South Sudan

PRIMARY
6

Mathematics

Teacher's Guide 6

This book is the property of the Ministry of General Education and Instruction.

THIS BOOK IS NOT FOR SALE

Funded by:
GLOBAL PARTNERSHIP for EDUCATION
quality education for all children

FOREWORD

I am delighted to present to you this Teacher's Guide, which is developed by the Ministry of General Education and Instruction based on the new South Sudan National Curriculum. The National Curriculum is a learner-centered curriculum that aims to meet the needs and aspirations of the new nation. In particular, it aims to develop (a) Good citizens; (b) successful lifelong learners; (c) creative, active and productive individuals; and (d) Environmentally responsible members of our society. This textbook, like many others, has been designed to contribute to achievement of these noble aims. It has been revised thoroughly by our Subject Panels, is deemed to be fit for the purpose and has been recommended to me for approval. Therefore, I hereby grant my approval. This Teacher's Guide shall be used to facilitate learning for learners in all schools of the Republic of South Sudan, except international schools, with effect from 4th February, 2019.

I am deeply grateful to the staff of the Ministry of General Education and Instruction, especially Mr Michael Lopuke Lotyam Longolio, the Undersecretary of the Ministry, the staff of the Curriculum Development Centre, under the supervision of Mr Omot Okony Olok, the Director General for Quality Assurance and Standards, the Subject Panelists, the Curriculum Foundation (UK), under the able leadership of Dr Brian Male, for providing professional guidance throughout the process of the development of National Curriculum, school textbooks and Teachers' Guides for the Republic of South Sudan since 2013. I wish to thank UNICEF South Sudan for managing the project funded by the Global Partnership in Education so well and funding the development of the National Curriculum, the new textbooks and Teachers' Guides. I am equally grateful for the support provided by Mr Tony Calderbank, the former Country Director of the British Council, South Sudan; Sir Richard Arden, Senior Education Advisor of DfID, South Sudan. I thank Longhorn and Mountain Top publishers in Kenya for working closely with the Ministry, the Subject Panels, UNICEF and the Curriculum Foundation UK to write the new textbooks. Finally, I thank the former Ministers of Education, Hon. Joseph Ukel Abango and Hon. Dr John Gai Nyuot Yoh, for supporting me, in my role as the Undersecretary, to lead the Technical Committee to develop and complete the consultations on the new National Curriculum Framework by 29 November 2013.

The Ministry of General Education and Instruction, Republic of South Sudan, is most grateful to all these key stakeholders for their overwhelming support to the design and development of this historic South Sudan National Curriculum. This historic reform in South Sudan's education system is intended to benefit the people of South Sudan, especially the children and youth and the future generations. It shall enhance the quality of education in the country to promote peace, justice, liberty and prosperity for all. I urge all Teachers to put this textbook to good use.

May God bless South Sudan. May He help our Teachers to inspire, educate and transform the lives of all the children and youth of South Sudan.

Deng Deng Hoc Yai, (Hon.)

Minister of General Education and Instruction, Republic of South Sudan

TABLE OF CONTENTS

INTRODUCTION

The mathematics Primary 6 teacher's guide consists of 5 units. Each unit starts with a list of objectives, or commonly known as performance objectives, that should be covered in each unit. In addition, the exercises in the learner's book have been carefully developed to ensure integration of the performance objectives from the curriculum, and a steady progression of skills throughout the year.

It is important that you follow the order of the units, especially for related sub-units, as units build on the knowledge and skills acquired in preceding units.

The units follow a 'teach and practice' approach:

- New concepts are explained and given context in their meaning.
- Worked-through examples show learners how to approach problem solving.
- Exercises allow learners to practice on their own.

Components of the book

This primary six mathematics book contains 5 different units each with its own sub unit. Each unit is strategically integrated with discussion sessions with activities that will help further the learners understanding.

The units are as outlined below.

Primary 6	
Unit	Title
1	Numbers: Operations (2)
2	Measurement: weight and mass
3	Geometry: geometric constructions
4	Algebra: algebraic expressions (1)
5	Statistics: reading statistical graphs

This teacher's book entails detailed notes covering all the 5 units.

Each unit and sub unit is outlined for the learning of each child as per their criteria of understanding. The teacher's guide book explains in detail about all the information in the mathematics book.

The learner's book also has a series of exercises that come at the very end of each sub-topic and their answers are provided in this teachers guide.

Purpose

This Teacher's Guide must be used in conjunction with the Mathematics learner's book. Its main purpose is to help you to implement the syllabus in your classroom.

This guide provides you with guidelines to help you plan and develop teaching and learning activities for the achievement of the learning outcomes. It also provides you with information and processes to:

Mathematics teaching and learning strategies

a) Problem-based learning

Using this strategy, you can set a problem or a task for the class to solve.
Steps

- ✍ Brainstorm learners' ideas and record them on the board.
- ✍ Ask related questions such as, "How many different multiplication strategies can you find?"
- ✍ Have learners carry out the investigation in groups and report back to the class.

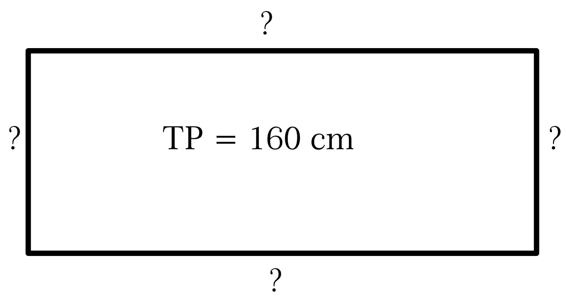
To make the learning explicit, it is important that you create a summary of what has been learnt from solving the problem.

b) Open-ended questions

Closed questions, commonly used in Mathematics lessons, only have one answer.

Open-ended questions can have more than one answer and the variety of possible answers allows learners to make important discoveries.

An example of an open-ended question is:



'The total perimeter of the rectangle above is 160 cm.

