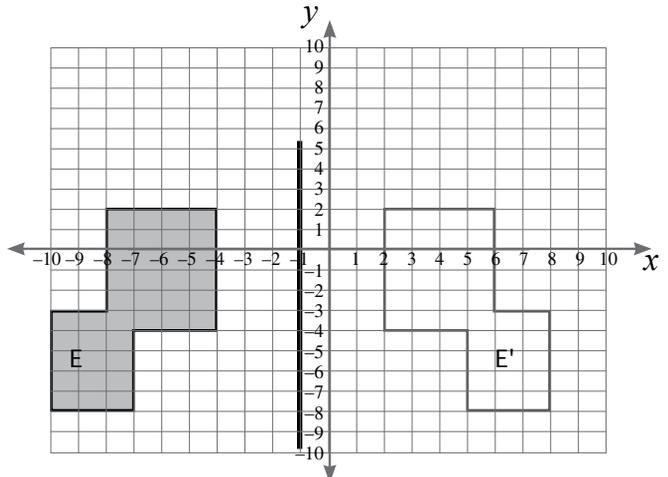
c)



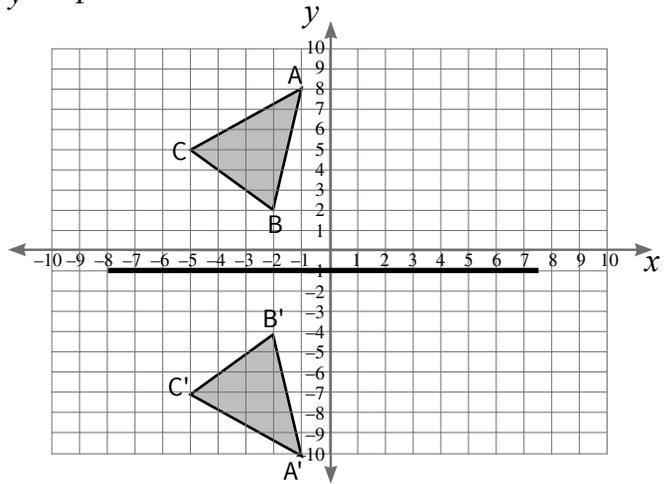
d)



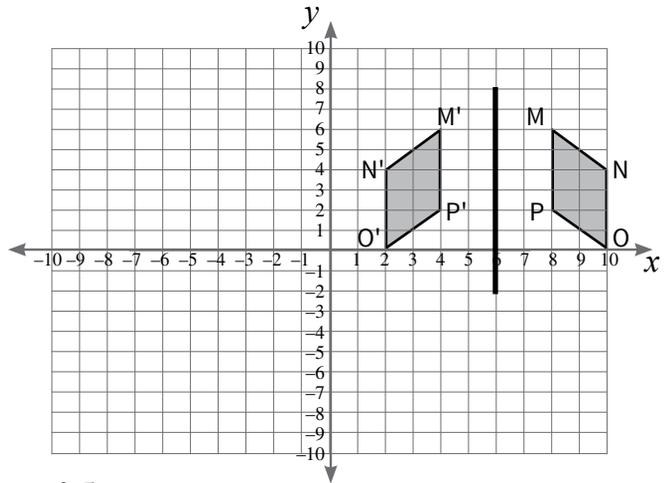
e)



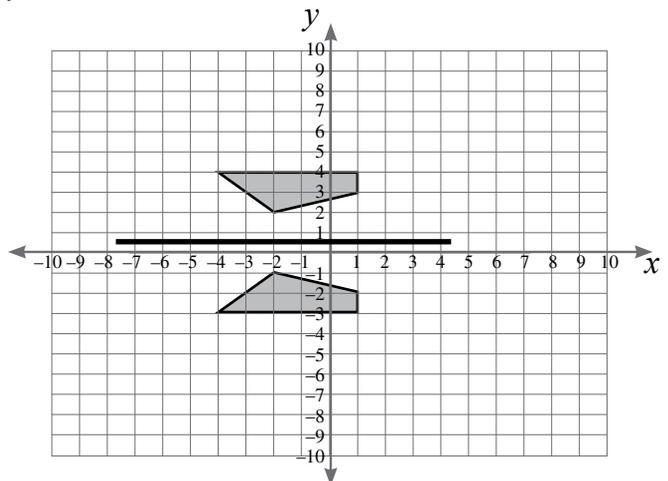
4. a) $y = -1$



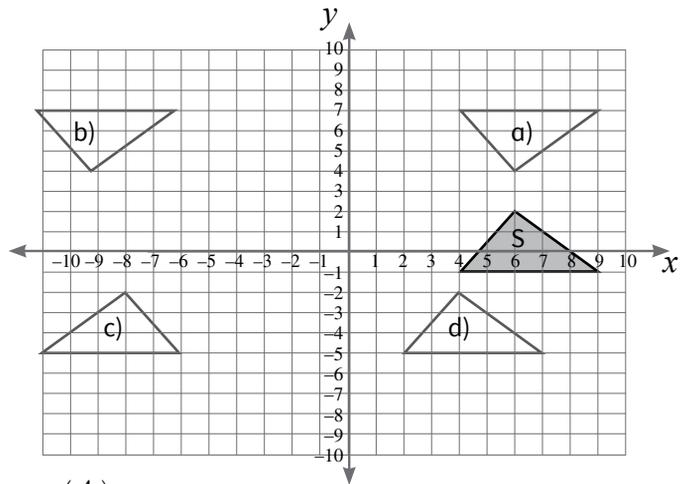
b) $x = 6$



c) $y = 0.5$

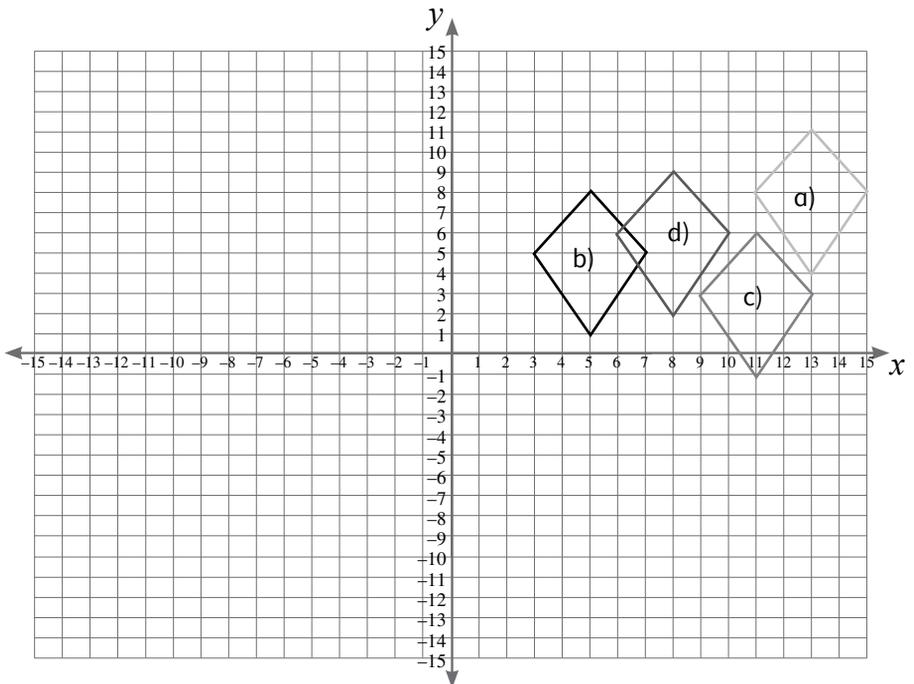


5.

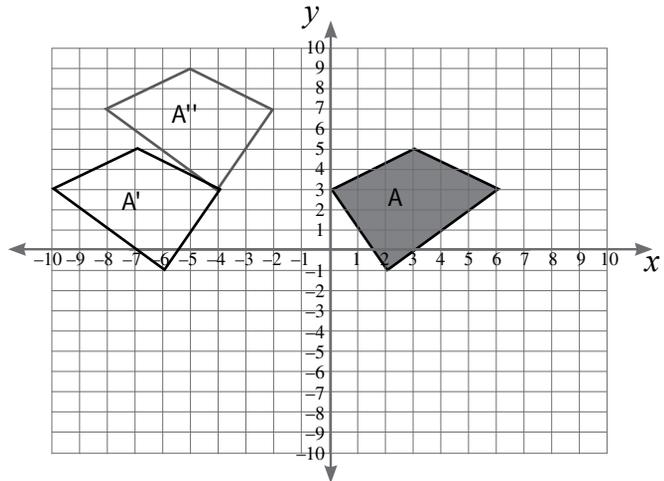


6. a) $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$
 b) $\begin{pmatrix} -4 \\ 0 \end{pmatrix}$
 c) $\begin{pmatrix} 5 \\ -11 \end{pmatrix}$
 d) $\begin{pmatrix} -11 \\ -10 \end{pmatrix}$
 e) $\begin{pmatrix} 15 \\ 5 \end{pmatrix}$

7.



8. a) and b)



c) $\begin{pmatrix} 8 \\ -4 \end{pmatrix}$

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 97 to 108 as Extension exercises. You can also choose any Exercises from pages 97 to 108 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

Sub-strand 1: Data collection, organisation, presentation, interpretation and analysis

Content standard

B6.4.1.1 Create, label and interpret line graphs

1. Essential for learning

Learners should have prior knowledge of data being a collection of information. They need to understand that there are many reasons for collecting data. Learners will be aware that the methods of data collection can vary. Therefore, they have to find suitable ways to represent the collected information, so they can make conclusions or predictions. They will learn how to use simple questionnaires and draw types of graphs.

2. Key words

Collection, organise, predict, presentation, interpretation and analyse, discrete data, continuous data, increase

3. Resources used in this chapter

Learner's Book, Workbook, scale, measuring tape, a chart, calendar, tables, graph paper, line graph, series of separate points, frequency distribution table

4. Large class teaching

Plan your activities for an inclusive class. Determine your learners' point of entry. Determine your learners' point of entry. Activities should also be learner-centred, so that learners are in control of their learning. Learners should be able to try a variety of strategies.

Divide the class into smaller groups, with learners of different abilities. Provide them with clear instructions, so they know what to do.

When assessing, give learners recognition of Logical reasoning. Credit them for the strategies they use, even if there is a mechanical error that might give rise to a wrong answer.

5. Support for learners with special needs

As teacher, your role is to facilitate learning and to keep content relevant to all learners. Break down content into small, manageable and logical steps. The activities should be practical and hands-on. Limit distractions.

6. Additional content for the teacher

You can represent the data of a given situation in multiple ways, for example, a line graph or a series of separate points. Ask learners to look for graphs in newspapers, and explain these to the class.

7. Teaching methodology

Start from known concepts, then moving to unknown concepts. Give them problems that relate to their immediate environment. Let them complete tables from flow diagrams, and draw graphs.

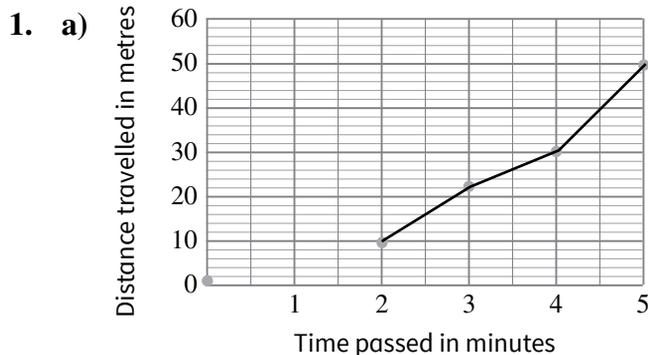
8. Assessment

Work sheet and tests, homework, assignments projects and end of term / year examinations.

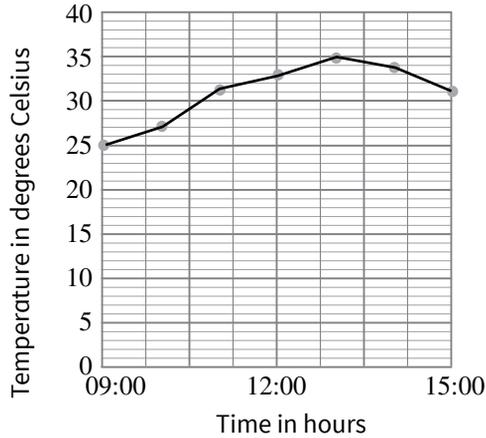
9. Answers

Exercise 1

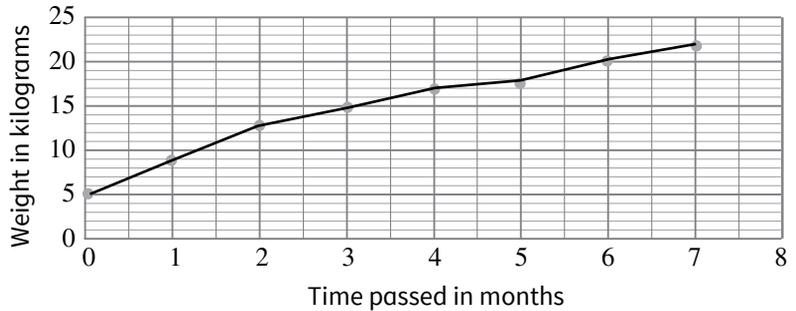
LB page 192



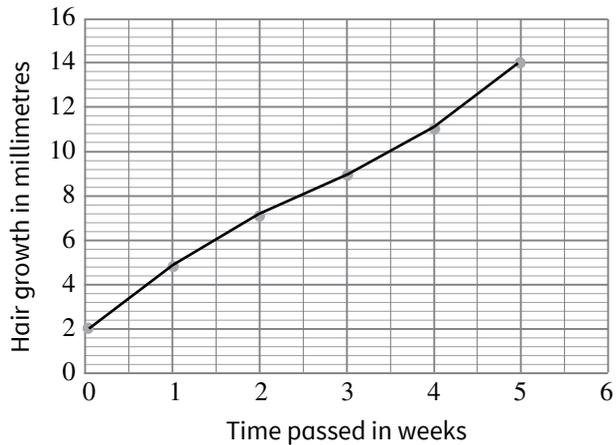
- b) Between 4 and 5 mins (20 m difference).
 2. a)



- b) 35 °C
 c) 13:00 (1 p.m.)
 3. a)



- b) The puppy reached 20 kg at 6 months.
 c) After the age of 0 months (4 kg difference)
 d) At birth he weighed 5 kg
 4. a)



- b) During the fifth week (3 mm growth)

5. a)



b) During the first hour (100 m)

c) It is the point where he began his climb.

Exercise 2

LB page 196

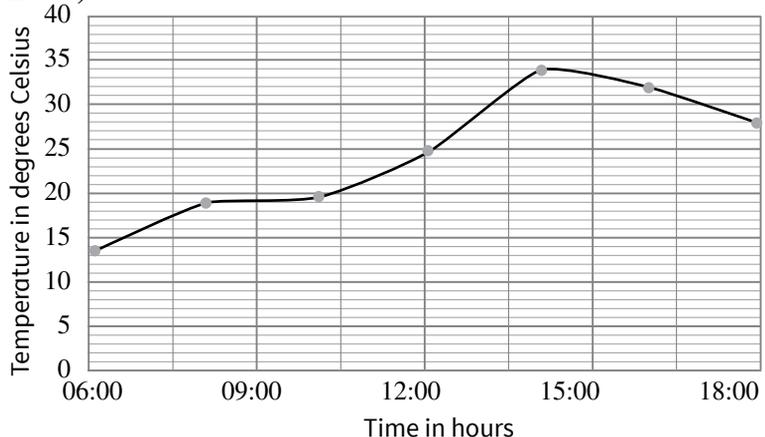
- Discrete. Points on a graph. Year on y -axis and profit earned on x -axis
 - Discrete. Points on a graph. Weight on y -axis and age on x -axis.
 - Discrete. Points on a graph. Year on x -axis and number of games won on y -axis.
- Learners' own answers

Exercise 3

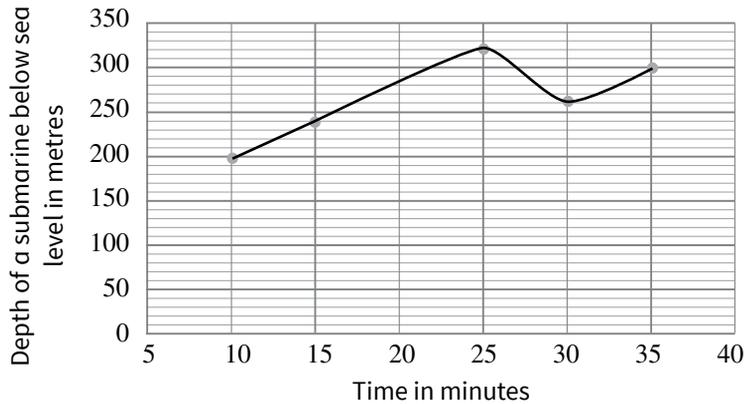
LB page 199

- 0; 70
 - 1 bar is 2 kg
 - The third month
 - 35 kg
 - The tiger's weight shows an exponential increase.

2. a)



- b) 34 °C
 - c) 16 °C
 - d) 29.5 °C
 - e) 1 p.m.; 5 p.m.
3. a) Vertical axis: 1 bar is 4 pages. Horizontal axis: 1 bar is 15 minutes.
- b) A: 30 pages; B: 25 pages
 - c) 60 pages
 - d) Learner A
 - e) Linear
 - f) A: 2 pages per 5 minutes. B: 1 page per 3 minutes.
4. a)



- b) Approximately 280 m
- c) The submarine depth decreased to 260 m, then increased to 300 m.
- d) The submarine will be 320 m below sea level.

10. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 109 to 116 as Extension exercises. You can also choose any Exercises from pages 109 to 116 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

B6.4.1.2 Select, justify and use appropriate methods of collecting data**1. Essential for learning**

Learners should have been involved in question and answer scenarios, whether formally or informally, for example, interviews. They should have been exposed to recording observations, for example, in Natural Science classes.

2. Key words

Data, database, justify, questionnaires, interview, observation, experiments, databases, electronic media

3. Resources used in this chapter

Learner's Book, Workbook, surveys, interviews, observations, tally sheets and questionnaires

4. Large class teaching

Divide the class into groups, each group not being more than 10% of the class size. Include learners of different abilities. Each member in the group must be assigned a specific task that they should complete for the group assignment.

Also delegate some 'teacher tasks' to your learners, such as distributing handouts, collecting homework and arranging groups.

5. Support for learners with special needs

Ensure that the learners understand the vocabulary of data collection. Also ensure that they understand the drawing of graphs (how axes should be labelled), and so on.

6. Additional content for the teacher

Integrate to other subject and educate learners on what graphs are best for what data. Give more information on how graphs help us to interpret data. Expose the learners to more hands-on activities and more exercises. You may also integrate the subject into other learning areas, such as English, using the data collection vocabulary as a spelling activity.

7. Teaching methodology

Use examples from the learners' direct environment. Allow them to design questionnaires for their peers. Let the learners report back to the class and explain how they reached their conclusions.

8. Assessment

Give the learners an assignment, so that you can see whether they are able to apply the concepts they have learnt.

9. Answers

Exercise 4

LB page 204

Learners' own answers

Exercise 5

LB page 207

1. a)

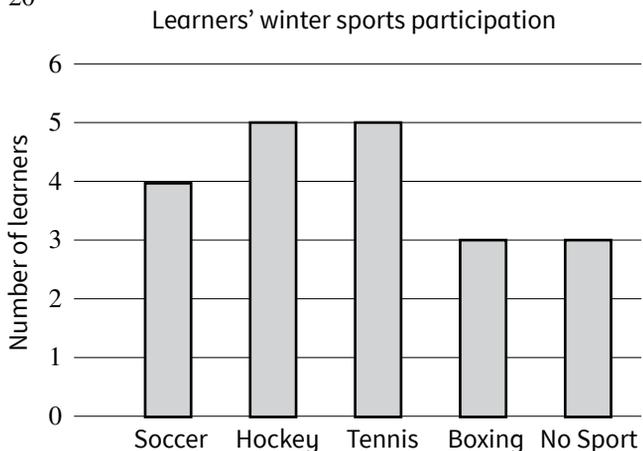
Favourite sport	Tally	Frequency
Soccer	IIII	4
Tennis	IIIII	5
Hockey	IIIII	5
Boxing	III	3
No sport	III	3

b) Both hockey and tennis (5)

c) $\frac{3}{20} = 0.15 = 15\%$

d) $\frac{5}{20} = 0.25 = 25\%$

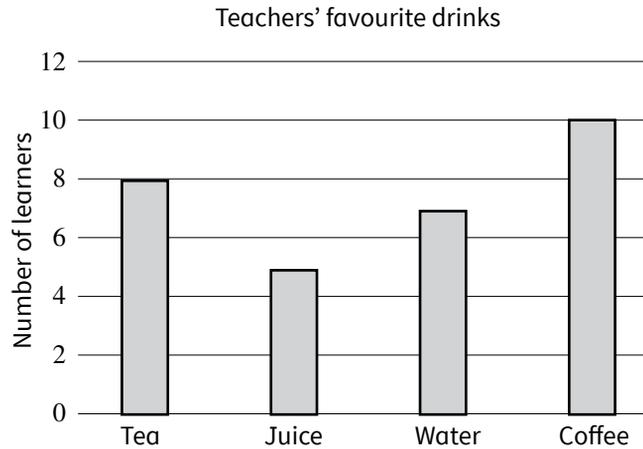
e)



2. a)

Favourite drink	Tally	Frequency
Tea		8
Juice		5
Water		7
Coffee		10

b)



c) Coffee is the favourite drink amongst the teachers $\frac{10}{30}$

d) $\frac{7}{30}$ 7 teachers drank water.

e) $\frac{8}{30} = 0.26666 = 26.67\%$

f) 10 Coffees : 8 Teas. Ratio: 5:4

g) $\frac{5}{30} = 1:6$

3. Learners' own answers

Sub-strand 2: Chance or probability

Content standard

B6.4.2.2 Understand probability

1. Essential for learning

Learners should have been exposed to the concept of probability in games, for example, “tossing of coin”, “you win or draw or lose”, or cards. They should be able to perform simple repeated and list possible outcomes for events, such as tossing a coin and rolling dice. They should be able to count and compare the frequency of actual outcomes for a series of trials.

2. Key words

Predict, probability, approach, outcome, results, chance

3. Resources used in this chapter

Learner’s Book, Workbook, die, coins, deck of playing cards

4. Large class teaching

Divide the class into groups, each group not being more than 10% of the class size. Each member in the group must be assigned a specific task that they should complete for the group assignment.

5. Support for learners with special needs

Ask two learners to play, while one learner records the outcome. Then, allow them to swap.

6. Teaching methodology

Allow the learners to play games that will help them understand the concept of probability, for example, cards. Give them a problem that relates to their immediate environment. Encourage peer-assisted learning, or the concept of a “flipped” classroom.

7. Assessment

Formative assessment (when they have been exposed to the topic), for example, test and exams

8. Answers

Exercise 6

LB page 211

1.
 - a) Very probable
 - b) Probable (depending on weather)
 - c) Probable
 - d) Probable to very probable
 - e) Very probable
 - f) Highly unlikely
 - g) Very probable
2.
 - a) 0.13
 - b) 0.12
 - c) 0.1
 - d) 0
3.
 - a) 0.19
 - b) 0.15
 - c) Theoretical: $\frac{1}{6}$. Experimental: $\frac{1}{10}$
 - d) 0.48
 - e) 0.5
 - f) The die slightly favoured the odd sides in the experiment.
4. Learners' own answers. Theoretical probability = 50%
5. Learners' own answers. Theoretical probability = 50%
6. Learners' own answers
7.
 - (a) to (c) Learners' own answers
 - d) 0.5
 - e) The experimental probability will approach the theoretical probability.
 - f) Learners' own answers

Exercise 7

LB page 214

1. Learners' own answers
2.
 - a) 50%
 - b) 66.6% chance of getting tails
 - c) The coin was only tossed six times. If the experiment is repeated, the experimental value will approach the theoretical value.

- d) Three heads (false)
Almost two tails (false)
Exactly two heads (true)
An even number of tails (true)
- 3. a) Red ball; white ball; blue ball and green ball
- b) $\frac{1}{3}$; 33.33%
- c) Learners' own answers
- d) $\frac{1}{4}$; 25%
- e) White and green balls
- 4. a) $\frac{1}{52}$
- b) $\frac{1}{4}$
- c) $\frac{1}{13}$
- d) 0

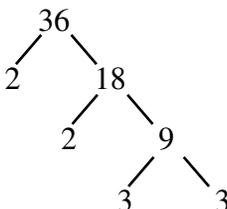
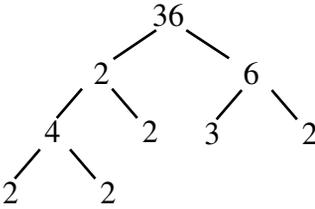
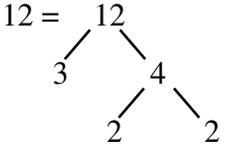
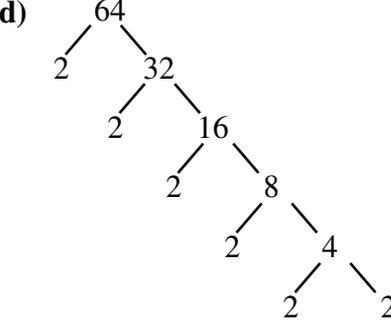
9. Homework

Ask learners to complete any exercises that they could not complete during class time as Homework. If there are learners in your class who complete the assigned work quickly, select questions from Workbook pages 119 to 123 as Extension exercises. You can also choose any Exercises from pages 119 to 123 of the Workbook and assign these as Homework. Once back in class, allow time for learners to provide feedback and allow them to correct any mistakes they may have made.

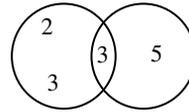
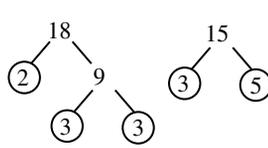
Revision answers

Strand 1: Number

1. Check that learners have used different colours to show the following:
 - a) $8 \times 1,000$ blocks; 1×100 blocks; 4×10 blocks, 5 blocks
 - b) $3 \times 10,000$; $4 \times 1,000$; 8 blocks
 - c) $1 \times 100,000$; $3 \times 1,000$; 4×100 ; 5×10 ; 6 blocks
 - d) $1 \times 10,000$; 9×10 ; 9 blocks
2.
 - a) thirty-nine million four hundred and five thousand one hundred and nineteen
 - b) nine million four hundred and forty-five thousand and one
 - c) four billion nine hundred and eighty million one hundred and fifteen thousand and ninety-eight
3.
 - a) 20,000 b) 10,000,000 c) 1,000,000,000
 - d) 900,000,000 e) 8,000,000 f) 20,000,000
4.
 - a) $190,809,888 = 100,000,000 + 90,000,000 + 800,000 + 9,000 + 800 + 80 + 8$
 - b) $45,610,098 = 40,000,000 + 5,000,000 + 600,000 + 10,000 + 90 + 8$
 - c) $780,770,880 = 700,000,000 + 80,000,000 + 700,000 + 70,000 + 800 + 80$
5.
 - a) 23,198,731,645 b) 47,310,747,419
6.
 - a) 456,088 b) 456,198 c) 457,098 d) 446,098
7.
 - a) $212,098 < 212,908$ b) $76,119 > 67,119$
 - c) $456,899 > 456,889$ d) $101,001 < 101,011$
 - e) $345,098 = 345,098$ f) $780,245 < 789,245$
8.
 - a) 144,094; 144,499; 144,904; 145,198; 145,990
 - b) 789,809; 789,908; 798,880; 809,789; 890,780
9.
 - a) 619,198; 618,116; 617,981; 617,189; 616,998
 - b) 233,413; 233,313; 232,312; 231,321; 223,331
10.
 - a) 700,000
 - b) 874,321
 - i) eight hundred and seventy-four thousand three hundred and twenty-one
 - ii) 884,321

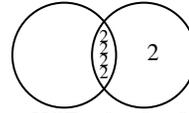
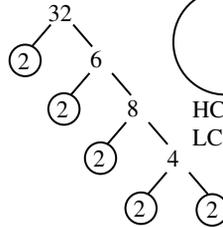
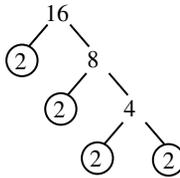
- c) 123,478
 i) $100,000 + 20,000 + 3,000 + 400 + 70 + 8$
 ii) 113,478
11. a) 1,056; 1,206; 1,356 Rule: +150
 b) 2,064; 2,175; 2,286 Rule: +111
 c) 11,648; 11,315; 10,982 Rule: -333
 d) 151,860; 151,810; 151,760 Rule: -50
12. a) 23 b) 39 c) 70 d) 43
13. a) XLVII b) LXXXII c) LXXVII
 d) XCIII e) LXIX
14. a) $6 + 2 = 8$ b) $10 + 3 = 13$
 c) $13 - 4 = 9$ d) $14 - 9 = 5$
15. a) $XI + IV = XV$ b) $XIX - IX = X$
 c) $XVIII + III = XXI$
16. a) 
- b) 
- c) $12 =$ 
- d) 
17. a) $2 \times 2 \times 2 \times 3$ b) $2 \times 3 \times 3 \times 3$
 c) $2 \times 3 \times 7$ d) $2 \times 2 \times 2 \times 5$
 e) $3 \times 3 \times 3 \times 3$
18. a) 12 b) 5 c) 9
19. 5 groups of 3 boys and 5 girls each
20. a) 36 b) 40 c) 48

21. a)



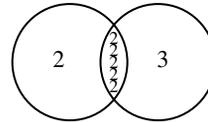
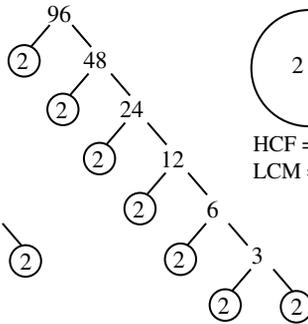
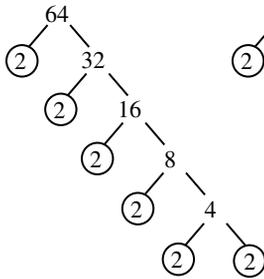
HCF = 3
 LCM = $2 \times 3 \times 3 \times 5 = 90$

b)



HCF = $2 \times 2 \times 2 \times 2 = 16$
 LCM = $2 \times 2 \times 2 \times 2 \times 2 = 32$

c)



HCF = $2 \times 2 \times 2 \times 2 \times 2 = 32$
 LCM = $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 = 192$

22. a)

	7	21	49
--	---	----	----

HCF =
 LCM =

b)

2	7	21	49
2	5	10	35
5	5	5	35
7	1	1	7
	1	1	1

HCF =
 LCM = $2 \times 2 \times 5 \times 7 = 140$

c)

2	7	21	49
2	8	16	32
2	4	8	16
2	2	4	8
2	1	2	4
2	1	1	2
	1	1	1

HCF =
LCM = $2 \times 2 \times 2 \times 2 \times 2 \times 2$
= 64

23. a) 20 b) 72 c) 30 d) 40
 e) 27 f) 49 g) 44 h) 63
 i) 42 j) 24 k) 60 l) 48
24. a) 10,000 b) 328 c) 440 d) 1,000
25. a) 7,740 b) 23,900 c) 530,000 d) 77,000
 e) 71,000 f) 52,200

26. There are 2,200 books.

27. a) 110 b) 184 c) 112 d) 198
28. a) 2,886

×	400	80	1
6	2,400	480	6

b) 1,440

×	200	80	8
5	1,000	400	40

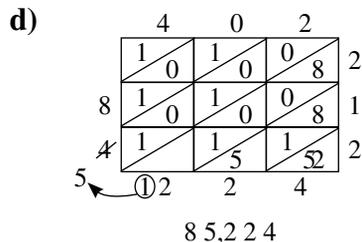
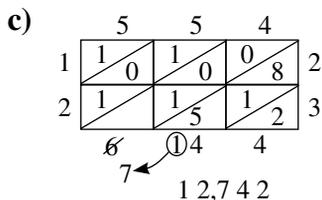
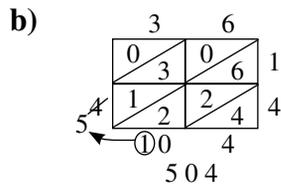
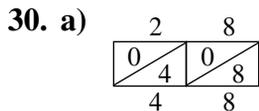
c) 1,484

×	300	70	1
4	1,200	280	4

d) 3,842

×	200	20	6
10	2,000	200	60
7	1,400	140	42
	3,400	340	102

29. a)
$$\begin{array}{r} 44 \\ \times 16 \\ \hline 264 \\ + 440 \\ \hline 704 \end{array}$$
- b)
$$\begin{array}{r} 27 \\ \times 33 \\ \hline 81 \\ + 810 \\ \hline 891 \end{array}$$
- c)
$$\begin{array}{r} 460 \\ \times 23 \\ \hline 1380 \\ + 9200 \\ \hline 10580 \end{array}$$
- d)
$$\begin{array}{r} 222 \\ \times 16 \\ \hline 1332 \\ + 2220 \\ \hline 3555 \end{array}$$



31. a) 1,320 or 1,326

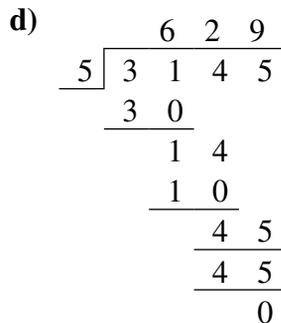
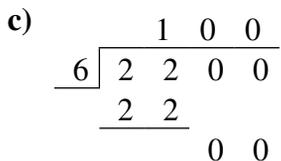
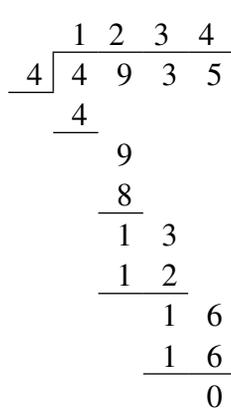
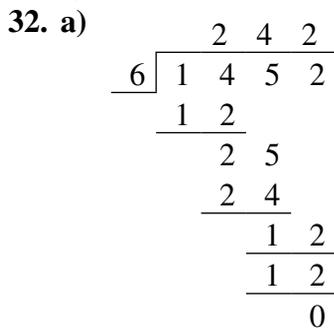
c) 52 or 56

e) 2,440 or 2,448

b) 21, 24 or 27

d) 30, 32, 34, 36 or 38

f) 550



33. $32 \times 11 = 352$

34. 3 butterflies per day for 3 weeks = 3×21 days = 63 more butterflies

$120 + 63 = 183$ butterflies after 3 weeks

35. -18; -12; -9

36. a) $-4 < -12$ **b)** $13 > -11$ **c)** $-2 < 16$

37. a) $-12; -9; -5; 6; 12$ b) $-11; -6; 0; 1; 12$
 38. a) $12; 7; 6; -7; -11$ b) $12; 9; -7; -11; -13$
 39. a) -6 b) 8 c) 8 d) 16
 e) -8 f) -14
 40. a) 6 b) 8 c) -20 d) 25
 e) -18 f) -6
 41. a) -12 b) -20 c) -60 d) -180
 e) 0 f) 32
 42. a) $\frac{4}{8}$ b) $\frac{3}{6}$ c) $\frac{7}{20}$
 43. a) $\frac{3}{4} < \frac{4}{5}$ b) $\frac{1}{5} = \frac{2}{10}$ c) $\frac{4}{9} > \frac{7}{15}$
 44. $\frac{1}{6}; \frac{3}{15}; \frac{1}{4}; \frac{2}{5}; \frac{8}{16}$
 45. $\frac{5}{8}; \frac{7}{12}; \frac{1}{2}; \frac{6}{14}; \frac{1}{3}$
 46. a) 0.16 b) 0.42 c) 0.18 d) 0.7
 47. a) $\frac{58}{100}$ or $\frac{29}{50}$ b) $\frac{165}{1,000}$ or $\frac{33}{200}$
 c) $\frac{3}{10}$ d) $\frac{56}{100}$ or $\frac{28}{50}$ or $\frac{14}{25}$
 e) $\frac{24}{100}$ or $\frac{12}{50}$ or $\frac{6}{25}$

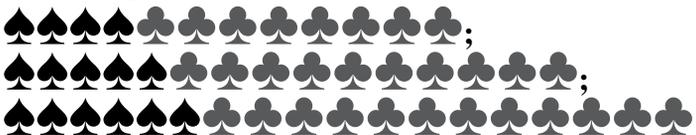
48.