Opposite sides are equal in length. What would be the lengths of the sides of the rectangle? How many different answers can you find?'

One answer could be $\mathbf{50\ \mathit{cm} \times 2 + 30\ \mathit{cm}\ \ 2}$.

If a learner comes up with one answer and stops, ask the class if anyone had a different answer. How many different answers are possible?

You may allow the learners to discuss their answers in groups and agree on an answer for presentation and discussion.

One open-ended question can provide many answers for learners to find and provides them with practice basic skills.

c) **Group work**

The purpose of group work is to give learners opportunities to share ideas and at the same time learn from other group members.

Every group should have a leader to supervise the group's activities. The leader would, for example, delegate tasks and consult you for assistance.

Group activities can take place inside or outside the classroom. A good example of a group activity would be drawing shapes such as squares and rectangles, and making models of common three-dimensional shapes such as cubes or cones.

Groups of learners could also use a soccer field to measure distance and perimeter using traditional methods of measuring such as with strings and sticks.

This will not only ensure participation by all learners but also gives room for collaborative learning and talk. When grouping, bear in mind their special educational needs, gender balance and their abilities. Groups should never be too large.

d) **Peer teaching and learning**

This is organised as a partnership activity in which one learner performs a task while the other observes and assist; making corrections and suggesting new ideas and changes. For example, one learner decides to multiply three-digit numbers by two-digit numbers. The learner who is observing should assist and make sure that all the steps are followed before the final answer is given. The teacher's role in this strategy is to observe and encourage positive interaction and effective communication through which the intended outcome can be achieved.

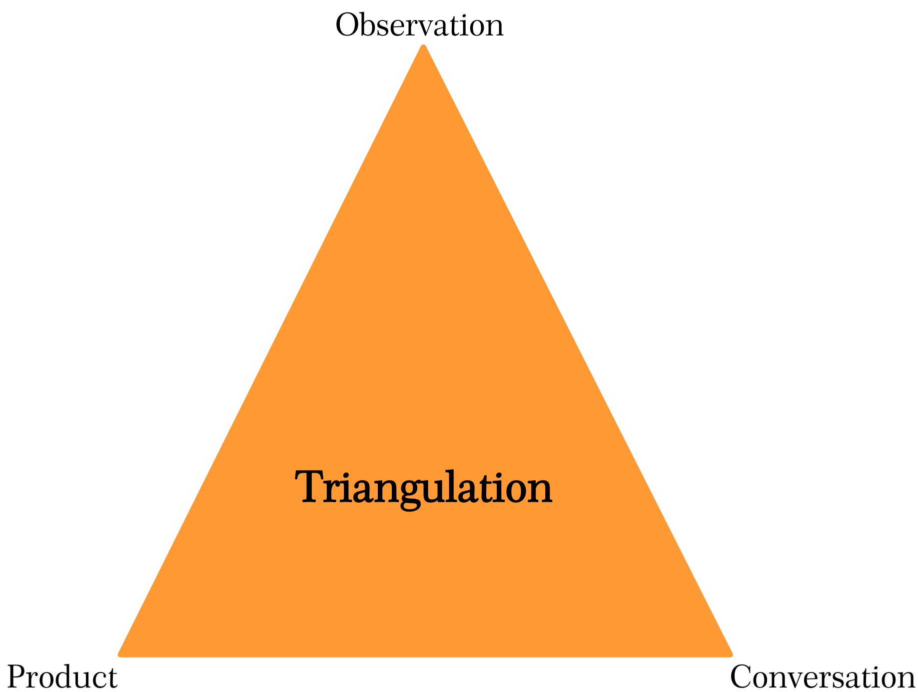
You are advised to set additional exercises depending on the learner's learning abilities.

MAKING CLASSROOM ASSESSMENT

- **Observation** – watching learners as they work to assess the skills learners are developing.

- **Conversation** – asking questions and talking to learners is good for assessing knowledge and understanding of the learner.

- **Product** – appraising the learner's work (writing report or finding, mathematics calculation, presentation, drawing diagram, etc).



To find these opportunities, look at the "Learn About' sections of the syllabus units. These describe the learning that is expected and in doing so they set out a range of opportunities for the three forms of opportunity.

UNIT 1: NUMBERS

Learn about	Key inquiry questions
✍ Learners should review their prior learning of reading, writing, ordering and comparing numbers of up to six digits. ✍ Learners should investigate, using place value, whole numbers up to a million, and apply their developing understanding to more complex problems (e.g. compare and identify place value of the number 7821365 and 85463). ✍ Learners should revisit their prior learning on divisibility tests of whole numbers of 3, 4, 6 and 9, and apply the principles to investigate divisibility tests (e.g. 8 and 11). By reading and writing numbers they should learn how to identify perfect numbers and represent them in a special notation such as $4 = 2x2 = 2^2, 25 = 5x5 = 5^2$, 169= 13$x$13= 13^2. Using their knowledge and understanding of perfect numbers in power forms. ✍ Learners should investigate squares of perfect numbers for examples:	• How can numbers up to a million be read, written, ordered and compared? • How can divisibility tests of 8 and 11 be carried out? • Why are the computations of squares and the square roots of perfect numbers important? • How do we relate squares with square roots of perfect numbers? • How can we convert decimals and fractions into percentages and vice versa? • How do we view proportions as the relationship between two quantities? • Why are proportions important in our daily life?