Common fraction	Percentage	Decimal number
$\frac{4}{5}$	80%	0.8
$\frac{1}{4}$	25%	0.25
$\frac{13}{20}$	65%	0.65
$\frac{28}{50}$	56%	0.56
$\frac{1}{8}$	12.5%	0.125

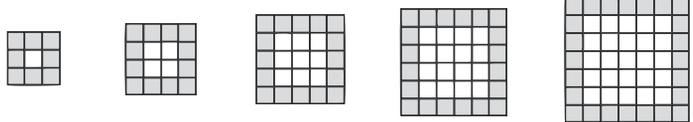
49. a) $0.45; \frac{3}{4}; 80\%$
 b) $25\%; \frac{2}{5}; 50\%; 0.7$
 50. a) $3\frac{1}{4}$ b) $7\frac{1}{9}$ c) $3\frac{4}{5}$
 51. There are 8 boys altogether. $6 \text{ litres} \div 8 \text{ boys} = \frac{3}{4}$ litre per boy
 52. $4\frac{5}{8} + 3\frac{3}{4} = 8\frac{3}{8}$
 53. a) 12 b) 25 c) 4 d) 40

54. a) $\frac{3}{14}$ b) $\frac{5}{18}$ c) $\frac{12}{55}$ d) $\frac{7}{30}$
 55. a) $2\frac{2}{5}$ b) $12\frac{5}{12}$ c) $10\frac{3}{20}$
 56. a) 9 b) 3 : 12 c) 3 : 9 or 1 : 3
 57. a) 1 : 2 b) 1 : 4 c) 1 : 4
 d) 1 : 2 e) 2 : 3
 58. 35 : 50 or 7 : 10
 59. 32 : 64 or 1 : 2
 60. Examples as follows (accept all correct answers):
 a) 1 : 2 b) 1 : 3
 c) 4 : 1 d) 18 : 20
 e) 10 : 4
 61. 8 burgers
 62. She is running at 4 km/h.
 a) 1 h 15 min b) $2\frac{1}{2}$ h or 2 h 30 min
 c) $3\frac{3}{4}$ h or 3 h 45 min
 63. Week 1 = GH¢ 15 × 6 = GH¢ 90
 Week 2 = GH¢ 15 × 11 = GH¢ 165
 GH¢ 255 in total

Strand 2: Algebra

1. 

2. a) increasing by 5 b) decreasing by 11
 3. a)



- b) 20 grey and 16 white tiles
 c) 24 grey tiles and 25 white tiles
 d)

Pattern	1	2	3	4	5
Grey tiles	8	12	16	20	24
White tiles	1	4	9	16	25

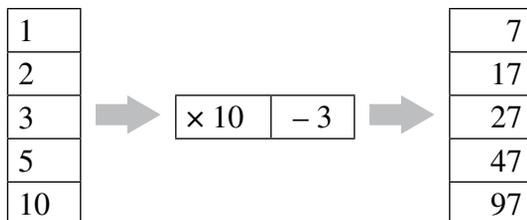
- e) The grey tiles increase by 4 each time. The white tiles is the pattern number multiplied by itself e.g. pattern 2 is $2 \times 2 = 4$.
 f) 44 grey tiles and 100 white tiles

4. a) The input $\times 4$ is the output or $4n$
 b) The input $\times 5 - 2$ is the output or $5n - 2$
- 5.

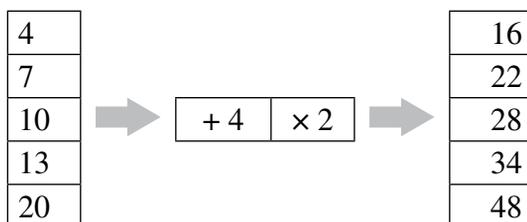
Input	1	2	3	4	10	25	40
Output	7	10	13	16	34	79	124

Rule: $3n + 4$

6. a)



- b)



7. a) $3z$ b) $25x$ c) $\frac{c}{8}$ d) $\frac{5}{8}y + 4y + 2$
 e) $11 - x$ f) $ab - 6$
 g) $\frac{m}{8} + 5$
8. a) $10x$ b) $7y + (-11y) = -4y$
 c) $5a - 3a + 4c - 4c + c + 2 + 4 = 2a + c + 6$
9. a) $3(3) + 3(4) = 9 + 12 = 21$
 b) $2(2) - 2(4) = 4 - 8 = -4$
 c) $\frac{6}{12} = \frac{1}{2}$
 d) $3a + 5a - 4b + 2b - c + 2c$
 $= 8a - 2b + c$
 $= 8(3) - 2(2) + 4$
 $= 24 - 4 + 4 = 24$
10. a) $a = 2$ because $2 + 14 = 16$.
 b) $b = -4$, because $-4 + 14 = 10$.
 c) $x = 17$ because $17 - 2 = 15$.
11. a) $p = 3$ because $8 \times 3 = 24$.
 b) $16 - 10 = 6$ so $2b = 16$.
 $2b \div 2 = b$ $16 \div 2 = 8$
 So $b = 8$.

- c) $3 + 2 = 5$ so $\frac{1}{4}b = 3$.
 $\frac{1}{4}b \times 4 = b$
 $3 \times 4 = 12$
 So $b = 12$.
- d) $3g - 1 = 8$
 $9 - 1 = 8$ so $3g = 9$
 $3g \div 3 = g$ $9 \div 3 = 3$
 So $g = 3$

12. 11 hours

13. 4 bottles

14. a) $312 - 72 = \text{GH}\text{¢} 240$

b) $240 \div 15 = 16$ weeks

15. GH¢ 76

Strand 3: Geometry and measurement

- a) 5 faces and 9 edges b) cone

c) 6 faces in a square shape d) rectangle

e) triangle f) square

g) rectangle
- a) triangle-based pyramid b) hexagon-based prism

c) rectangular prism d) triangular prism
- a) north-west b) south

c) Bolgatana d) Accra
- a) black arrow b) red star c) yellow star

d) There are several possible answers. One suggestion is: Move 4 squares east. Move 6 squares north. Move 1 square east.
- a) reflection b) rotation c) translation
- Check learners' drawings
- a) $\begin{pmatrix} 11 \\ -3 \end{pmatrix}$ b) $\begin{pmatrix} 0 \\ -10 \end{pmatrix}$ c) $\begin{pmatrix} -5 \\ 11 \end{pmatrix}$ d) $\begin{pmatrix} -4 \\ -8 \end{pmatrix}$

Strand 4: Data

- Discrete data can be counted and takes on an integer value, for example, the number of people who bought cars in a year. It is drawn as points on a graph. Continuous data is not restricted to a whole number (defined value) and can take on any value in a range of values, for example, temperature over a given time period. It is drawn as a line joining points on a graph.
- a) Day 4 b) 150 books

c) 5 more books d) Days 2, 3 and 4

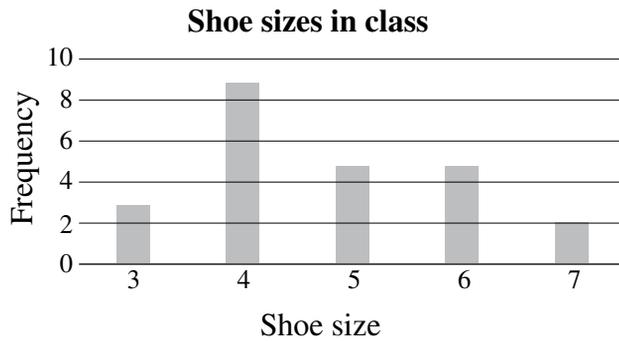
- e) Day 5
- f) 10 books
- g) Yao
- h) Yes, on Day 4
- i) 5 books
- j)

	Day 1	Day 2	Day 3	Day 4	Day 5
Yao	25	30	35	40	20
Efua	5	50	25	40	30

3. a)

Shoe size	Tally	Frequency
3		3
4	HHH	9
5	HHH	5
6	HHH	5
7		2

- b) size 4
- c) $\frac{3}{24}$ or $\frac{1}{8}$
- d) sizes 5 and 6
- e) 37.5%
- f)



- 4. a) 1
- b) Learners' own answers, depends on weather
- c) 0.5
- d) 0
- 5. Learners' own answers. In theory, the outcome for an even number should be 0.5.

Workbook answers

Strand 1: Number

B6.1.1.1

Quantities and place value up to 1,000,000

Exercise 1

WB page 1

1.

Millions	Hundred thousands	Ten thousands	Thousands	Hundred	Tens	Ones
2	3	4	8	5	9	4
1	5	6	9	2	3	7
7	8	2	3	4	5	9

2. a) 9 thousands
b) 9 ones
3. a) 2 hundreds
b) 2 ten thousands
4. a) 3 tens
b) 3 thousands
5. 6 ten thousands
6. 4 hundreds
7. a) 1,569,237
b) 7,823,459

Exercise 2

WB page 2

1. a) 2,543,00
b) 7,264,000
c) 9,452,000
2. a) 357
b) 278
3. a) 2,030
b) 2,360
4. a) 31,200
b) 42,600
5. a) 2,450,000
b) 5,320,000
6. Learners' own work

Exercise 3

WB page 7

1.
 - a) Two **million**, four hundred and sixty-**eight** thousand, three hundred and **ninety-one**
 - b) **Four** million, one **hundred and thirty-six thousand**, eight hundred and **ninety-one**
2.
 - a) Three hundred and forty-five thousand, six hundred and seventy-eight
 - b) Two hundred and forty-five thousand, eight hundred and thirty-nine
 - c) Two million, four hundred and sixty-seven thousand, eight hundred and forty-three
 - d) One million, four hundred and sixty-eight thousand, nine hundred and four
3.
 - a) 456,738
Digits: 700
Word form: seven hundred
 - b) 367,894
Digits: 60,000
Word form: sixty thousand
 - c) 2,456,739
Digits: 450,000
Word form: four hundred and fifty thousand
 - d) 7,456,264
Digits: 7,450,000
Word form: seven million, four hundred and fifty thousand
4.
 - a) $800,000 + 90,000 + 4,000 + 100 + 30 + 4$
 - b) $50,000 + 6,000 + 400 + 50 + 7$
 - c) $1,000,000 + 200,000 + 30\ 000 + 4,000 + 500 + 60 + 3$

Exercise 4

WB page 9

Whole number	Expanded form	Word form
3,966,124	$3,000,000 + 900,000 + 60,000 + 6,000 + 100 + 20 + 4$	Three million, nine hundred and sixty-six thousand one hundred and twenty-four
1,128,175	$1,000,000 + 100,000 + 20,000 + 8,000 + 100 + 70 + 5$	One million, one hundred and twenty-eight thousand one hundred and seventy-five

Whole number	Expanded form	Word form
9,134,215	$9,000,000 + 100,000 + 30,000 + 4,000 + 200 + 10 + 5$	Nine million, one hundred and thirty-four thousand, two hundred and fifteen
6,751,313	$6,000,000 + 700,000 + 50,000 + 1,000 + 300 + 10 + 3$	Six million, seven hundred and fifty-one thousand, three hundred and thirteen
203,767	$200,000 + 3,000 + 700 + 60 + 7$	Two hundred and three thousand and sixty-seven
8,401,186	$8,000,000 + 400,000 + 1,000 + 100 + 80 + 6$	Eight million, four hundred and one thousand, one hundred and eighty-six

Exercise 5

WB page 9

1. a)

Number	10 less	10 more
23,465	23,455	23,475
	100 less	100 more
	23,365	23,565
	1,000 less	1,000 more
	22,465	24,465
	10,000 less	10,000 more
	13,465	33,465

b)

Number	10 less	10 more
34,567	34,557	34,577
	100 less	100 more
	34,467	34,667
	1,000 less	1,000 more
	33,567	35,567
	10,000 less	10,000 more
	24,567	44,567

c)

Number	10 less	10 more
435,780	435,770	435,790
	100 less	100 more
	435,680	435,880
	1,000 less	1,000 more
	434,780	436,780
	10,000 less	10,000 more
	425,780	445,780

d)

Number	10 less	10 more
2,367,892	2,367,882	2,367,902
	100 less	100 more
	2,367,792	2,367,992
	1,000 less	1,000 more
	2,366,892	2,368,892
	10,000 less	10,000 more
	2,357,892	2,377,892

2.
 - a) greater than
 - b) less than
 - c) less than
 - d) equal to
3.
 - a) <
 - b) <
 - c) <
 - d) >
4.
 - a) 53,691; 112,234; 124,567; 213,491; 241,600
 - b) 256,712; 354,269; 1,812,365; 2,389,412; 3,213,574
5.
 - a) 632,415; 459,742; 235,671; 38,285; 17,639
 - b) 3,369,134; 3,344,565; 3,229,812; 3,025,689; 326,813

B6.1.1.2

Roman numerals up to C

Exercise 1

WB page 12

1.

Hindu Arabic number	Roman numeral
1	I
50	V
10	X
50	L
100	C

2.

Roman numeral	Calculations	Hindu Arabic number
VIII	$V + I + I + I = 5 + 1 + 1 + 1 =$	8
XXI	$X + X + I = 10 + 10 + 1 =$	21
C	$C = 100$	100
XXVII	$X + X + V + I + I + 10 + 10 + 5 + 1 + 1 =$	27
LXXXI	$L + X + X + X + I = 50 + 10 + 10 + 10 + 1 =$	81
LXIV	$L + X + (V - I) = 50 + 10 + (5 - 1) =$	64
XCVI	$(C - X) + V + I = (100 - 10) + 5 + 1 =$	96
XLV	$(L - X) + V = (50 - 10) + 5 =$	45
LXXXIX	$L + X + X + X + (X - I) = 50 + 10 + 10 + 10 + (10 - 1) =$	89
XXXVI	$X + X + X + V + I = 10 + 10 + 10 + 5 + 1 =$	36
LVII	$L + V + I + I = 50 + 5 + 1 + 1 =$	57
LIX	$L + (X - I) = 50 + (10 - 1) =$	59
XII	$X + I + I = 10 + 1 + 1$	12
XIV	$X + (V - I) = 10 + (5 - 1) =$	14
XCIV	$(C - X) + (V - I) = (100 - 10) + (5 - 1) =$	94

3. a) LIX b) XXIV c) LXXVIII
 d) XXIII e) XLVI f) XXXIX
 g) XIV h) XVIII i) XXV
 j) LXV k) LII l) XXI

1.

+	I	III	IV	V	IX
VIII	IX	XI	XII	VIII	XVII
X	XI	XIII	XIV	XV	XIX
XV	XVI	XVIII	XIX	XX	XXIV
XXV	XXVI	XXVIII	XXIX	XXX	XXXIV

2.

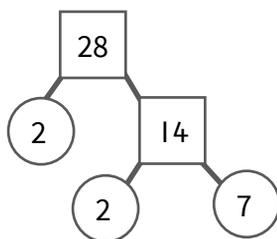
-	III	VI	XIX	XV	IV
LX	LVII	LIV	XLI	XLV	LVI
C	C - III = XCVII	XCIV	LXXXI	LXXXV	XCVI
XXV	XXII	XIX	VI	X	XXI
XLIII	XL	XXXVII	XXIV	XXVIII	XXXIX

B6.1.1.3

Factors, multiples and prime numbers from 1 to 100

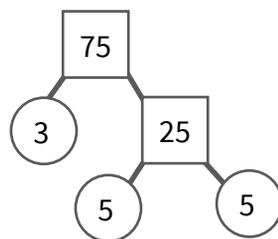
Exercise 1

1. a)



$$28 = 2 \times 2 \times 7$$

b)



$$75 = 3 \times 5 \times 5$$

2. a)

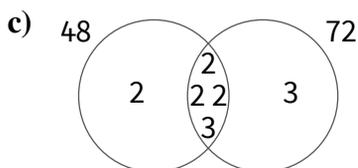
$$2 \times 17$$

b) $2 \times 2 \times 2 \times 2 \times 2 \times 2$

c) 2×23

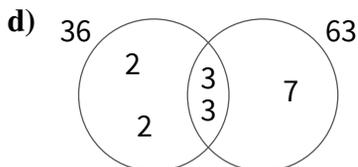
d) $2 \times 3 \times 39$

$$\text{LCM of 24 and 60} = 2 \times 2 \times 2 \times 3 \times 5 = 120$$



$$\text{HCF of 48 and 72} = 2 \times 2 \times 2 \times 3 = 24$$

$$\text{LCM of 48 and 72} = 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 288$$



$$\text{HCF of 36 and 63} = 3 \times 3 = 9$$

$$\text{LCM of 36 and 63} = 2 \times 2 \times 3 \times 3 \times 7 = 252$$

Exercise 3

WB page 18

1. a) $15 = 3 \times 5$

$$35 = 5 \times 7$$

$$40 = 2 \times 2 \times 2 \times 5$$

$$\text{HCF} = 5; \text{LCM} = 2 \times 2 \times 2 \times 3 \times 5 \times 7 = 840$$

b) $16 = 2 \times 2 \times 2 \times 2$

$$24 = 2 \times 2 \times 2 \times 3$$

$$48 = 2 \times 2 \times 2 \times 2 \times 3$$

$$\text{HCF} = 2 \times 2 \times 2 = 8; \text{LCM} = 2 \times 2 \times 2 \times 2 \times 3 = 48$$

c) $12 = 2 \times 2 \times 3$

$$32 = 2 \times 2 \times 2 \times 2 \times 2$$

$$40 = 2 \times 2 \times 2 \times 5$$

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

$$\text{LCM} = 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 480$$

d) $12 = 2 \times 2 \times 3$

$$36 = 2 \times 2 \times 3 \times 3$$

$$48 = 2 \times 2 \times 2 \times 2 \times 3$$

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

$$\text{LCM} = 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 144$$

e) $42 = 2 \times 3 \times 7$

$$48 = 2 \times 2 \times 2 \times 2 \times 3$$

$$54 = 2 \times 3 \times 3 \times 3$$

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

$$\text{LCM} = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 7 = 3,024$$

B6.1.2.1

Apply mental mathematics strategies and number properties for multiplication and division

Exercise 1

WB page 19

1. a)

×	3	0	5	7	9
3	9	0	15	21	27
4	12	0	20	28	36
6	18	0	30	42	54
8	24	0	40	56	72

b)

×	2	1	6	9	11
2	4	2	12	18	22
4	8	4	24	26	44
5	10	5	30	45	55
7	14	7	42	63	77
9	18	9	54	81	99

2. a) $12 + 12 = 24$
b) $48 \div 2 = 24$
c) 30; $30 + 30 = 60$
d) 28; $28 + 28 = 56$
e) 30; $30 + 30 = 60$
3. a) $4 \times 9 = (40 - 4) = 36 \leftarrow 4 \times 10 = 40 \rightarrow 4 \times 11 = (40 + 4) = 44$
b) $8 \times 9 = (80 - 8) = 72 \leftarrow 8 \times 10 = 80 \rightarrow 8 \times 11 = (80 + 8) = 88$
c) $6 \times 9 = (60 - 9) = 54 \leftarrow 6 \times 10 = 60 \rightarrow 6 \times 11 = (60 + 6) = 66$
d) $7 \times 9 = (70 - 9) = 63 \leftarrow 7 \times 10 = 70 \rightarrow 7 \times 11 = (70 + 7) = 77$
e) $3 \times 9 = (30 - 3) = 27 \leftarrow 3 \times 10 = 30 \rightarrow 3 \times 11 = (30 + 3) = 33$

Exercise 2

WB page 20

1. a) $35 \times 10 = 350 \leftarrow 350 \times 100 = 35,000$
 $\rightarrow 35,000 \times 1,000 = 35,000,000$
- b) $15 \times 10 = 150 \leftarrow 150 \times 10 = 1,500 \rightarrow 1,500 \times 10 = 15,000$
- c) $2 \times 100 = 200 \leftarrow 200 \times 10 = 2,000 \rightarrow 2,000 \times 100 = 200,000$
- d) $36 \times 10 = 360 \leftarrow 360 \times 1,000 = 360,000$
 $\rightarrow 360,000 \times 10 = 3,600,000$
2. a) $4 \times (10 + 5) = (4 \times 10) + (4 \times 5) = 40 + 20 = 60$
- b) $5 \times (20 + 4) = (5 \times 20) + (5 \times 4) = 100 + 20 = 120$
- c) $6 \times (20 + 6) = (6 \times 20) + (6 \times 6) = 120 + 36 = 156$
- d) $7 \times (30 + 2) = (7 \times 30) + (7 \times 2) = 210 + 14 = 254$

B6.1.2.2

Multiply multi-digit numbers

Exercise 1

WB page 21

1. a) $164 + 40 = 200$

\times	20	5
8	160	40

- b) $240 + 30 = 270$

\times	40	5
6	240	30

- c) $200 + 24 = 224$

\times	50	6
4	200	24

- d) $(600 + 120) + (50 + 10)$
 $= 720 + 60$
 $= 780$

\times	60	5
10	600	50
2	120	10

$$\begin{aligned}
 \text{e) } & (2,000 + 1,400) + (100 + 70) + (60 + 42) \\
 & = 3,400 + 170 + 102 \\
 & = 3,672
 \end{aligned}$$

×	200	10	6
10	2,000	100	60
7	1,400	70	42

2. a) 2,788

$$\begin{array}{r}
 82 \\
 \times 34 \\
 \hline
 328 \\
 + 2460 \\
 \hline
 2788
 \end{array}$$

b) 1,088

$$\begin{array}{r}
 68 \\
 \times 16 \\
 \hline
 408 \\
 + 680 \\
 \hline
 1088
 \end{array}$$

c) 7,425

$$\begin{array}{r}
 275 \\
 \times 27 \\
 \hline
 1925 \\
 + 5500 \\
 \hline
 7425
 \end{array}$$

d) 4,672

$$\begin{array}{r}
 146 \\
 \times 32 \\
 \hline
 292 \\
 + 4380 \\
 \hline
 4672
 \end{array}$$

e) 3,082

$$\begin{array}{r}
 134 \\
 \times 23 \\
 \hline
 402 \\
 + 2680 \\
 \hline
 3082
 \end{array}$$

f) 3,690

$$\begin{array}{r} 205 \\ \times 18 \\ \hline 1640 \\ + 2050 \\ \hline 3690 \end{array}$$

g) 21,148

$$\begin{array}{r} 622 \\ \times 34 \\ \hline 2488 \\ + 18660 \\ \hline 21148 \end{array}$$

3. Learners' own answers

4. Learners' own answers

Exercise 2

WB page 24

1. a) 1,694

	1	2	1	
	0	0	0	
		1	2	1
	0	0	0	
1		4	8	4
	6	9	4	

b) 5,850

	3	2	5	
	0	0	0	
		3	2	5
	2	1	4	
5		4	6	0
	8	5	0	

c) 5,005

	1	4	3	
	0	1	0	
		3	2	9
	0	2	1	
5		5	0	5
	0	0	5	

d) 32,535

	7	2	3	
3	2 8	0 8	1 2	4
2	3 5	1 0	1 5	5
	5	3	5	

e) 30,885

	1	4	5	
	0 2	0 8	1 0	2
3	0 1	0 4	0 5	1
0	0 3	1 2	1 5	3
	8	8	5	

f) 61,857

	2	3	7	
	0 4	0 6	1 4	2
6	1 2	1 8	4 2	6
1	0 2	0 3	0 7	1
	8	5	7	

g) 71,504

	3	2	8	
	0 6	0 4	1 6	2
7	0 3	0 2	0 8	1
1	2 4	1 6	6 4	8
	5	0	4	

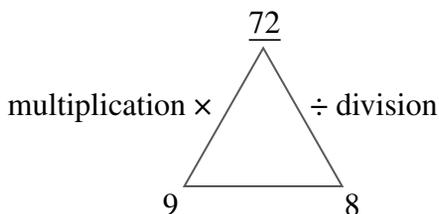
B6.1.2.3

Multiply numbers given division facts

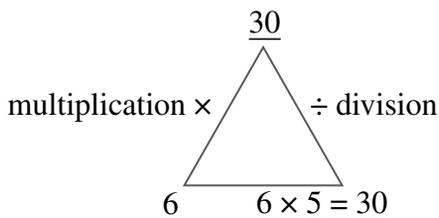
WB page 25

Exercise 1

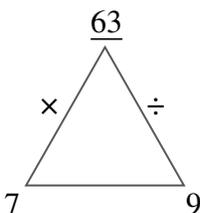
1. a)



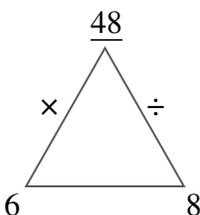
b)



2. a)



b)



3. a) the last digit is an even number or zero
b) the sum of the digits is divisible by 3
c) the last 2 digits divisible by 4
d) No, not always
e) If the last digit is 5 or zero

4.

Number	Divisible by	Divisible by	Divisible by	Divisible by
55	5	11		
255	3	5	17	
84	2	3	7	
230	2	5	10	23
74	2	37		
112	2	4	7	8
432	2	4	8	9
2,706	2	3	6	11
610	2	5	10	
384	2	3	4	6 and 8
4,992	2	3	4	6 and 8

B6.1.2.4

Divide 2- or 3-digit numbers by 1- or 2-digit numbers

Exercise 1

WB page 27

1. a)

$$\begin{array}{r} 117 \\ 5 \overline{) 586} \\ \underline{-5} \\ 8 \\ \underline{-5} \\ 36 \\ \underline{-35} \\ 1 \end{array}$$

$$586 \div 5 = 117 \text{ remainder } 1$$

c)

$$\begin{array}{r} 20 \\ 12 \overline{) 250} \\ \underline{-24} \\ 10 \end{array}$$

$$250 \div 12 = 20 \text{ remainder } 10$$

b)

$$\begin{array}{r} 39 \\ 24 \overline{) 936} \\ \underline{-72} \\ 216 \\ \underline{-216} \\ 0 \end{array}$$

$$936 \div 24 = 39$$

d)

$$\begin{array}{r} 75 \\ 14 \overline{) 1,050} \\ \underline{-98} \\ 70 \\ \underline{-70} \\ 0 \end{array}$$

$$1,050 \div 14 = 75$$

$$\begin{array}{r} \text{e)} \quad \quad \quad 28 \\ 15 \overline{) 432} \\ \underline{- 30} \\ 132 \\ \underline{- 120} \\ 12 \end{array}$$

$$432 \div 15 = 28 \text{ remainder } 12$$

$$\begin{array}{r} \text{2. a)} \quad \quad \quad 21 \\ 40 \overline{) 850} \\ \underline{- 80} \\ 50 \\ \underline{- 40} \\ 10 \end{array}$$

$$850 \div 40 = 21 \text{ remainder } 10$$

$$\begin{array}{r} \text{b)} \quad \quad \quad 17 \\ 29 \overline{) 493} \\ \underline{- 29} \\ 203 \\ \underline{- 203} \\ 0 \end{array}$$

$$493 \div 29 = 17$$

$$\begin{array}{r} \text{c)} \quad \quad \quad 29 \\ 18 \overline{) 535} \\ \underline{- 36} \\ 175 \\ \underline{- 162} \\ 13 \end{array}$$

$$535 \div 18 = 29 \text{ remainder } 13$$

$$\begin{array}{r} \text{d)} \quad \quad \quad 519 \\ 27 \overline{) 1,377} \\ \underline{- 135} \\ 27 \\ \underline{- 27} \\ 0 \end{array}$$

$$1,377 \div 27 = 51$$

$$\begin{array}{r} \text{e)} \quad \quad \quad 321 \\ 15 \overline{) 4,815} \\ \underline{- 45} \\ 31 \\ \underline{- 30} \\ 15 \\ \underline{- 15} \\ 0 \end{array}$$

$$4,815 \div 15 = 321$$

$$\begin{array}{r} \text{f)} \quad \quad \quad 201 \\ 12 \overline{) 2,418} \\ \underline{- 24} \\ 18 \\ \underline{\quad 12} \\ 6 \end{array}$$

$$2,418 \div 12 = 201 \text{ remainder } 6$$

B6.1.2.5

Translate word problems into mathematical sentences and solve

Exercise 1

WB page 28

- Total number of cakes = $4 \times 12 = 48$
 $48 \div 24 = 2$
So, each learner will receive 2 cakes.
- $(12 + 12) \times 4 = 96$ kg of food needed for 24 animals.
 $4,896 \div 96 = 51$
So, the farmer will be able to feed the animals for 59 days.
- $(15 \times 2) + (6 \times 2) + (3 \times 2) = 30 + 12 + 6 = 48$
Fifi's purchase will cost GH¢ 48. No, he will not have enough money.
- a) $1,944 \div 12 = 162$. One payment = GH¢ 162.
 $162 \times 5 = \text{GH¢ } 810$
So, she has paid off GH¢ 810 after 5 months.
b) $1,944 - 810 = 1,134$
Her balance after 5 months is GH¢ 1,134.

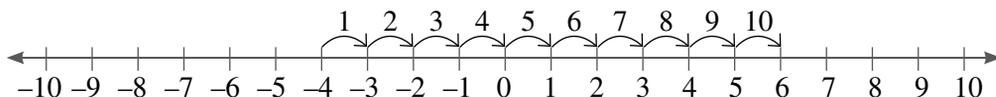
B6.1.2.6

Understand integers

Exercise 1

WB page 29

- a) +2; -2
b) +5; -5
c) The sum of the same digit with opposite signs equals zero.
d) $-10 + 10 = 0$
-



- a) > b) < c) > d) >

Exercise 2

1. a) $D = 0$
b) $G = 15$
 $G - D$
 $15 - 0 = 15$
c) -15
d) $F = 9$
 $G = 15$
So, $F < G$
e) $F = 9$
 $9 > -9$
So, $F > -9$
f) On the number line above, the distance from B to 6 is 4 units.
1 unit = 3 values
So, 4 units = $4 \times 3 = 12$.
g) On the number line above, the distance from D to A is 4 units.
1 unit = 3 values
So, 4 units = $4 \times 3 = 12$.
h) On the number line above, the distance from -15 to G is 30 units.
1 unit = 3 values
So, 30 units = $10 \times 3 = 30$
2. a) $A = -25$
 $B = -20$
 $C = -10$
 $D = -5$
 $E = 5$
 $F = 15$
 $G = 20$
 $H = 25$
b) $B = -20$
 $D = -5$
So, $D - B = -5 - (-20) = 15$
c) $D = -5$
 $G = 20$
So, $G - D = 20 - (-5) = 25$
d) $E = 5$
 $B = -20$
So, $B - E = -20 - 5 = -25$

- e) (i) smaller than
(ii) greater than
(iii) equal to
3. a) -10 b) 1 c) -6 d) 7
e) -7 f) -8 g) 0 h) -1
i) -11 j) 11

Exercise 3

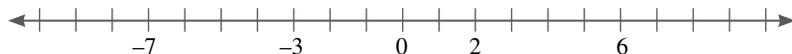
WB page 32

1. a) 1 b) 10 c) 9 d) -12
e) -1 f) -9; -7 g) smaller; -7
h) 0
2. a) < b) < c) > d) <
e) < f) > g) > h) >
i) < j) >

Exercise 4

WB page 33

1. a)



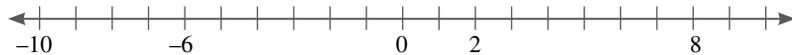
-7; -3, 0; 2; 6

b)



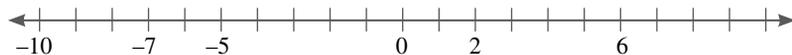
-9; -4; 3; 7; 8

c)



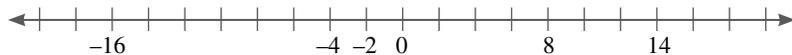
-10; -6; 0; 2; 8

d)



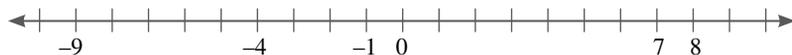
-10; -7; -5; 0; 2; 6

e)



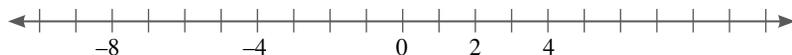
-16; -4; -2; 0; 8; 14

2. a)



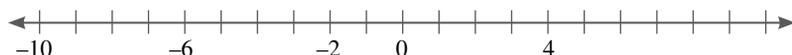
8; 7; 0; -1; -4; -9

b)



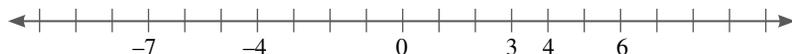
4; 2; 0; -4; -8

c)



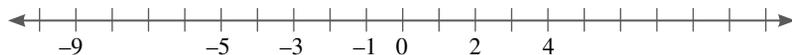
4; 0; -2; -6; -10

d)



6; 4; 3; 0; -4; -7

e)



4; 2; 0; -1; -3; -5; -9

Exercise 5

WB page 35

1. a) -8; -3; -2; 7; 4; 7
b) -5; -1; 0; 4; 8; 10
c) -9; -5; -3; -1; 2; 4; 5
d) -8; -7; -2; 0; 3; 6; 9
e) -12; -8; -5; -1; 3; 6; 12
2. a) 8; 3; 2; 1; -4; -5; -6; -8
b) 12; 9; 5; 4; 0; -6; -18
c) 20; 15; 4; -1; -8; -9; -13
d) 17; 10; 6; 3; -2; -3; -11; -12
e) 13; 6; 5; 2; -2; -5; -6; -13

Exercise 6

WB page 36

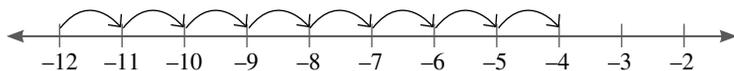
1. a) -5°
b) -10 m
c) -25 litre
d) -12 m
e) +7 cm
f) -GH¢ 100
g) -GH¢ 200
h) -10°
i) +20 km/h
j) -6%

2. a) $-2; -3; -1; 0; -2$
 b) $5; 4; 6; 7; 5$
 c) $-1; -2; 0; 1; -1$
 d) $16; 15; 17; 18; 16$
 e) $-8; -9; -7; -6; -8$
 f) $-11; -12; -10; -9; -11$

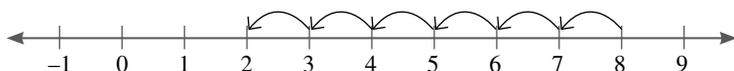
Exercise 7

WB page 37

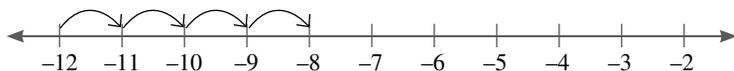
1. a) -4



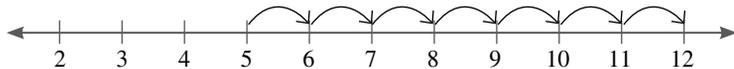
- b) 2



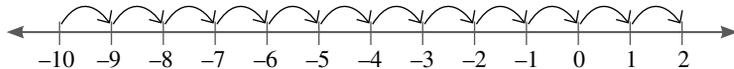
- c) -8



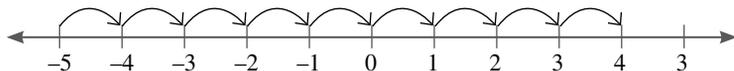
- d) 12



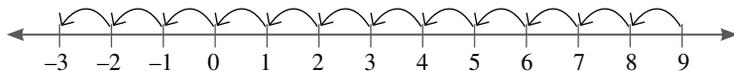
- e) 2



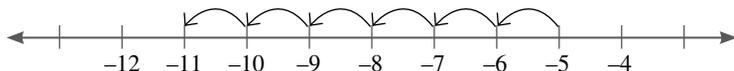
- f) 4



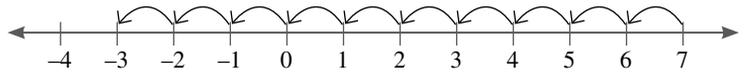
2. a) -3



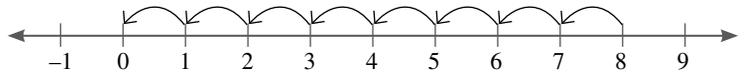
- b) -11



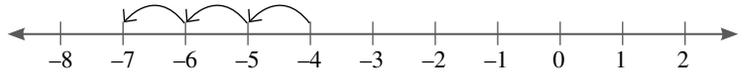
c) -3



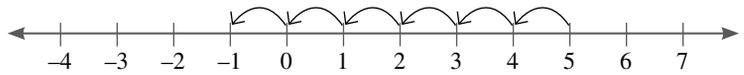
d) 0



e) -7



f) -1



Exercise 8

WB page 39

- | | | |
|---------|----------|---------|
| a) 5 | b) -5 | c) 21 |
| d) -5 | e) -11 | f) 7 |
| g) -5 | h) -12 | i) -7 |
| j) 0 | | |
- a) $13 - 8 = 5$
The new temperature is 5°C .

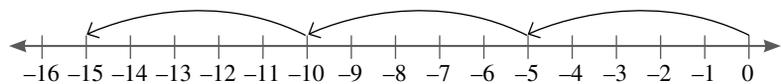
b) $5 - 7 = -2$
The temperature is -2°C .

c) $-2 + 10 = 8$
The new temperature is 8°C .
- | | | |
|----------|------|---------|
| a) 11 | b) 7 | c) 10 |
| d) 5 | e) 9 | f) -4 |
| g) -13 | h) 5 | |

Exercise 9

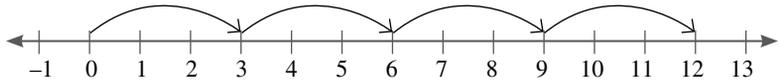
WB page 40

- a) -15



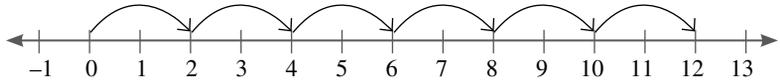
The product is -15 .

b) 12



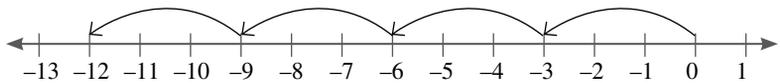
The product is 12.

c) 12



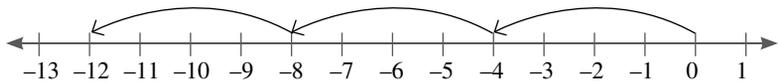
The product is 12.

d) -12



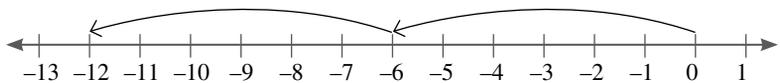
The product is -12.

e) -12



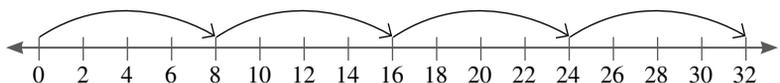
The product is -12.

f) -12



The product is -12.

g) 32



The product is 32.