<table>
<tr><td colspan="2">$25 = 5^2, therefore\ \sqrt{25} = \sqrt{5^2} = 5$; $\sqrt{169} = \sqrt{13^2} = 13\ etc.$ This leads to the conversion of decimals and fractions to percentages and vice versa and learn recurring decimals and investigate proportion and ratio as a relationship between two quantities and understand their difference.</td><td>• Why would we recommend the use of %, proportion etc.?</td></tr>
<tr><td colspan="3">Learning outcomes</td></tr>
<tr><td>Knowledge and understanding</td><td>Skills</td><td>Attitudes</td></tr>
<tr><td>• Read, write, compare and order numbers up to a million.
• Divisibility tests of 8 and 11.
• Squares and square roots of perfect squares up to 3 digits.
• Conversion of decimals and fractions into percentage and vice- versa.
• Proportion as relationship between two quantities.</td><td>• Able to read, write, compare and order numbers in their place value.
• Perform calculation of numbers up to a million.
• Analyze numbers according to their divisibility tests.
• Determine the squares and square roots of perfect numbers.
• Compute percentages from decimals and fractions.
• Apply proportions in daily life situations.</td><td>• Enjoy elementary mathematical concepts.
• Appreciate the importance of percentages in applications.
• Confidence to investigate using maths and to take responsibility for their own learning.</td></tr>
</table>

Contribution to the competencies: <u>Critical thinking</u>: as they comprehend questions and solve problems in numbers. <u>Communication and Co-operation</u>: group discussion in reading, writing, comparing and ordering numbers.
Links to other subjects: Numbers are linked to all the subjects and are very much used in our day to day activities.

Objectives

By the end of this unit, learners should be able to:

- Read and write in millions.
- Compare and order to a million.
- Apply counting of large numbers to real life situations.
- Solve problems using this type of quantitative reasoning.

Key word definitions

1. **Digit:** one figure in a number.
2. **Interval:** time, gap or space between.
3. **Figure:** symbol for a number.
4. **Place value:** the value of a digit determined by its position in a number.
5. **Numeral:** another word for number.
6. **Units:** single numbers from 0 to 9.
7. **Tens:** twin values: larger than 9 but less than 100.
8. **Hundreds:** three digit values larger than 99 but less than 1 000.
9. **Thousands:** four digit values larger than 999 but less than 10 000.

10. **Ten thousands:** five digit values larger than 9 999 but less than 100 000.
11. **Hundred thousands:** six digit values larger than 99 999 but less than a million.
12. **Million:** seven digit numbers larger than 999, 999.
13. **Compare:** making distinction between 2 or more things by looking at similarities and differences.
14. **Count:** proceeding sequentially from one value to another higher value.
15. **More than:** a number that is bigger in comparison to another.
16. **Less than:** a number that is lower in value than another.

Frequently asked questions

What prior knowledge should the learner have?

Learners should be able to count forwards and backwards in 1s, 5s, 10s and 100s from any given number. They should also have a thorough understanding of place value in up to five digit whole numbers, and be able to read and write whole numbers to five-digits in words.

Common errors that learners make

Learners sometimes have difficulty in crossing the place value bridges from 9 000 to 10 000 and from 10 000 to 100 000. Practise counting forwards and backwards from various starting points and in different multiples, for example in 3s and 4s, as well in the usual 5s and 10s. Use number lines as a support.

When writing numbers that include zeros, learners often ignore the zero, so a four-digit number becomes a three-digit number: for example, they write five thousand and sixty as 560. They also sometimes write numbers with too many digits: for example, they write four thousand, six hundred and twenty-four as 400 060 024.

NOTE: Give the learners plenty of practice in reading and writing numbers, especially ones that contain zeros. Ask them to use a place value table to help them. Reinforce the fact.

Evaluation guide

Learners to:

1. Count in thousands and millions.
2. Read and write numbers in words and figures.

1.1 Reading, writing and comparing numbers to a million

With the learners, practise counting in 10s, starting from any two-digit number. Then count in 10s starting from any three-digit and then any four, FIVE, six and seven digit number.

Lesson focus

Demonstrate how to read and write in millions. For instance 1 000 000, 2 000 000, etc. Follow this by reading and writing in the intermediate million values i.e. 1 100 000, 2 100 000, etc. Work through example 1 on page 3 in the learner's book and guide learners in the reading, writing exercises.

Also use activity 1 to assess their understanding and check their answers. Give the learner's exercise 1 to attempt on their own.

UNIT 1: NUMBERS

1.1 Read, write, compare and order numbers to a million

Kiden decided to count what grew in her garden. She found 867,440 carrots. Can you read that sentence aloud?

It's a tough one. But knowing how to read and write larger numbers is an essential math skill. So, let us explore how to read and write numbers with one to seven digits.

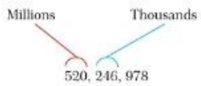
Reading Larger Numbers

All numbers are read from left to right. You can use place value, the value of a digit based on its position in the number, to help you read the number. Let's see how.

Reading and writing numbers to a million

In reading numbers up to six digits you have to identify the specific place value of each of the numbers.

Reading and writing whole numbers can be explained by using the following illustration.
Take a close look and carefully study it.



Recall that the place value for 2, 4, and 6 are the hundred-thousands, the ten-thousands, and the thousands respectively.

Again, the position occupied by 2 is the hundred-thousands and putting a 2 is this position means that there are 2 hundred-thousands or **two hundred** thousand.

In the same way, putting a 4 in the ten-thousands position means that there are 4 ten-thousands or **forty** thousand because 4 tens is forty.

Finally, putting a 6 in the thousands position means that there are 6 thousands or **six** thousand.

Putting it all together, we have;

(**two hundred**) thousand + (**forty**) thousand + (**six**) thousand =

(**two hundred** + **forty** + **six**)thousand =

(**two hundred and forty six**)thousand = **246** thousand

What gives us the right to just add **two hundred**, **forty**, and **six**?

Try to do the following:

two hundred cars + forty cars + six cars.

Would not you agree that it is equal to two hundred forty six cars?

The above is the same, except that instead of using cars, we are using thousand.

The group name, as shown in the illustration, is 'thousand'

1 2

Compare and order to a million

Starter activity

Practise place values of numbers up to 1 000 000.

Write place value tables and give a copy to each learner or 2 learners per copy. Call out a few large numbers and have learners write the numbers under their correct place values on their tables.