Exercise 10

WB page 41

- | | | |
|-----------|--------|--------|
| 1. a) -20 | b) -18 | c) 24 |
| d) -15 | e) 28 | f) -28 |
| g) -30 | h) -24 | i) -45 |
| j) 42 | k) -48 | l) -36 |

2. a) If $-2 \times 3 = -6$, then $-2 \times 6 = -6 + (-6) = -12$
- b) If $-4 \times 8 = -32$, then $-4 \times 4 = -32 \div 2 = -16$
- c) If $-3 \times 10 = -30$, then $-3 \times 9 = (-30 - (-3)) = -27$
- d) If $-5 \times 10 = -50$, then $-5 \times 11 = (-50 + (-5)) = -55$
- e) $-4 \times 16 = -4(10 + 6) = (-4 \times 10) + (-4 \times 6)$
 $= -40 + (-24) = -64$
- f) $-6 \times 14 = -6(10 + 4) = (-6 \times 10) + (-6 \times 4)$
 $= -60 + (-24) = -84$

Exercise 11

WB page 42

1. a) $3 \times 6 = 18$
Kwaku baked 18 cookies
- b) -11
- c) $18 - 11 = 7$
- d) 7 cookies remained
- e) $18 - (+11) = 7$
- f) Learners' own answers
2. a) 1 hour = 60 min; $(60 \times 3) \div 20 = 9$
The lawnmower will have used 9 litres of petrol after 1 hour.
- c) $3 \times 3 = 3 + 3 + 3 = 9$ litres of petrol
- d) $15 - 9 = 6$
So, 6 litres of petrol is left after an hour.
- e) $6 - 9 = -3$
No, the lawnmower will not have enough petrol for 2 hours.
3. $(6 \times 3) + (3 \times 2) = 18 + 6 = 24$
Junior bought 24 toffees and pieces of chewing gum.
4. $3 \times 10 = 30$; $2 \times 10 = 20$
There are 30 pencils and 20 erasers in 10 boxes.
5. $3 \times 9 = 27$
Sally buys 27 packets of peanuts for nine trips.

B6.1.3.1

Compare, add, subtract, multiply and divide fractions

Exercise 1

WB page 44

1.

	Fraction	HCF	Simplified fraction
a)	$\frac{10}{15}$	5	$\frac{2}{3}$
b)	$\frac{9}{18}$	9	$\frac{1}{2}$
c)	$\frac{18}{24}$	6	$\frac{3}{4}$
d)	$\frac{32}{40}$	2	$\frac{16}{25}$
e)	$\frac{4}{32}$	4	$\frac{1}{8}$
f)	$\frac{8}{36}$	4	$\frac{2}{9}$
g)	$\frac{9}{36}$	9	$\frac{1}{4}$
h)	$\frac{18}{45}$	3	$\frac{6}{15}$
i)	$\frac{25}{40}$	5	$\frac{5}{8}$
j)	$\frac{36}{42}$	6	$\frac{6}{7}$
k)	$\frac{8}{12}$	4	$\frac{2}{3}$
l)	$\frac{16}{40}$	8	$\frac{2}{5}$
m)	$\frac{6}{30}$	6	$\frac{1}{5}$
n)	$\frac{14}{49}$	7	$\frac{2}{7}$
o)	$\frac{10}{25}$	5	$\frac{2}{5}$
p)	$\frac{9}{63}$	9	$\frac{1}{7}$

	Fraction	Multiplying numerator and denominator by a factor of HCF	Equivalent
a)	$\frac{2}{5}$	4	$\frac{8}{20}$
b)	$\frac{9}{10}$	3	$\frac{27}{30}$
c)	$\frac{7}{13}$	2	$\frac{14}{26}$
d)	$\frac{3}{7}$	5	$\frac{15}{35}$
e)	$\frac{1}{5}$	6	$\frac{6}{30}$
f)	$\frac{5}{6}$	3	$\frac{15}{18}$

Exercise 2

WB page 45

1. a) > b) < c) > d) = e) <

$$2. \text{ a) } = \frac{20}{28}, \frac{18}{28}, \frac{14}{28}, \frac{5}{28}$$

$$= \frac{5}{28}, \frac{14}{28}, \frac{18}{28}, \frac{20}{28}$$

$$= \frac{5}{28}, \frac{2}{4}, \frac{9}{14}, \frac{5}{7}$$

$$\text{b) } = \frac{25}{30}, \frac{6}{30}, \frac{12}{30}, \frac{15}{30}$$

$$= \frac{3}{15}, \frac{2}{5}, \frac{1}{2}, \frac{5}{6}$$

$$\text{c) } = \frac{8}{24}, \frac{12}{24}, \frac{8}{24}, \frac{15}{24}$$

$$= \frac{1}{3}, \frac{2}{6}, \frac{2}{4}, \frac{5}{8}$$

$$\text{d) } = \frac{12}{18}, \frac{4}{18}, \frac{12}{18}, \frac{13}{18}$$

$$= \frac{2}{9}, \frac{2}{3}, \frac{4}{6}, \frac{13}{18}$$

$$3. \text{ a) } = \frac{3}{4}, \frac{2}{5}, \frac{1}{6}$$

Exercise 3

WB page 46

$$1. \text{ a) } \frac{6}{10} = 0.6$$

$$\text{b) } 0.44$$

$$\text{c) } \frac{1}{3} = 0.33\dots$$

$$\text{d) } 0.625$$

$$\text{e) } 0.66\dots$$

$$\text{f) } \frac{1}{5} = \frac{2}{10} = 0.2$$

2. a) $\frac{40}{100} = 40\%$
 b) $\frac{25}{100} = 25\%$
 c) $\frac{15}{100} = 15\%$
 d) $\frac{755}{1,000} = 75.5\%$
 e) 25%
 f) $\frac{125}{1,000} = \frac{12.5}{100} = 12.5\%$
3. a) $\frac{44}{100} = 44\%$
 b) $6\frac{5}{10} = \frac{65}{10} = \frac{650}{100} = 650\%$
 c) $\frac{875}{1,000} = \frac{87.5}{100} = 87.5\%$
 d) $\frac{7}{10} = \frac{70}{100} = 70\%$
 e) $\frac{66}{100} = 66\%$
 f) $\frac{125}{1,000} = \frac{12.5}{100} = 12.5\%$

Exercise 4

WB page 47

	Fraction	Decimal	Percentage
a)	$\frac{1}{5}$	0.2	20%
b)	$\frac{375}{1,000} = \frac{3}{8}$	0.375	37.5%
c)	$\frac{8}{10} = \frac{4}{5}$	0.8	80%
d)	$\frac{36}{50} = \frac{72}{100}$	0.72	72%
e)	$\frac{42}{100} = \frac{21}{50}$	0.42	42%
f)	$6\frac{5}{10} = 6\frac{1}{2}$	6.5	650%
g)	$\frac{9}{12} = \frac{3}{4} = \frac{75}{100}$	0.75	75%
h)	$\frac{2}{100} = \frac{1}{50}$	0.02	2%
i)	$\frac{11}{25} = \frac{44}{100}$	0.44	44%

Exercise 5

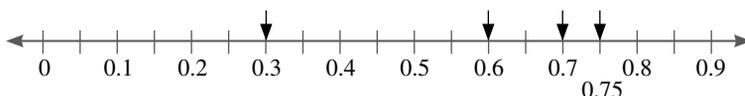
1. a) > b) > c) >
 d) = e) < f) =

2. a) = 0.82; 0.8; 0.85; 0.67; 0.875



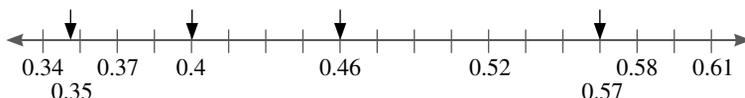
$$\frac{7}{8}; 85\%; 0.82; \frac{4}{5}; \frac{2}{3}$$

- b) = 0.7; 0.75; 0.6; 0.3



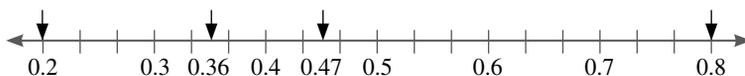
$$\frac{9}{12}; 70\%; 0.6; \frac{1}{3}$$

- c) = 0.4; 0.46; 0.35; 0.57



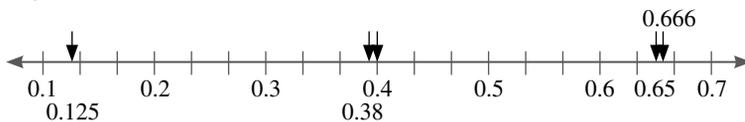
$$4; 7; 0.4; 35\%$$

3. a) = 0.6; 0.47; 0.8; 0.2



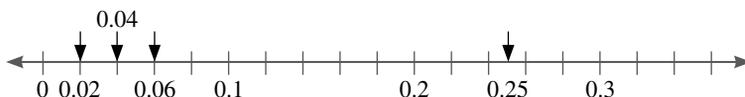
$$20\%; 0.36; \frac{47}{100}; \frac{8}{10}$$

- b) = 0.4; 0.38; 0.65; 0.125; 0.666



$$\frac{1}{8}; 0.38; 40\%; 65\%; 0.666$$

- c) = 0.04; 0.02; 0.06; 0.25



$$\frac{2}{100}; 0.04; 6\%; \frac{2}{8}$$

4. $75\% = \frac{75}{100} = \frac{3}{4}$

$$\frac{8}{10} = \frac{4}{5}$$

$$\frac{9}{12} = \frac{3}{4}$$

$$0.75 = \frac{75}{100} = \frac{3}{4}$$

$$66.6\% = 66\frac{6}{10}$$

$$\frac{6}{8} = \frac{3}{4}$$

So, $\frac{8}{10}$ and 66.6% are not equal to $\frac{3}{4}$.

Exercise 6

WB page 49

1. a) $\frac{12}{5}$

b) $\frac{15}{4}$

c) $\frac{14}{3}$

d) $\frac{45}{7}$

e) $\frac{64}{11}$

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

b) $2\frac{2}{7}$

c) $1\frac{6}{15} = 1\frac{2}{5}$

d) 4

e) $\frac{13}{3} = 4\frac{1}{3}$

f) $3\frac{1}{11}$

Exercise 7

WB page 50

1. a) $\frac{7}{5} = 1\frac{2}{5}$

b) $3 - 3\frac{3}{9}$

$$= \frac{-3}{9}$$

$$= -\frac{1}{3}$$

c) $\frac{93}{7} - \frac{54}{7}$

$$= \frac{39}{7}$$

$$= 5\frac{4}{7}$$

d) $10\frac{5}{6}$

e) $\frac{18}{12}$

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

$$= 1\frac{1}{2}$$

f) $2\frac{7}{8}$

$$\begin{aligned} \text{g)} \quad & 6\frac{8}{20} + 3\frac{15}{20} \\ & = 9\frac{23}{20} \\ & = 10\frac{3}{20} \end{aligned}$$

$$\begin{aligned} \text{h)} \quad & 4\frac{7}{10} + 6\frac{5}{10} \\ & = 10\frac{12}{10} \\ & = 11\frac{2}{10} \\ & = 11\frac{1}{5} \end{aligned}$$

$$\begin{aligned} \text{i)} \quad & 5\frac{16}{56} - 2\frac{21}{56} \\ & = 4\frac{72}{56} - 2\frac{21}{56} \\ & = 2\frac{51}{56} \end{aligned}$$

$$\begin{aligned} \text{j)} \quad & \frac{9}{16} - \frac{6}{16} \\ & = \frac{3}{16} \end{aligned}$$

$$\begin{aligned} \text{k)} \quad & 4\frac{21}{30} + 7\frac{20}{30} \\ & = 11\frac{41}{30} \\ & = 12\frac{11}{30} \end{aligned}$$

Exercise 8

WB page 51

$$\begin{aligned} \text{1.} \quad & 4\frac{2}{3} - 3\frac{1}{2} \\ & = 4\frac{4}{6} - 3\frac{3}{6} \\ & = 1\frac{1}{6} \end{aligned}$$

Kojo walked $1\frac{1}{6}$ kilometres more.

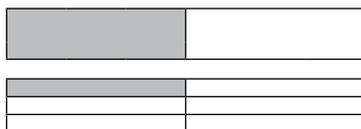
$$\text{2.} \quad 7\frac{3}{8} - 4\frac{2}{8} = 3\frac{1}{8}$$

Abena has $3\frac{1}{8}$ m fabric left.

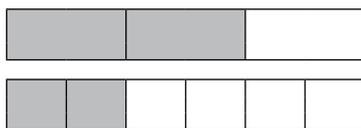
Exercise 9

WB page 51

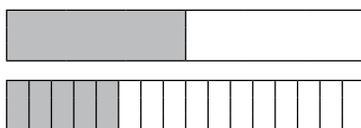
1. a) $\frac{1}{6}$



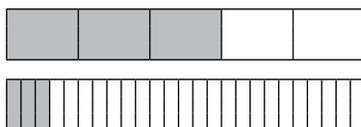
b) $\frac{1}{2} \times \frac{2}{3} = \frac{2}{6}$



c) $\frac{5}{16}$



d) $\frac{8}{25}$



Exercise 10

WB page 52

1. a) $\frac{15}{42} = \frac{5}{14}$ or

$$\frac{5}{6} \times \frac{3}{7} = \frac{5}{2} \times \frac{1}{7} = \frac{5}{14}$$

b) $\frac{14}{45}$

c) $\frac{12}{42} = \frac{2}{7}$ or

$$\frac{4}{7} \times \frac{3}{6} = \frac{2}{7} \times \frac{3}{3} = \frac{2}{7} \times 1 = \frac{2}{7}$$

d) $\frac{16}{40} = \frac{2}{5}$ or

$$\frac{4}{8} \times \frac{4}{5} = \frac{1}{2} \times \frac{4}{5} = 1 \times \frac{2}{5} = \frac{2}{5}$$

2. a) $\frac{4}{1} \times \frac{11}{2}$

$$= 2 \times 11 = 22$$

$$\begin{aligned} \text{b) } & \frac{11}{4} \times \frac{17}{3} \\ & = \frac{187}{12} \\ & = 15\frac{7}{12} \end{aligned}$$

$$\begin{aligned} \text{c) } & \frac{7}{3} \times \frac{7}{3} \\ & = \frac{49}{9} \\ & = 5\frac{4}{9} \end{aligned}$$

$$\begin{aligned} \text{d) } & \frac{25}{4} \times \frac{38}{5} \\ & = \frac{5}{2} \times \frac{19}{1} \\ & = \frac{95}{2} \\ & = 47\frac{1}{2} \end{aligned}$$

B6.1.4.1

Ratios and its relationship to fractions, multiplication and division

Exercise 1

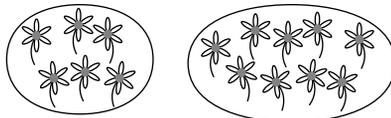
WB page 53

1.
 - a) 6 : 8
 - b) 5 : 10
 - c) 6 : 3
2.
 - a) 2 of shape A can fit into shape B
 - b) Shape A is $\frac{1}{2}$ of shape B
 - c) 1 : 2
 - d) 3
 - e) $\frac{1}{3}$
 - f) 1 : 3
 - g) No
 - h) 8 : 12

Exercise 2

WB page 54

1. a)

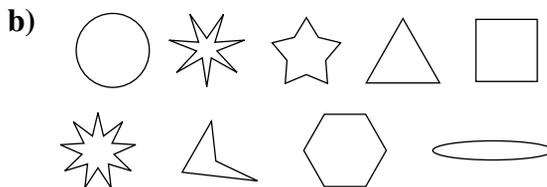


- b) 12 photos in one group and 21 photos in the other group

c) 9 marbles in one group and 12 marbles in the other group



Part to whole ratio



Part to part ratio



Part to whole ratio

Exercise 3

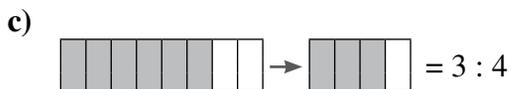
WB page 55

1. a) $\frac{7}{9}$

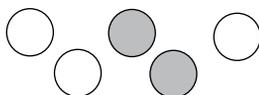
b) $\frac{12}{36} = \frac{1}{3}$

c) $\frac{3}{24} = \frac{1}{8}$

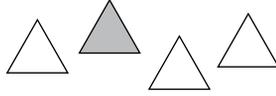
2. a) 1 : 5



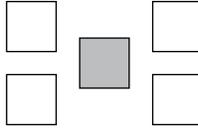
3. a) 2 : 3



b) 1 : 3



c) 1 : 4



Exercise 4

WB page 57

	Ratio	Calculation	Simplest form
1.	$\frac{14}{56}$	$\frac{14 \div 14}{56 \div 14} = \frac{1}{4}$	$\frac{1}{4}$
2.	14 : 21	$14 \div 7 = 2$ $21 \div 7 = 3$	2 : 3
3.	32 : 64	$32 \div 32 = 1$ $64 \div 32 = 2$	1 : 2
4.	$\frac{25}{65}$	$\frac{25 \div 5}{65 \div 5} = \frac{5}{13}$	$\frac{5}{13}$
5.	9 : 3	$9 \div 3 = 3$ $3 \div 3 = 1$	3 : 1
6.	Kwaw reads 5 fiction books and 10 science fiction books	10 : 5 $10 \div 5 : 5 \div 5 = 2 : 1$	2 : 1
7.	12 : 8	$12 \div 4 = 3$ $8 \div 4 = 2$	3 : 2
8.	20 : 32	$20 \div 4 = 5$ $32 \div 4 = 8$	5 : 8
9.	An animal shelter has 12 puppies and 18 kittens to adopt	12 : 18 $12 \div 6 : 18 \div 6 = 2 : 3$	2 : 3
10.	70 : 49	$70 \div 7 = 10$ $49 \div 7 = 7$	10 : 7
11.	9 : 15	$9 \div 3 = 3$ $15 \div 3 = 5$	3 : 5
12.	15 cookies to 40 cakes	15 : 40 $15 \div 5 : 40 \div 5 = 3 : 8$	3 : 8

Exercise 5

1. a) $6 : 4 = 3 : 2$
 - b) $\frac{2}{5}$ white paint
 - c) $\frac{2}{5}$ of 30 = 12 litres of white paint
 $\frac{3}{5}$ of 30 = 18 litres of green paint
2. a) $\frac{5}{12} \times 36 = 15$ girls in the class
 - b) $\frac{5}{12} = \frac{7}{12}$
 $\frac{7}{12} \times 36$
 = 21 boys in the class
 - c) boys : girls = 21 : 15
 = 7 : 5
3. a) hockey : soccer = 12 : 8
 = 3 : 2
 - b) hockey : total number of cards = 12 : 42
 = 2 : 7
 - c) cricket : total = 7 : 42
 = 1 : 6
 - d) hockey : basketball = 12 : 15
 = 4 : 5
4. a) Kukua receives $\frac{4}{9}$ of GH¢ 252 = $\frac{4}{9} \times \frac{252}{1}$
 = $4 \times 28 = \text{GH¢ } 112$
 Yaw receives $\frac{5}{9}$ of GH¢ 252 = $\frac{5}{9} \times \frac{252}{1} = 5 \times 28$
 = GH¢ 140
 - b) 112 : 252
 = 4 : 9
5. a) Total number of ice cream sold = 24
 strawberry : total = 3 : 24 = 1 : 8
 - b) chocolate : mint = 8 : 6
 = 4 : 3
 - c) $240 \div 24 = 10$
 So, one ice cream costs GH¢ 10.
 - d) $8 \times 10 = \text{GH¢ } 80$
 Chocolate ice cream earned GH¢ 80.