Lesson focus

Demonstrate that the learner's place value for millions.

Explain how the number 1 940 613 can be placed on the place value table.

Example of a place value table.

Tens of millions	Mullion	Hundreds of thousands	Tens of thousands	thousands	hundreds	tens	Ones
	1	9	4	0	6	1	3

Give more examples and let the learners fill in the table.

After practicing the concept of place value the learner will be able to write numbers from the largest to the smallest and vice versa.

Use activity two to give examples and allow the learners practise on their own in groups or individually.

In general, it is unnecessary to say it three times.

When reading whole numbers, always read the numeral first, which is **246** and then the group name from left to right.

Therefore, we read
(**two hundred**) thousand + (**forty**) thousand + (**six**) thousand as
(**two hundred forty six**) thousand = **246** thousand.

The whole number can be read as:

(**two hundred thirty four**) billion (**five hundred twenty**) million (**two hundred forty six**) thousand nine hundred seventy-eight =

(**234** billion (**520** million (**246**)thousand 978

Example 1.

355,645 is read three hundred fifty five thousand, six hundred forty-five

16,006,006 is read sixteen millions, six thousand, six

Activity 1.

In groups, Read this to your partner, does it make sense? Write the following numbers in figures or words.

1. Seven million, nine hundred and thirty thousand, two hundred and six.
2. Five million, three hundred and twenty thousand, one hundred and twelve.
3. Three million, five hundred and six thousand, four hundred and seventy two.
4. 4,789,652
5. 2,565,531
6. 9,578,123

3

Exercise 1:

Write the following in words or numbers.

1. 5821456
2. 1235847
3. Six million, five hundred and forty thousand, six hundred and seventy four.
4. Seven million, eight hundred and twenty one thousand three hundred and sixty five.

Compare and order to a million

First we need to identify the place value of the numbers

Activity 2.

In groups, Discuss and then write the following numbers from the smallest to the biggest.

Who can order these the fastest? Explain your answers to the class.

a. 12, 415, 62, 418, 3468, 1345
b. 65, 89, 45, 672, 456, 196
c. 980, 768, 560, 356, 45, 120
d. 765, 980, 134, 1452, 698, 19345

Exercise 2:

There are 645,465 people living in Unity while there are 962,716 people living in Eastern Equitoria.
Which state has the greater population?

The size of Upper Nile is 77,283 square metres while Jonglei is 122,580 square miles.

Which state has a smaller area? Explain how did you get it.

4

Let the learners do exercise 2 on their own and assess their understanding on this concept.

As a teacher formulate more exercise for the learners to attempt.

For example extension activities like this below;

Write the place and value of each number that is underlined.

1. 21,<u>8</u>16,835
2. <u>2</u>2,482,784
3. 17,293,<u>6</u>40
4. 42,<u>1</u>88,384
5. <u>2</u>9,672,974
6. 7<u>3</u>,882,340
7. 58,<u>5</u>98,513
8. 35,968,75<u>5</u>
9. 18,887,<u>5</u>58
10. 52,<u>7</u>48,782

Exercise 1

Expected Answers

1. Five million, eight hundred and twenty one thousand, four hundred and fifty six.
2. One million, two hundred and thirty five thousand, eight hundred and forty seven.
3. 6,540,674
4. 7,821,365

Exercise 2

Expected Answers

1. Eastern Equitoria
2. Upper Nile

1.2 Divisibility tests of 8 and 11

Divisibility test of 8

Lesson focus

A number with at least 3 digits is divisible by 8 if its last three digits form a number divisible by 8.

An example; 8120 is divisible 8 because its last three digits, 120, form a number divisible by 8.

Use examples 2 in the learner's book to make the learners understand the divisibility test of 8 better.

1.2 Divisibility test of 8 and 11.

Divisibility of 8

A number is divisible by 8 if the last three numbers are divisible by 8.

Attempt in pairs if they are divisible by 8

a. 723,810 b. 456,791,824 c. 923,780

Is it easy? How was the experience?

Example 2.

a. 723,810

Take a look at the last two digits: 723,810. Does 4 divide evenly into 10? No.
That means that 4 will not divide evenly into 7223,810 and there will be a remainder.

The Rule for 8: If the last three digits of a whole number are divisible by 8, then the entire number is divisible by 8.

b. 456,791,824

Look at the last three digits of the number: 456,791,824. Does 8 divide evenly into 824? YES, 8 goes into 824, 103 times without anything left over.
So this number is divisible by 8.

c. 923,780

Again, we will focus on the last three digits of the number: 923,780. Does 8 divide evenly into 780? NO, 8 goes into 780, 97 times with a remainder of 4.

So this number is not divisible by 8.

5

Activity 3.

1. Discuss and identify which number is divisible by 8
   a) 23751 b) 396 c) 506 d) 1624
2. Discuss and identify which number is not divisible by 8
   a)56816 b) 63424 c) 31326 d)6832

Divisibility of 11

A number is divisible by 11 if the alternating sum of its digits is divisible by 11.

Example 3.

A.) 280,819:

$2 - 8 + 0 - 8 + 1 - 9 = -22$, so it is divisible by 11 (recall the definition of divisibility allows for negative numbers).

B.) 53:

$5 - 3 = 2$, so it is not divisible by 11.

To identify if a number is divisible by 11, add and subtract digits in an alternating pattern. (Add digit, subtract next digit, add next digit, etc...) Then check if that number is divisible by 11.

Example 4.

1364 $(+1 - 3 + 6 - 4 = 0)$ Yes

913 $(+9 - 1 + 3 = 11)$ Yes

3729 $(+3 - 7 + 2 - 9 = -11)$ Yes

987 $(+9 - 8 + 7 = 8)$ No

6

Use activity 3 to assess the learners understanding the concept on the divisibility test of 8.