Exercise 6

WB page 61

1. $\frac{2}{4}$ and $\frac{2}{8}$

$$\frac{2}{4} = \frac{1}{2}$$

And $\frac{2}{8} = \frac{1}{4}$

The ratios are not equivalent.

2.

	Ratio	First equivalent ratio	Second equivalent ratio
a)	2 : 3	8 : 12	10 : 15
b)	$\frac{1}{8}$	$\frac{2}{16}$	$\frac{4}{32}$
c)	13 : 20	26 : 40	39 : 60
d)	3 : 5	12 : 20	18 : 30
e)	$\frac{4}{10}$	$\frac{2}{5}$	$\frac{12}{30}$
f)	4 : 7	12 : 21	16 : 28

3. $60 \div 3 = 20 : 1$

And $90 : 6 = 15 : 1$

No, the ratio of pages read is not equivalent.

4. $30 : 60 = 1 : 2$

And $45 : 85 = 9 : 17$

No, the ratios are not equivalent.

5. a) Ama: $10 : 5 = 2 : 1$ and Awo: $12 : 6 = 2 : 1$

b) Yes, the ratios are equivalent forms of each other.

c) bracelets : friends = 2 : 1

$$2 : 1 = x : 8 \therefore x = 16$$

So, Alena has to make 16 bracelets.

Exercise 7

WB page 62

1.

Water (ℓ)	10	20	25	35	40
Orange juice (ℓ)	30	60	75	105	120

2. apples : tarts = 20 : 5 = x : 20

$$\therefore x = 80$$

So, Mom would need 80 apples to make 20 tarts.

3. dogs : bag of food = 8 : 1

$$8 : 1 = 32 : x$$

$$\therefore x = 4$$

So, the shelter needs 4 bags of dog food to feed 32 dogs.

4. flour : pancakes = 3 : 12 = 1 : 4
 $1 : 4 = 9 : x$
 $\therefore x = 36$
 So, you can make 36 pancakes with 9 cups of flour.
5. completed : not complete = 6 : 3 = 24 : 12
 $24 : 12 = 8 : x$
 $\therefore x = 4$
 So, Kacely had 8 + 4 + 12 homework problems in total.
6. text : calls = 3 : 4; 3 : 4 = 18 : x
 $\therefore x = 24$
 So, Adwana made 24 calls.

B6.1.4.2

Proportion and its relationship to ratio and rates

Exercise 1

WB page 63

1. Means = 5 and 6
 Extremes = 3 and 10
2. a) Not in proportion
 b) In proportion
 c) In proportion
 d) Not in proportion
3. a) $2 : 5 = x : 10$
 $5x = 20; x = 4$
 So, $2 : 5 = 4 : 10$
- b) $4 : 12 = x : 6$
 $12x = 24$
 $\therefore x = 2$
 So, $4 : 12 = 2 : 6$
4. $1 : 7 = x : 35$
 $7x = 35$
 $\therefore x = 5$
 So, 5 pages would hold 35 photos.

Exercise 2

WB page 65

1. $\frac{20}{2} = 10$ words in a minute; $10 \times 10 = 100$.
 So, Sibidoo will be able to type 100 words in 10 minutes.
2. a) $\frac{45}{5} = 9$
 The workers can pick 9 oranges in one minute.

- b) 1 hour = 60 min; $60 \times 9 = 540$
So, the workers can pick 540 oranges in 1 hour.
3. $\frac{124}{6} = 20.66\dots$
The price of one bag of rice is GH¢ 20.67.
4. Shop 1: $\frac{10}{6} = 1.66$; the price of one box of juice is GH¢ 1.67.
Shop 2: $\frac{9}{14} = 2.25$; the price of one box of juice is GH¢ 2.25.
So, she could buy six boxes of juice for GH¢ 10.
5. $\frac{1}{20} = 0.5$; the price of one can of cola is GH¢ 0.50.
 $15 \times 0.5 = 7.50$
So, the cost of 15 cans of cola is GH¢ 7.50.
6. $\frac{8}{2} = 4$; Keku's granny uses 4 balls of wool to knit a jersey.
 $4 \times 3 = 12$
So, she would need 12 balls of wool to knit 3 jerseys.

Exercise 3

WB page 66

1. a) $15,000 \times 15 = 225,000$
So the length of the river is $225,000 \div 100 = 2,250$ m
- b) $2,250 \div 1,000 = 2,250$ km
- c) $150 \times 100,000 = 15,000,000$ cm
 $15,000,000 \div 5 = 3,000,000$
So the scale is 1 : 3,000,000.
2. $5.5 \times 100 = 550$
So, the actual length of the bedroom is 550 cm.
 $550 \div 100 = 5.5$
The actual length is 5.5 m.
3. $125 \text{ m} = 12,500 \text{ cm}$
 $\frac{12,500}{500} = 25 \text{ cm}$
So, the model will be 25 cm tall.

c)

Row	1	2	3	4	5	6	7	8	9
No. of blocks	1	6	11	16	21	26	31	36	41

So, row 9 will contain 41 blocks.

3. a)



b) Pattern $\frac{3}{8}$: 16 matchsticks; Pattern 5: 26 matchsticks

Pattern 4: 21 matchsticks; Pattern 6: 31 matchsticks

c) Five matchsticks are added each time to the previous pattern (shape).

Exercise 2

WB page 69

1. a)

Row number	1	2	3	4	5	6
Number of seats	5	7	9	11	13	15

b) The number of seats in a row is twice the row number plus 3.

c) Number of seats in row 6: $(2 \times 6) + 3 = 15$

Number of seats in the whole classroom:

$$5 + 7 + 9 + 11 + 13 + 15 = 60 \text{ seats}$$

2. b) 2; 4; 6; **8; 10; 12**

Proof $4 + 2 = 6$

Next terms: $6 + 2 = 8$; $8 + 2 = 10$; $10 + 2 = 12$

c) 45; 36; **27; 18; 9**

Rule: Start at 45, subtract 9 from the previous number.

Proof: $45 - 9 = 36$

Next terms: $39 - 9 = 27$; $27 - 9 = 18$; $18 - 9 = 9$

d) 6; 14; 22; **30; 38; 46**

Rule: Start at 6, add 8 to the previous number.

Proof: $6 + 8 = 14$

Next terms: $22 + 8 = 30$; $30 + 8 = 38$; $38 + 8 = 46$

e) 2; 5; 10; **17; 26; 37**

Rule: The first two terms are 2 and 5. Find the next terms by adding 2 plus the difference between the previous two terms.

Proof: $5 + 2 + 3 = 10$

Next terms: $10 + 2 + 5 = 17$; $17 + 2 + 7 = 26$;

$26 + 2 + 9 = 37$

OR: Square the term number and add 1 to determine the numbers (terms) in the pattern.

Proof:

Term no:	1	2	3	4	5	6
Number	1	5	10	17	26	37

3.

Column A	Column B
Add 7	2; 9; 16; 23; 30
Subtract 4	20; 24; 20; 16; 12
Subtract 3 (remember the rules for integers)	8; 5; 2; -1; -4

Exercise 3

WB page 71

1.

	Column A	Column B
a)	2; 5; 8; 11	$3n + 3$
b)	6; 9; 12; 15	3 times $n + 1$
c)	0; 4; 8; 12	1 less than 3 times n
d)	4; 7; 10	$4(n - 1)$

2.

	Pattern	Rule in words	Algebraic rule
a)	1; 5; 9; 13; ...	Difference is 4. Multiply the term number by 4 and then subtract 3.	$4n - 3$
b)	1; 4; 7; 9; ...	Difference is 3. Rule: Multiply the term number by 3 and then subtract 2.	$3n - 2$
c)	5; 8; 11; 14; ...	Difference is 3. Rule: Multiply the term number by 3 and then add 2.	$3n + 2$

(Note: term number = input)

3.

	Rule	Term 2 ($n = 2$)	Term 5	Term 11
a)	$2n - 3$	$(2)(2) - 3$ $= 1$	$(2)(5) - 3$ $= 7$	$(2)(11) - 3$ $= 19$
b)	$7n + 4$	$(7)(2) + 4$ $= 18$	$(7)(5) + 4$ $= 39$	$(7)(11) + 4$ $= 81$
c)	$5n - 2$	$(5)(2) - 2$ $= 8$	$(5)(5) - 2$ $= 23$	$(5)(11) - 2$ $= 53$

B6.2.2.1

Understand algebraic expressions

Exercise 1

WB page 72

- In a linear relationship, any change in an input value will result in a corresponding change in the output.
- In a proportional relationship, one value increases/decreases as the other value increases/decreases. The ratio always stays the same.

3. a)

Adult	1	2	3	4
Children	6	12	18	24

- Variable: n
- Six times the input (n)
- $6n$
- $6 \times 7 = 42$. So, 42 learners are going to the zoo, if seven adults are to accompany them.

4. a)

Number of sheets	1	2	3	4	5
Cost (GH¢)	1	3	5	7	9

- Multiply the input value by 2 and then subtract 1.
- $2n - 1$
- $(2 \times 8) - 1 = 15$. So, it would cost GH¢ 15 to print 8 A4 sheets.
- It is a proportional relationship. As the number of A4 colour sheets increases, the cost increases.
- Yes

Exercise 2

WB page 74

1.

	Expression	Terms	Variables	Coefficient	Constant term
a)	$5m + 3p - 7$	3	2	2	1
b)	$4n + 6y + 5$	3	2	2	1
c)	$3x + 2(y + 4) + 5$	3	2	2	2

2.

	Variables	Constants	Coefficient	Expression
a)	$x; y; z$	9	-3; 2; 1	$-3x + 2y + 2 + 9$
b)	$m; n; p$	-4	5; -2; 4	$5m - 2n + 4p - 4$
c)	$s; t$	6	8; 6; 10	$8s + 6t + 10t + 6$

Exercise 3

WB page 74

1. a) $x - 5$

b) $\frac{x}{6}$

c) $11 - a$

d) $y + 8$

e) $3x - 5$

f) $2m + 6$

g) $\frac{12}{3p}$

h) $(p + q) - 7$

2. a) $3a + 2$

b) $\frac{2y - 3}{7}$

c) $\frac{5x}{2} + 8$

3. a) $a \rightarrow \times 2 \rightarrow + 2a$

b) $2 \rightarrow x(y + 3)$

$$= 2 \rightarrow xy \rightarrow + \rightarrow 2 \rightarrow \times 3$$

c) $x \rightarrow + 7 \rightarrow \div 2$

Exercise 4

WB page 76

1. a) $P = (2x + 1 + 4)$

$$A = 4(2x + 1)$$

b) $P = 2(4x + 2 + 2y)$

$$A = (4x + 2)(2y)$$

2. a) $P = 3(2y) = 6y$

So, $P = 6y$

$$A = \frac{1}{2} \times 2y \times 3x$$

b) $P = 2y + 2y + (3y + 1)$

$$= 4y + 3y + 1$$

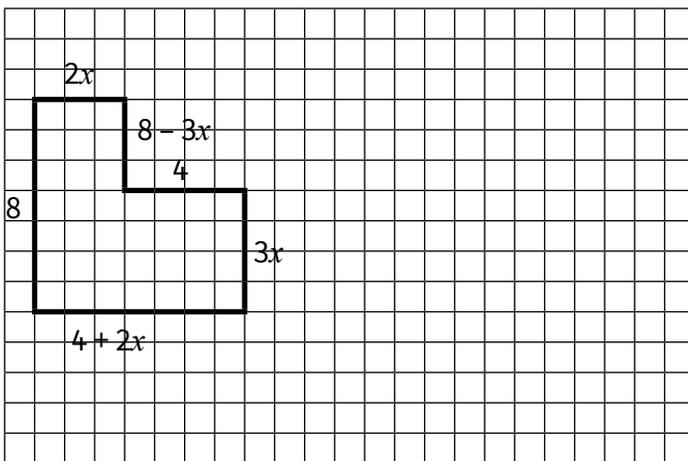
$$= 7y + 1$$

So, $P = 7y + 1$

$$A = \frac{1}{2} \times 2y \times 2 = 2y$$

So, $A = 2y$

3. a)



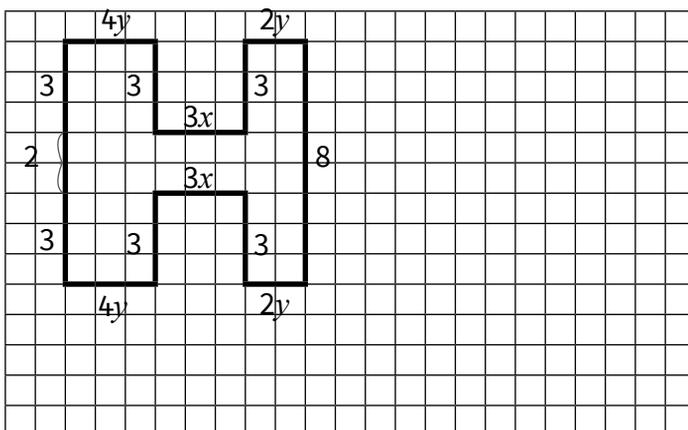
Perimeter of figure

$$= 2x + (8 - 3x) + 4 + 3x + (4 + 2x) + 8$$

$$= 2x + 8 - 3x + 4 + 3x + 4 + 2x + 8$$

$$= 4x + 24$$

b)



Perimeter of figure

$$\begin{aligned} &= 4y + 3 + 3x + 3 + 2y + 8 + 2v + 3 + 3x + 3 + 4y + \\ &\quad 3 + 2 + 3 \\ &= 6x + 12y + 28 \end{aligned}$$

B6.2.3.1

Solve problems with a single variable and a whole number coefficient

Exercise 1

WB page 78

1. a) $x + 2y$
- b) $7 + 4 - 2g$
 $= 11 - 2g$
- c) $9x + 4xy$
- d) $2a + 6a + 4 = 7$
 $= 8a - 3$
- e) $3x + 15 - 2x$
 $= 3x - 2x + 15$
 $= x + 15$
- f) $30 - 18c$
- g) $7x + 3x - 4x + 2y - 4y + y$
 $= 6x - y$
- h) $4mn - 9mn + 6m - 3m + 4n - 5n$
 $= -5mn + 3m - n$
- i) $2p - 3p + 3x - 3x + 5xy - 8xy$
 $= -p - 3xy$

Exercise 2

WB page 79

1. a) $3(4) + 7$
 $= 12 + 7 = 19$
- b) $4(4) + 2 - (3)(4)$
 $= 18 - 12 = 6$
- c) $\frac{(2)(4)}{6} + 5 - 4$
 $= \frac{8}{6} + 5 - 4$
 $= 8 + 30 - 24$
 $= 14$
2. a) $4(2) + 3(4)$
 $= 8 + 12$
 $= 20$

$$\begin{aligned}
 \text{b)} \quad & 3(2)(2) + 5(4) \\
 & = 3(4 + 20) \\
 & = 12 + 60 \\
 & = 72
 \end{aligned}$$

$$\begin{aligned}
 \text{c)} \quad & \frac{4(4)}{2(2)} + 3(4) - 6 \\
 & = 4 + 12 - 6 \\
 & = 10
 \end{aligned}$$

Exercise 3

WB page 80

$$\begin{aligned}
 \text{1.} \quad & x + 3 = 9 \\
 & x + 3 - 3 = 9 - 3 \\
 & x = 6
 \end{aligned}$$

$$\begin{aligned}
 \text{2.} \quad & 8p = 72 \\
 & \frac{8p}{8} = \frac{72}{8} \\
 & p = 9
 \end{aligned}$$

$$\begin{aligned}
 \text{3.} \quad & \frac{y}{7} = 4 \\
 & \frac{y}{7} \times \frac{7}{1} = 4 \times 7 \\
 & y = 28
 \end{aligned}$$

$$\begin{aligned}
 \text{4.} \quad & 25 - n = 14 \\
 & 26 - n + n = 14 + n \\
 & 25 = 14 + n \\
 & 25 - 14 = 14n - 14 \\
 & n = 11
 \end{aligned}$$

$$\begin{aligned}
 \text{5.} \quad & m - 5 = 11 \\
 & m - 5 + 5 = 11 + 5 \\
 & m = 16
 \end{aligned}$$

$$\begin{aligned}
 \text{6.} \quad & 3m = 27 \\
 & \frac{3m}{3} = \frac{27}{3} \\
 & m = 9
 \end{aligned}$$

$$\begin{aligned}
 \text{7.} \quad & \frac{p}{4} = q \\
 & \frac{p}{4} \times \frac{4}{1} = q \times 4 \\
 & p = 4q
 \end{aligned}$$

8. $x - 7 = 19$
 $x - 7 + 7 = 19 + 7$
 $x = 26$
9. $\frac{14}{x} = 2$
 $\frac{14}{x} \times \frac{x}{1} = 2 \times x$
 $14 = 2x$
 $\frac{14}{2} = \frac{2x}{2}$
 $x = 7$
10. $5 = z - 7$
 $5 + 7 = z - 7 + 7$
 $12 = z$
 $z = 12$
11. $19 + y = 23$
 $19 + y - 19 = 23 - 19$
 $y = 4$
12. $y + 7 = 18$
 $y + 7 - 7 = 18 - 7$
 $y = 9$

Exercise 4

WB page 82

1. a) $x + 4 = 17$
 $x = 13$
- b) $\frac{x}{3} = 8$
 $x = 24$
- c) $x - 6 = 13$
 $x = 19$
2. a) $\frac{48}{6} = x$
 $x = 8$
 The cost of each can of cat food is GH¢ 8.
3. $4 \times 75 = 300$.
 So, Araba earned GH¢ 300 during the holiday.
4. $x + 14 = 25$
 $x = 11$
 So, Aba volunteered 11 hours in the second week.
5. $33 - 8 = x$ or $8 + y = 33$
 $x = 25$ $y = 25$
 So, Eba's distance was 25 cm.