Divisibility test of 11

Lesson focus

It's easy to tell the following are multiples of 11. That is 22, 33, 44, 55 etc. but how about 3367, 9867 etc?

Here is an easy way to test for divisibility by 11. Take the alternating sum of the digits in the number, read from left to right. If that is divisible by 11, so is the original number.

For instance, 2 728 has alternating sum of digits (2-7) + (2-8) = -11 since -11 is divisible by 1 so is 2 728.

Use example 3 and 4 to explain more of this concept to the learners.

Let the learners attempt activity 4 to assess their understanding on the divisibility test of 11 concepts.

Let the learners attempt exercise 3 for more assessment. Assess their answers.

Exercise 3

Expected Answers

1. 31415
2. 760672
3. 3624, 2728 , 7120 are divisible by 8
   2728 and 28182 are divisible by 11

1.3 Squares and Square roots

Objectives

By the end of this sub unit, learners should be able to:

Calculate squares of whole numbers more than 50 and calculate square roots of perfect squares greater than 400.

Solve quantitative aptitude problems involving squares of numbers more than 50 and square roots of numbers greater than 400.

Key word definitions

Display the following words to the learners and explain to them their meanings.

Square numbers: numbers you get when you multiply a number by itself. For example: 2×2.

Square root: a number which when multiplied by it produces the given number. Square rooting is the inverse operation of squaring a number

Evaluation guide

Learners to:

1. Calculate the squares and square roots of given numbers more than 50 and greater than 400.

2. Solve quantitative aptitude problems on squares of numbers more than 50 and square root numbers greater than 400.

Activity 4.

1. Discuss and identify which number is not divisible by 11
   a) 54637 b) 7894 c) 891 d) 2494
2. Discuss and identify which number is divisible by 11
   a) 69859 b) 23469 c) 38929 d) 18958

Exercise 3:

1. Which of the following numbers is not divisible by 11?
   a)2547039 b)10604 c)31415 d)292215
2. Which of the following numbers is divisible by 8?
   a)760672 b)89612 c)93732 d)65432
3. Identify numbers divisible by 8 or 11.
   a)3624 b)2728 c)28182 d)7120

1.3 Squares and square roots

Square

A square is the second power of a quantity. Simply means to multiply a number by itself.

Example 5.

What is the square of 3?

3 squared =

1	2	3
4	5	6
7	8	9

= 3x3= 9

7

What is the square of 5?

5 squared =

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

= 5x5= 25

Squared is usually written as a little 2 like this

This means "squared"

$4^2 = 16$

This says "4 squared equals 16"

(The little two says the number appears twice in multiplying)

Activity 5.

1. In groups, discuss and give the squares of the following numbers.
   a) 9^2 b) 10^2 c) 14^2 d) 24^2
   e) 19^2 f) 32^2 g) 13^2 h) 20^2

Square root

A square root is a value that can be multiplied by itself to give the original number.

Square root goes the other way of square.

9 is the square of 3
3 is the square root of 9

3 is the square root of 9 because when 3 is multiplied by itself it gives you 9.

This means square root

$\sqrt{9}=3$

This says square root of 9 equals 3

8

Squares

Starter activity

Revise the perfect squares between 1 and 100.

Remind learners that in order to obtain a perfect square we multiply a chosen number by itself. Run through the perfect squares viz. 1, 4, 9, 16, 25, etc. and show learners how each of these numbers are products of the first a few sequential counting number i.e. 1×1, 2×2, 3×3, etc. Let learners create a table with all the perfect squares up to 100.

Lesson focus

The lesson extends the starter activity by considering seemingly large numbers.

Take care to relate a square such as 50 × 50 to the basic square 5 × 5. Also remind learners that the concept of the square number is directly related to the concept of the geometric square. The square has all sides equal and in order to calculate the area of the square, we multiply one side by another. Thus, obtaining a square number. Work through the example 5 in the learner's book on page 7.

Refer to the notes in the learners' book.

Use activity 5 to check that learners understand that a square number is a number multiplied by itself and that they can square any given number.

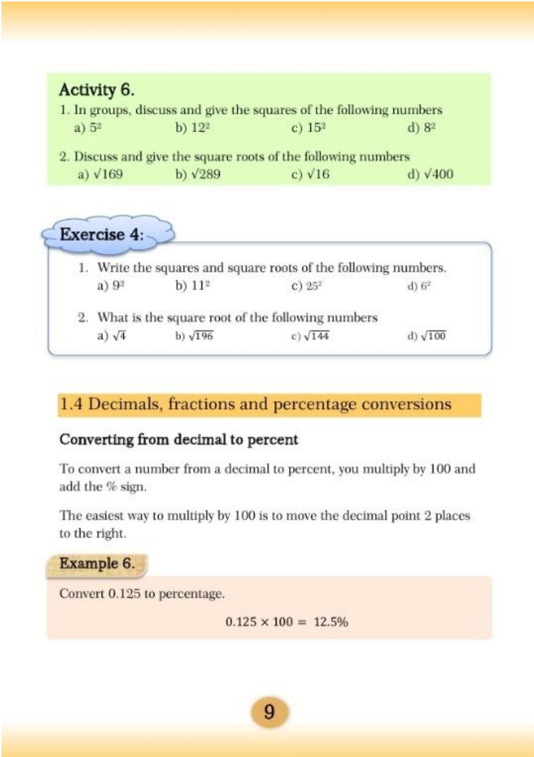
Square roots

Starter activity

Draw several geometric squares of various sizes on a paper. Each square should have its area written on the inside. Ask learners to work out what the dimensions of each of the squares are. They should look for a number which was multiplied by itself to give the area. For example, if the area is 4 cm2, then the dimensions must be 2 × 2. Avoid giving areas that are not perfect squares.

Lesson focus

Before working with square roots, make sure learners know the difference between a square and a square root. Emphasis that the processes of obtaining these are inverse processes of each other. Work through the example in the learner's book on page 8.



Activity 6.

1. In groups, discuss and give the squares of the following numbers
   a) 5^2 b) 12^2 c) 15^2 d) 8^2
2. Discuss and give the square roots of the following numbers
   a) $\sqrt{169}$ b) $\sqrt{289}$ c) $\sqrt{16}$ d) $\sqrt{400}$

Exercise 4:

1. Write the squares and square roots of the following numbers.
   a) 9^2 b) 11^2 c) 25^2 d) 6^2
2. What is the square root of the following numbers
   a) $\sqrt{4}$ b) $\sqrt{196}$ c) $\sqrt{144}$ d) $\sqrt{100}$

1.4 Decimals, fractions and percentage conversions

Converting from decimal to percent

To convert a number from a decimal to percent, you multiply by 100 and add the % sign.

The easiest way to multiply by 100 is to move the decimal point 2 places to the right.

Example 6.

Convert 0.125 to percentage.

$0.125 \times 100 = 12.5\%$

9

For instance show learners that the square root of 900 can be obtained by finding the square root of 9 i.e. 3 and then multiplying the answer by 10. Thus, obtaining 30.

Use activity 6 to check that learners understand the concept of finding square roots.

Let the learners attempt the exercise in the learner's book page 9.

Exercise 4

Expected Answers

1. a) 81 b) 121 c) 625 d) 36
2. a) 2 b) 14 c) 12 d) 10

1.4 Decimals, fractions and percentage conversion.

Objectives

By the end of this unit, learners should be able to:

- Change fractions to decimals and percentages.
- Solve quantitative aptitude questions relating to percentages.

Key word definitions

Convert: to change one thing into another.

Denominator: the number in a fraction that is below the line and that divides the number above the line.

Numerator: the number written above the line in a common fraction to indicate the number of parts of the whole.

Teaching this unit

Learners have been working with fractions for a number of grades now. This unit builds directly on the work done on fractions in the previous grades (primary 4 and 5).

Throughout this unit refer to the number line as often as possible and guide your learners to see where different fractions are placed on the number line.

To introduce learners to the content of this unit, take care to explain to learners that fractions, decimals and percentages are equivalent forms i.e. they are just different ways of expressing how parts of a whole are divided.

In the case of decimals the whole is denoted by 1 and in the case of percentages the whole is 100 (all percentages are expressed as parts of 100).

Converting from decimal to percentage

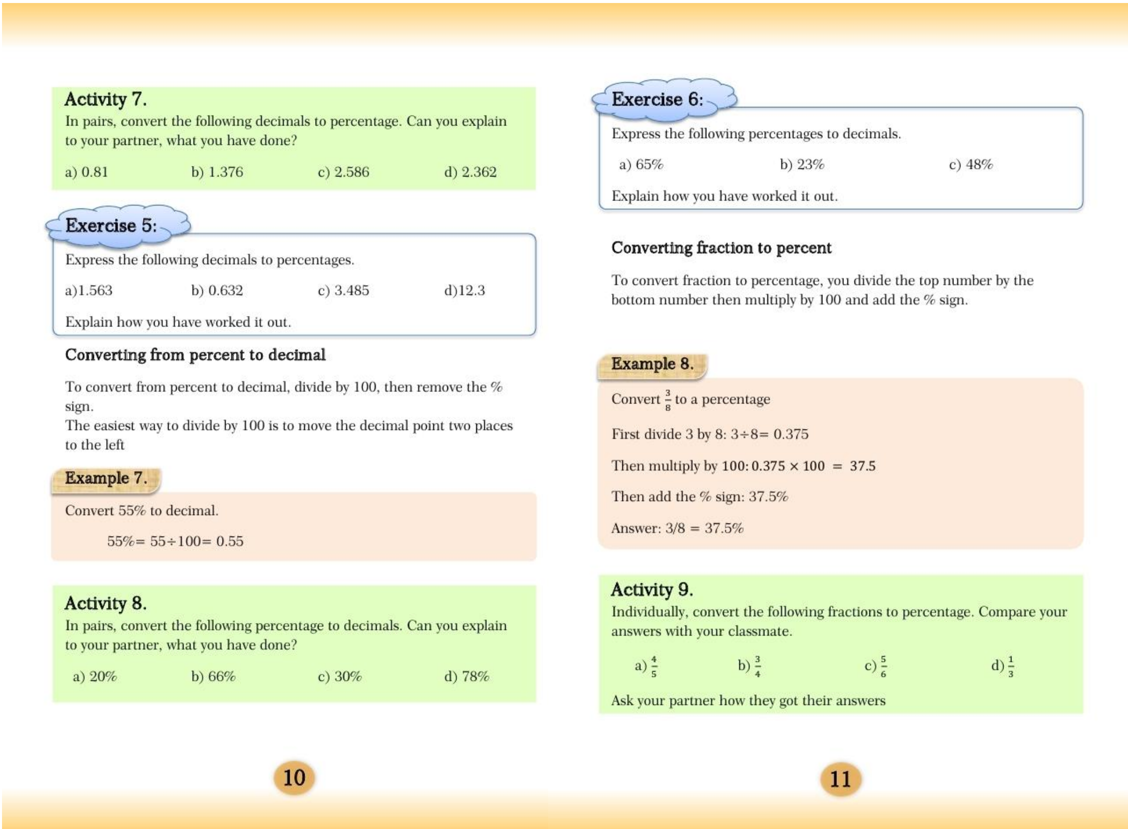
The decimal number is always multiplied by 100 and added the percentage sign.

For instant 0.05

Is multiplied by 100 ie $0.05 \times 100 = 5\%$

Therefore 100% is the ultimate number for percentage.

Use the examples 6 and activity 7 for more practice.



Activity 7.

In pairs, convert the following decimals to percentage. Can you explain to your partner, what you have done?

a) 0.81 b) 1.376 c) 2.586 d) 2.362

Exercise 5:

Express the following decimals to percentages.

a)1.563 b) 0.632 c) 3.485 d)12.3

Explain how you have worked it out.