6. $12 + y = 25$
 $y = 13$
 So, Kamla's friend has 13 cards.

7. $\frac{1}{3y} = 15$
 $y = 45$
 So, the length of the pool is 45 m.

Exercise 5

WB page 84

1. a) There are 23 books in total on two shelves. There are 5 books on one shelf. How many books are on the second shelf?
 b) A number minus 7 = 18. What is the number?

2. a)  +  -  = 5.725
 = 2.725,  = 5.275 and  = 2.275

b) $5 + 5 + 5 = 15$
 $1 - 5 + 7 = 11$
 $1 + 5 + 7 = 13$
 $\triangle = 1, \square = 5, \bigcirc = 7$

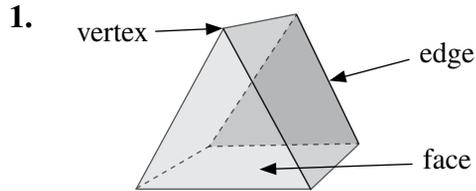
Strand 3: Geometry and measurement

B6 3.1.1

Understand prisms

Exercise 1

WB page 85



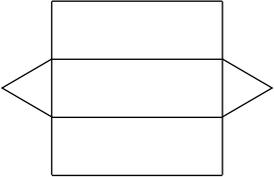
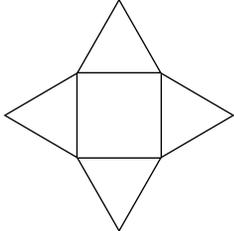
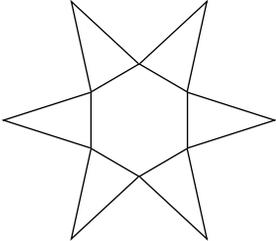
2. a) cylinder
b) pyramid
3. From left to right: triangular pyramid; rectangular prism; hexagonal prism; rectangular prism

Exercise 2

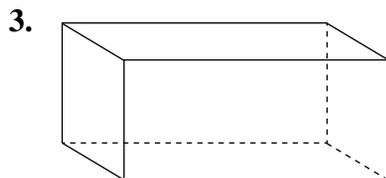
WB page 86

1.

Type of solid	Number of faces	Number of vertices	Number of edges	Draw the net
Rectangular prism	6	8	12	
Cylinder	2	0	2	

Type of solid	Number of faces	Number of vertices	Number of edges	Draw the net
Triangular prism	5	6	9	
Square-based pyramid	5	5	8	
Hexagonal prism	8	12	12	

2. a) Rectangular prism
b) Triangular prism
c) Square-based pyramid
d) Sphere
e) Triangular prism



Exercise 3

WB page 88

1. Rectangle
Trapezium

2.

Shape	Vertical cross section	Horizontal cross section
Rectangular prism	Square	Rectangle
Cylinder	Rectangle	Circle
Square-based pyramid	Triangle	Square
Triangular prism	Triangle	Rectangle
Cone	Triangle	Circle
Triangular pyramid	Triangle	Triangle

3. Yes

4. a) E b) B c) B d) C
 e) A f) A g) E h) E
 i) D j) A

Exercise 4

WB page 90

	Shape	Number of vertices	Number of faces	Number of edges	Diagram of 3D shape
A	Square	8	6	12	Cube
B	Rectangle	8	6	12	Rectangular prism
C	Rectangle	6	5	9	Triangular prism
D	Triangle	6	5	9	Triangular prism
E	Square	5	5	8	Square-based pyramid
F	Hexagon	7	7	12	Hexagonal-based pyramid
G	Triangle	4	4	6	Triangular-based pyramid
H	Pentagon	10	7	15	Pentagonal prism

Exercise 5

WB page 92

- Learners own work
- Learners' own work
- Learners' own work

B6.3.3.1

Describe the position of objects in space, using the cardinal points

Exercise 1

WB page 93

1. First row, from left to right: North; South; East; West
Second row, from left to right: North-east; North-west;
South-east; South-west
2. a) South-west b) South-east
c) North-east d) South-east
e) North-west f) North-east
g) South-west h) South
3. a) East
South-west
b) South-west
East
c) South
North-west
d) East
South-west
4. a) North-east b) North
c) South-east d) South-west
e) South-east f) South
g) North-east

Exercise 2

WB page 96

1. a) From the courtyard (H), go south-east to the school office (F).
b) From the boys' toilet (E), go south-west to the Grade 4–6 area (B).
c) From the parking area (I), go south-east to the Grade 7 area (C).
d) From the Grade 7 area (C), go south-west to the sports field (G).
e) From the Grade 6 area (B), go east to the Grade 7 area (C).

B6.3.3.5

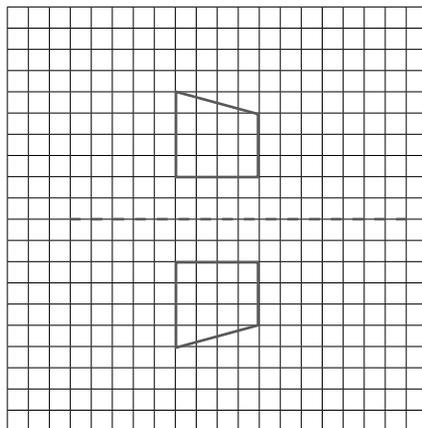
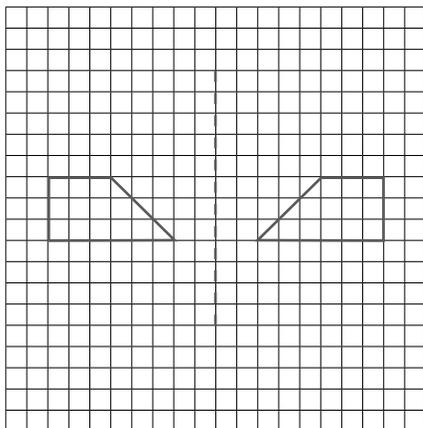
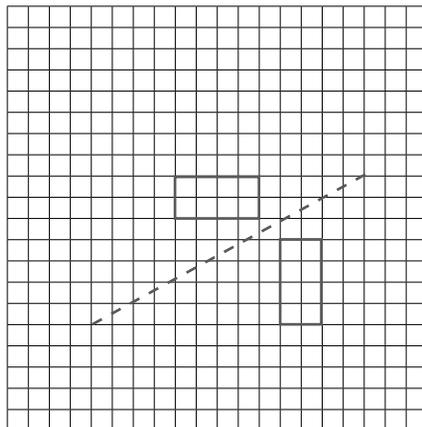
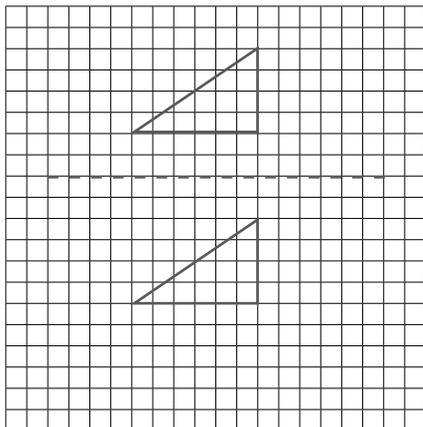
Perform a single translation on a 2D shape

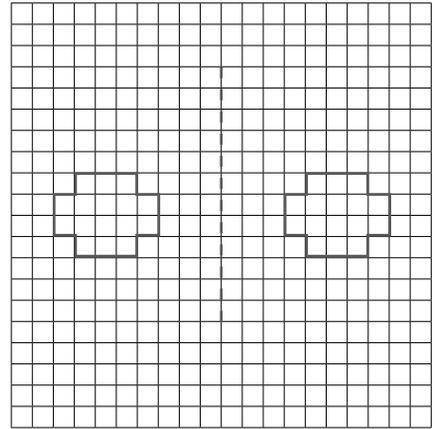
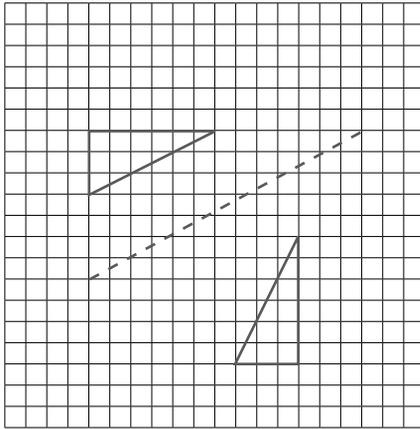
Exercise 1

WB page 97

1. a) Horizontal line of reflection
- b) Vertical line of reflection
- c) Horizontal line of reflection
- d) Diagonal line of reflection

2.

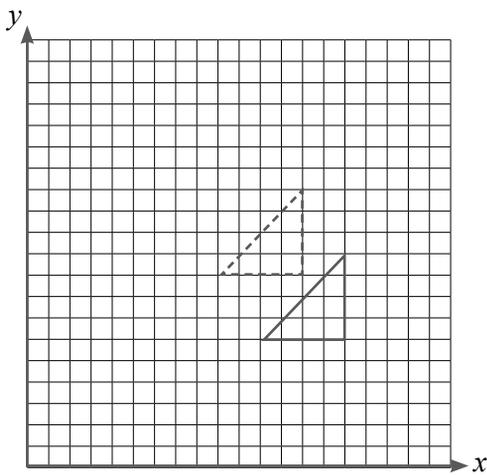




Exercise 2

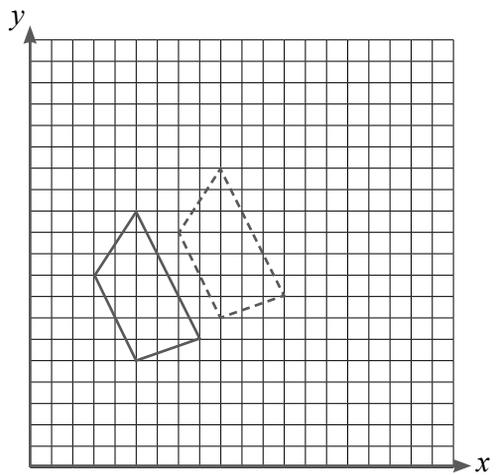
WB page 99

1. a)



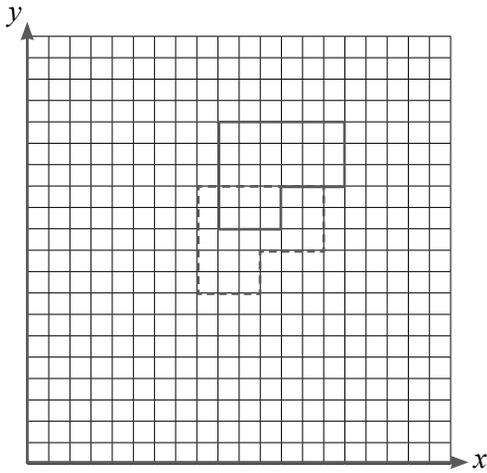
$$\begin{pmatrix} -2 \\ 3 \end{pmatrix}$$

b)



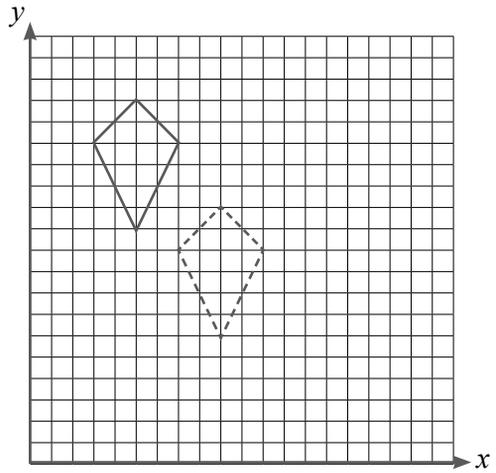
$$\begin{pmatrix} 4 \\ 2 \end{pmatrix}$$

c)



$\begin{pmatrix} -1 \\ -3 \end{pmatrix}$

d)



$\begin{pmatrix} 4 \\ 5 \end{pmatrix}$

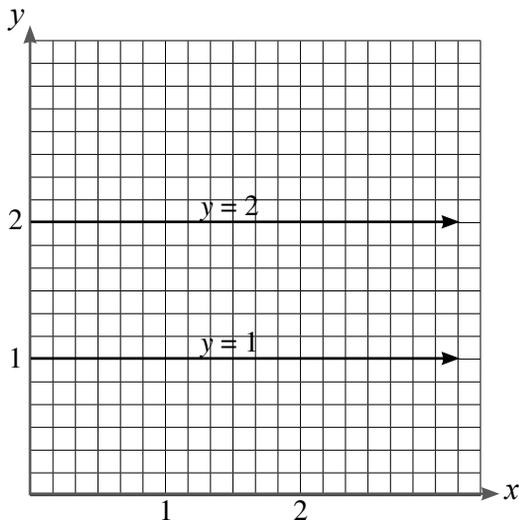
2. a) $\begin{pmatrix} -2 \\ 6 \end{pmatrix}$

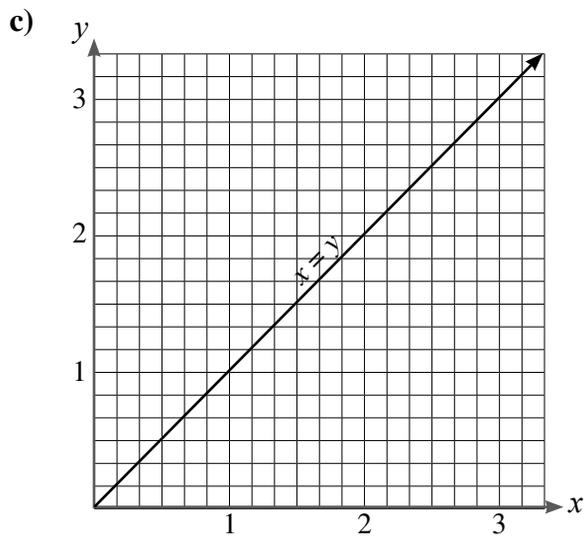
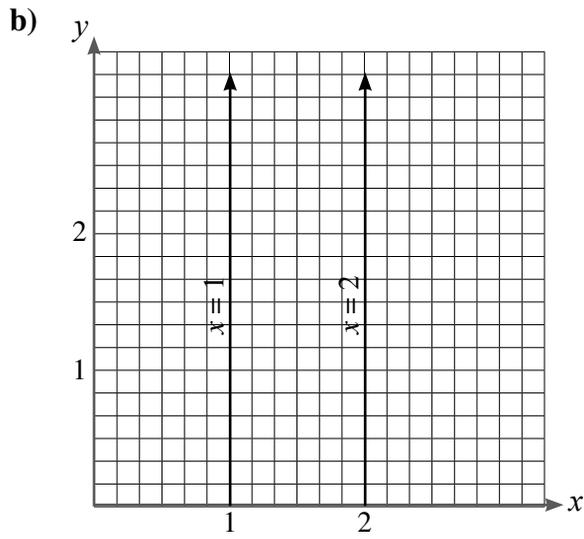
b) $\begin{pmatrix} 0 \\ -13 \end{pmatrix}$

Exercise 3

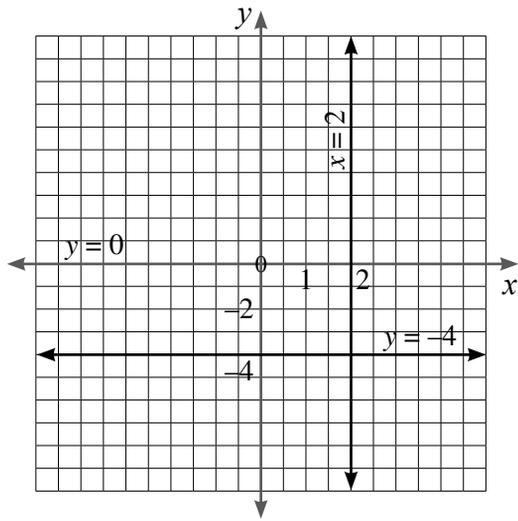
WB page 101

1. a)

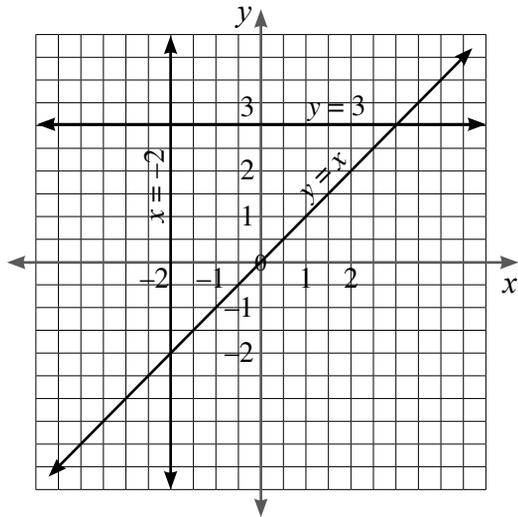




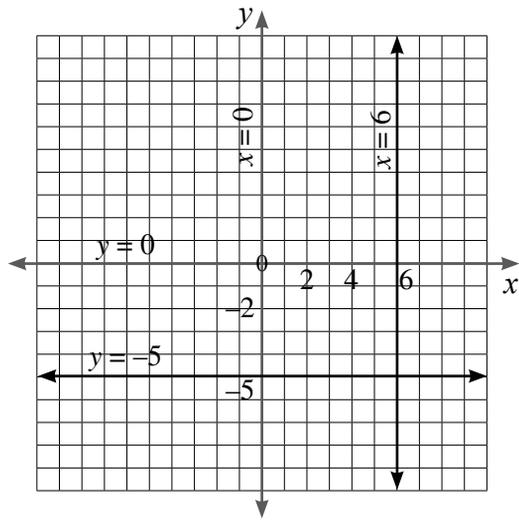
2. a)



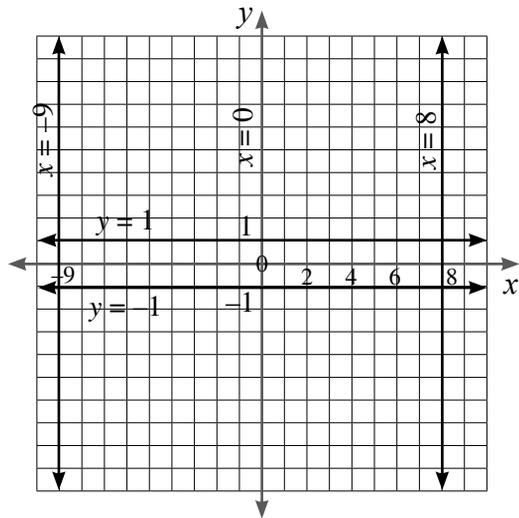
b)



c)