Converting from percent to decimal

To convert from percent to decimal, divide by 100, then remove the % sign.

The easiest way to divide by 100 is to move the decimal point two places to the left

Example 7.

Convert 55% to decimal.

55%= 55÷100= 0.55

Activity 8.

In pairs, convert the following percentage to decimals. Can you explain to your partner, what you have done?

a) 20% b) 66% c) 30% d) 78%

10

Exercise 6:

Express the following percentages to decimals.

a) 65% b) 23% c) 48%

Explain how you have worked it out.

Converting fraction to percent

To convert fraction to percentage, you divide the top number by the bottom number then multiply by 100 and add the % sign.

Example 8.

Convert $\frac{3}{8}$ to a percentage

First divide 3 by 8: 3÷8= 0.375

Then multiply by 100: 0.375 × 100 = 37.5

Then add the % sign: 37.5%

Answer: 3/8 = 37.5%

Activity 9.

Individually, convert the following fractions to percentage. Compare your answers with your classmate.

a) $\frac{4}{5}$ b) $\frac{3}{4}$ c) $\frac{5}{6}$ d) $\frac{1}{3}$

Ask your partner how they got their answers

11

Converting from percentage to decimal

The percentage should be divided by 100 to convert into decimal.

For instance 11%

$\frac{11}{100}$= 0.11

Use example 7 and activity 8 in the learner's book for more practice.

Converting from fraction to percentage

Refer notes in the learners' book.

Example 8 and activity 9 will help you to elaborate more on conversion.

The rest of the conversions refer to the notes in the learner's book and use the examples provided to explain the concepts.

Exercise 7:

1. Convert the following fractions to percentage.

   a) $\frac{2}{5}$ b) $\frac{5}{7}$ c) $\frac{2}{3}$

   Explain how you have worked it out.

2. $\frac{17}{20}$ of the number of homeless children are boys. What is the percentage of the boys?

3. $\frac{5}{2}$ of the number of beds in a hospital are occupied by patients. What is the percentage of beds occupied by the patients?

Converting from percent to fraction

To convert from percent to fraction, first write the number as a fraction by (dividing by 100) then we simplify the fraction as shown below.

Example 9.

Convert 60% to a fraction.

Write 60% as a fraction: $60 \div 100 = \frac{60}{100}$

Simplify the fraction $\frac{60}{100}$

Every number after simplifying will be $\frac{6}{10}$

Simplify fraction further $\frac{3}{5}$

Activity 10.

In groups, discuss and convert the following percentages to fractions.

a) 45% b) 32% c) 40% d) 78%

Can you describe the method used?

12

Exercise 8:

1. Convert the following percentages to fractions.

   a) 55% b) 70% c) 36% d) 80%

   What did you notice when converting percentages to fractions?

2. Lobojo used of 45% of his land to plant sorghum. What fraction of the land did he use for sorghum?

3. In a church in Mapel, 58% are women. What is the fraction of women in that church?

Converting from fraction to decimal

To convert a fraction to a decimal simply divide the numerator with the denominator.

Example 10.

Convert $\frac{1}{3}$ to a decimal

$1 \div 3 = 0.3$

Therefore $\frac{1}{3}$ as a decimal is 0.3

Activity 11.

In pairs, convert the following fractions to decimals. Explain your thinking.

a) $\frac{4}{5}$ b) $\frac{2}{5}$ c) $\frac{5}{6}$

13

Exercise 10

Expected Answers

1. a) $\frac{14}{25}$ b) $\frac{13}{50}$ c) ¼ d) $\frac{9}{20}$

1.5 Ratios and proportions

Objectives

By the end of this unit, learners should be able to:

- State the relationship between fraction and ratio
- Solve quantitative aptitude problems related to ratio.

Key word definitions

Ratio: shows the relative sizes of two or more values.

Proportion: is a pair of ratios equal to each other.

Truncated: shorten (something) by cutting off the top or the end.

Scaled down: a reduction according to a fixed ratio.

Scaled up: an increase proportionally.

Ratio

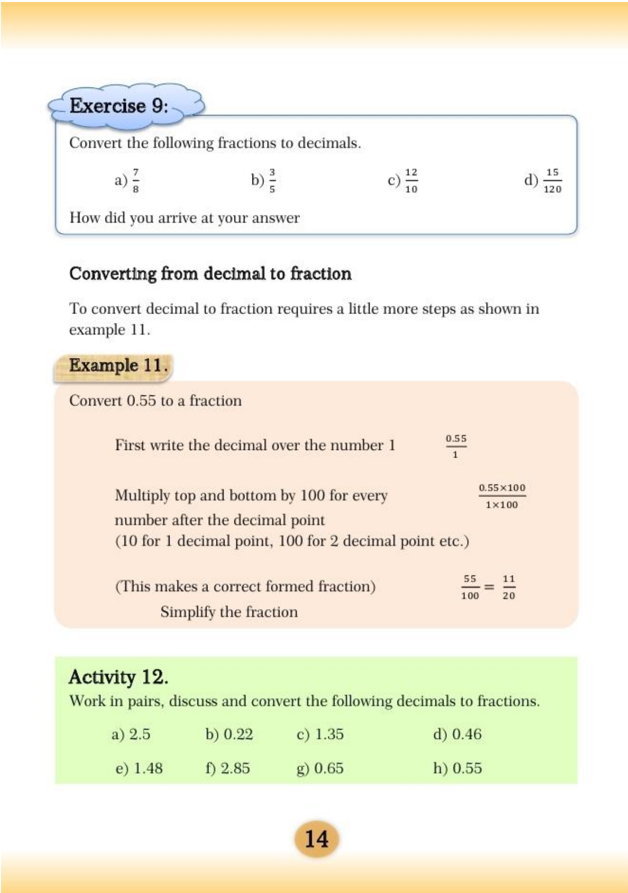
Lesson focus

Explain that the word 'ratio' is used to describe the relative numbers of different things or parts.