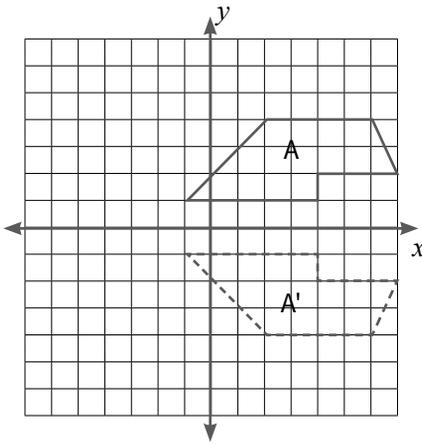


d)

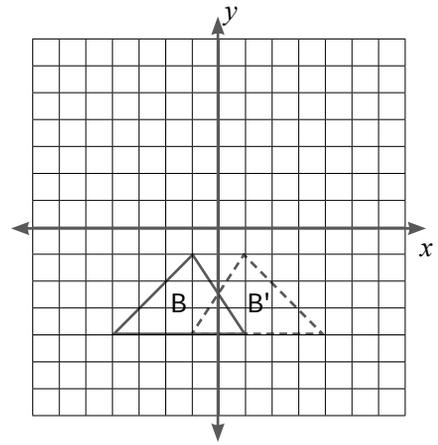


3. a) $y = -1$
b) $y = 3$
c) $x = -5$
d) $y = x$

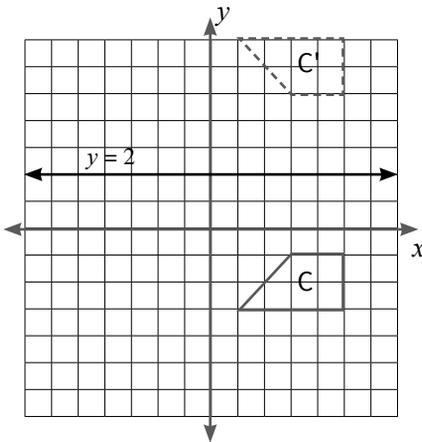
4. a)



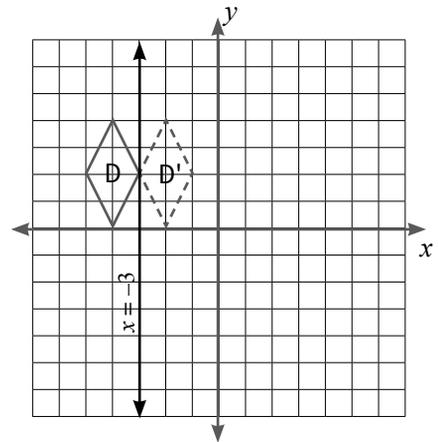
b)



c)



d)



5. a) $x = 1$

b) $y = x$

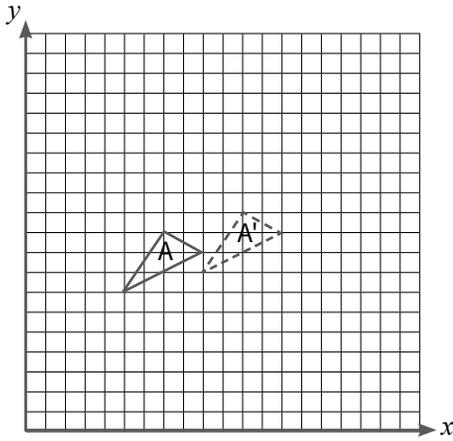
Exercise 4

WB page 106

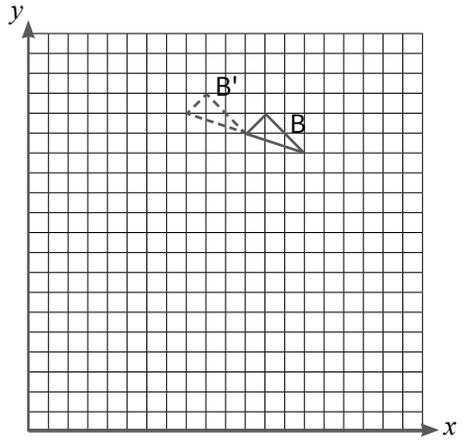
1. a) 6 units to the left and 3 units up

b) 4 units to the right and 2 units down

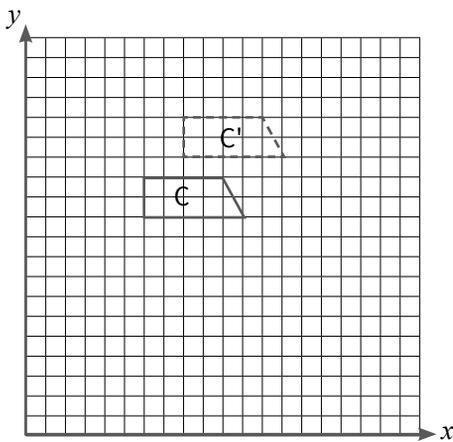
2. a)



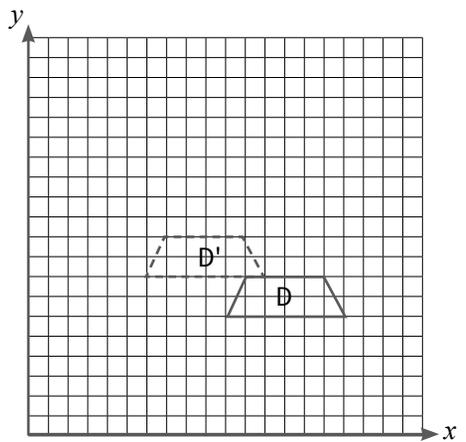
b)



c)



d)



3. a) $\begin{pmatrix} 10 \\ 0 \end{pmatrix}$

b) $\begin{pmatrix} 9 \\ 7 \end{pmatrix}$

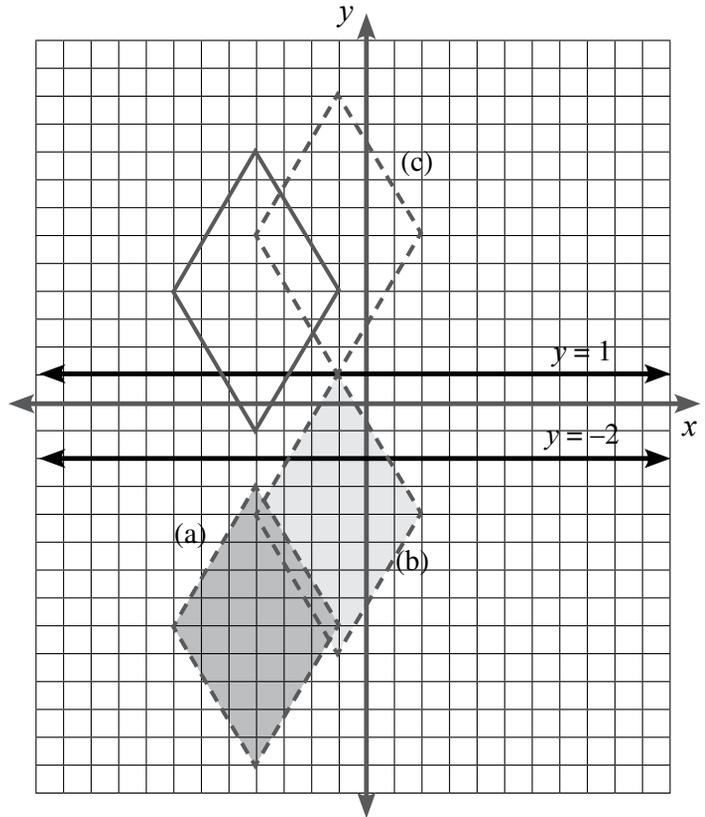
c) $\begin{pmatrix} -4 \\ -5 \end{pmatrix}$

d) $\begin{pmatrix} 11 \\ 3 \end{pmatrix}$

e) $\begin{pmatrix} 0 \\ 16 \end{pmatrix}$

f) $\begin{pmatrix} 1 \\ -13 \end{pmatrix}$

4. a)



d) $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$

Strand 4: Data

B6 4.1.1

Create, label and interpret line graphs

Exercise 1

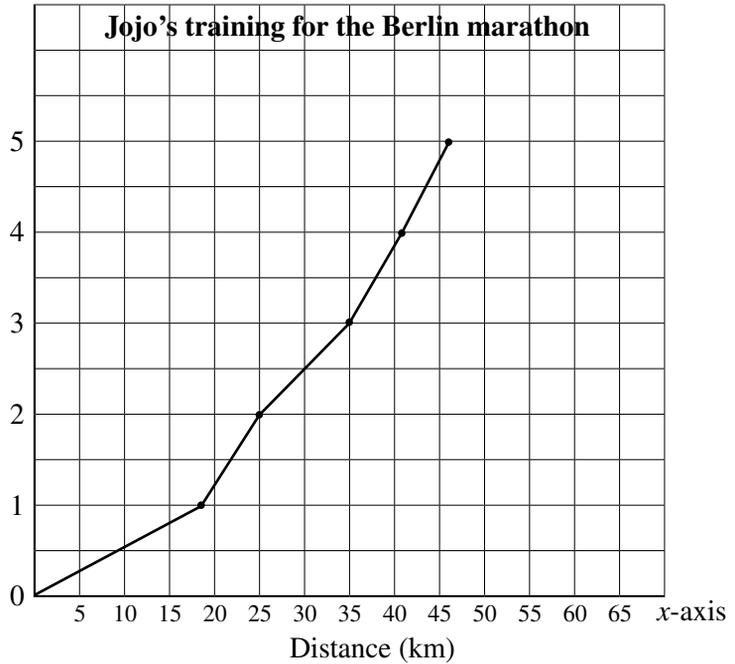
WB page 109

1. a)

Distance (km)	18	25	35	46	51
Week	1	2	3	4	5

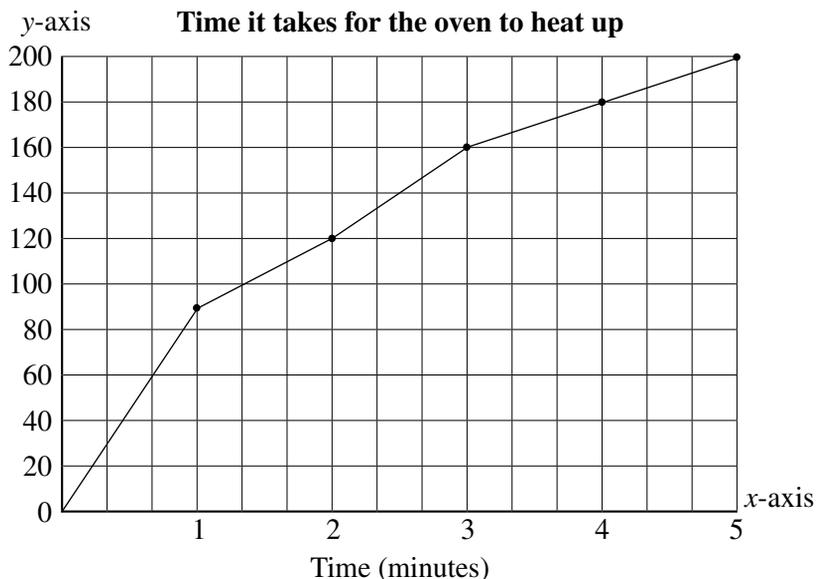
b)

y-axis



c) Week 4

2. a)



- b) 5 minutes
- c) Between 2 and 3 minutes
- d) Yes, up to the point (temperature) of the oven's temperature capacity.

Exercise 2

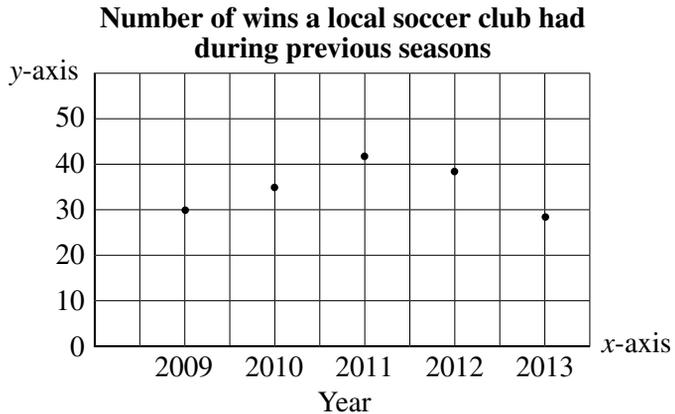
WB page 111

1. a) Continuous data can **take any value** in the range of values, so it is represented using a **line graph**.
 b) Discrete data can be **counted**. **Discrete data** is represented by using a **series of points on a graph**.
2. Line graph: mass of new-born puppies
 Points: number of learners in the school
- 3.

	Data	Continuous or discrete	How to represent data
a)	Number of soccer games won in the season	Discrete	Series of points
b)	Growth of a plant in a year	Continuous	Line graph
c)	Number of sneaker sold at a shoe store	Discrete	Series of points
d)	Distance travelled in car	Continuous	Line graph

	Data	Continuous or discrete	How to represent data
e)	Depth of deep-sea diver below sea level	Continuous	Line graph
f)	Time spend on social media per week	Continuous	Line graph

4. a) Discrete data. The data values are whole numbers.
b)



Exercise 3

WB page 113

- 38 people
 - 10 people
 - The number of adults decreased as the weeks go by.
 - Between 4 and 6 people
- 6:00 p.m.
 - 2.75 mm
 - Approximately 5.25 mm
 - Approximately 3 mm
- He travelled 45 km from home.
 - He stopped to rest and drink water.
 - He travelled back home.
 - During the first hour and then again between the 6th and 7th hour and the 7th and 8th hour.
 - 10 km
 - 110 km
 - He became tired; he had to cycle uphill for certain distances; etc.

B6.4.1.2

Select, justify and use appropriate methods of collecting data

Exercise 1

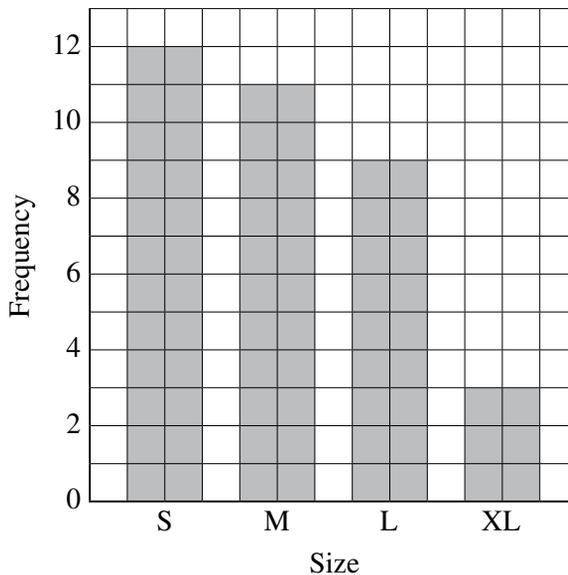
WB page 117

1. a)

Size	Tally	Frequency
S	### ## II	12
M	### ## I	11
L	### III	9
XL	III	3
Total		35

b)

Sizes of T-shirts members of a netball team wear



- c) Small
- d) X-large

2. a)

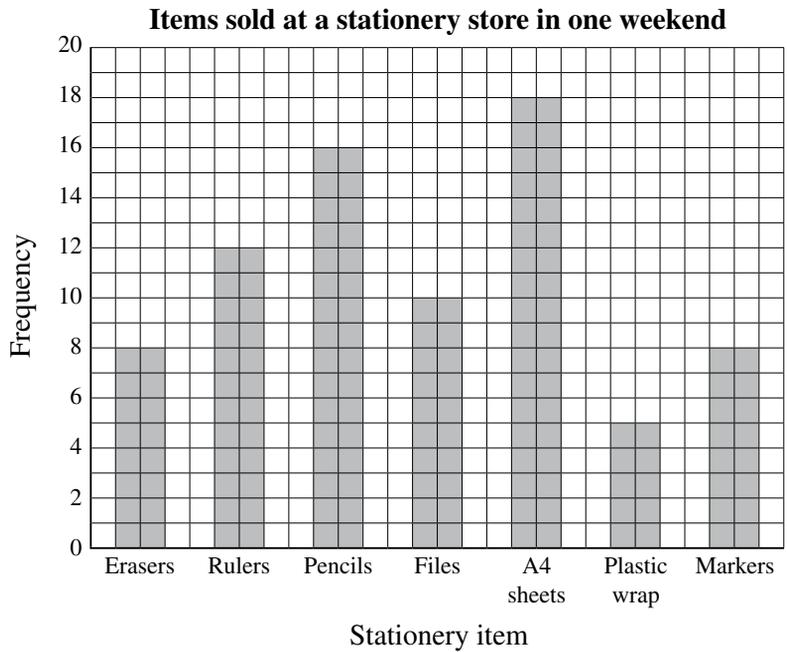
Stationery item	Tally	Frequency
Erasers	### III	8
Rulers	### ### II	12
Pencils	### ### ### I	16
Files	### ###	10
A4 sheets	### ### ### III	18
Plastic wrap	###	5
Markers	### III	8

b) A4 Sheets

c) Plastic wrap

d) 77 items

e)



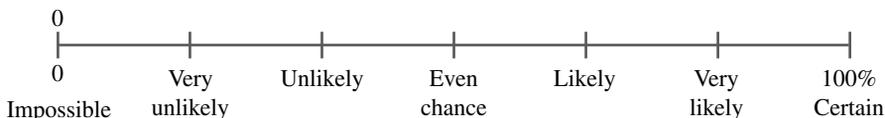
B6.4.2.2

Understand probability

Exercise 1

WB page 119

1.



2. a) Certain

b) Impossible

c) Likely

d) Likely

(Answers to (c) and (d) will depend on learner's own perception and experiences.)

e) Likely

Exercise 2

WB page 120

1. a) (i) $\frac{2}{12} = \frac{1}{6}$

(ii) $\frac{5}{12}$

b) $\frac{1}{8}$

c) $\frac{0}{21} = 0$

d) Theoretical probability = $\frac{1}{8}$;
experimental probability = 0

2. a)–b) Learners' own work

c) (i) $\frac{2}{6} = \frac{1}{3}$

(ii) Learners' own answers

(iii) Theoretical probability: $\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$

(iv) $\frac{2}{6} = \frac{1}{3}$

3. a) $\frac{10}{50} = \frac{1}{5}$

b) $\frac{1}{6}$

c) $\frac{40}{50} = \frac{4}{5}$

d) $\frac{5}{6}$

e) $\frac{28}{50} = \frac{14}{25}$

f) $\frac{3}{6} = \frac{1}{2}$

4. a) $\frac{1}{2}$

b) $\frac{1}{2}$

5. a) $\frac{12}{50} = \frac{6}{25}$

b) $\frac{12}{50} + \frac{18}{50} = \frac{30}{50} = \frac{3}{5}$

c) $\frac{20}{50} = \frac{2}{5}$

6. a) (i) $\frac{15}{100} = \frac{3}{20}$

(ii) $\frac{20}{100} = \frac{1}{5}$

b) (i) 50 people

(ii) 80 people