So when observing a total of 6 vehicles there are 2 buses for every 4 cars, which can be written in the form: '2 buses: 4 cars'.

The colon is used to separate the two parts of the ratio. The two sides of the ratio behave in exactly the same way as a fraction, and so it can also be simplified (we can find an equivalent ratio).

Write this on the chalk board to show the learners what you are talking about.


Exercise 9:

Convert the following fractions to decimals.

a) $\frac{7}{8}$ b) $\frac{3}{5}$ c) $\frac{12}{10}$ d) $\frac{15}{120}$

How did you arrive at your answer

Converting from decimal to fraction

To convert decimal to fraction requires a little more steps as shown in example 11.

Example 11.

Convert 0.55 to a fraction

First write the decimal over the number 1 $\frac{0.55}{1}$

Multiply top and bottom by 100 for every number after the decimal point (10 for 1 decimal point, 100 for 2 decimal point etc.) $\frac{0.55\times100}{1\times100}$

(This makes a correct formed fraction) Simplify the fraction $\frac{55}{100} = \frac{11}{20}$

Activity 12.

Work in pairs, discuss and convert the following decimals to fractions.

a) 2.5 b) 0.22 c) 1.35 d) 0.46

e) 1.48 f) 2.85 g) 0.65 h) 0.55

14

In this case 2:4 can be simplified to 1:2, so the sentence could be written as 'Out of three vehicles, there is 1 bus for every 2 cars'. I.e. there are half as many buses as cars, or twice as many cars as buses. Ensure that learners understand the concept of ratio and the language used. Use example 12 for more understanding of the concept to the learners.

Allow the learners to attempt activity 13 in groups to assess their understanding on the ratio. Tell learners to explain to the other groups how they got their answers.

Proportions.

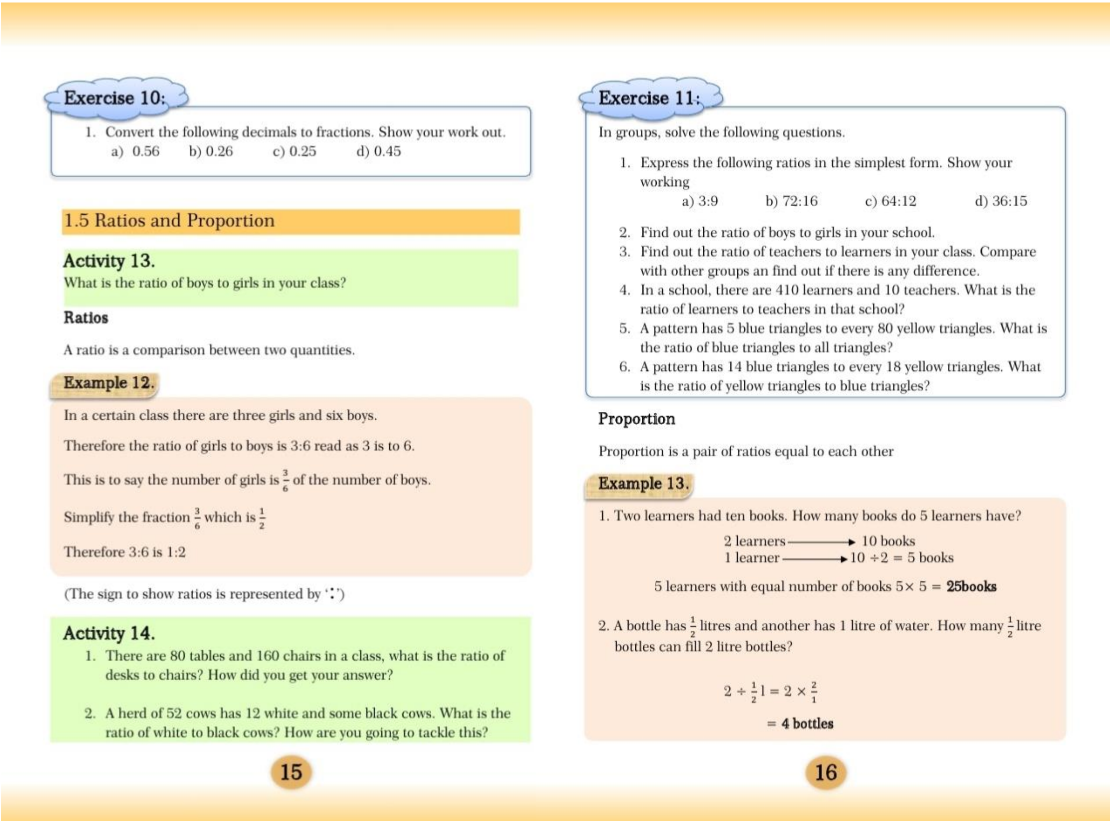
Lesson focus

A proportion is an equation with a ratio on each side. It's a statement that two ratios are equal. For example ¾ = 6/8.

Use example 13 to elaborate more about the proportion concept to the learners.

The activity in the learners book should be attempted by learners in groups or individually. Assess their answers and see the way the learners answer.

Assess the learners with exercise 12.



Exercise 10:

1. Convert the following decimals to fractions. Show your work out.
   a) 0.56 b) 0.26 c) 0.25 d) 0.45

1.5 Ratios and Proportion

Activity 13.

What is the ratio of boys to girls in your class?

Ratios

A ratio is a comparison between two quantities.

Example 12.

In a certain class there are three girls and six boys.

Therefore the ratio of girls to boys is 3:6 read as 3 is to 6.

This is to say the number of girls is $\frac{3}{6}$ of the number of boys.

Simplify the fraction $\frac{3}{6}$ which is $\frac{1}{2}$

Therefore 3:6 is 1:2

(The sign to show ratios is represented by ':')

Activity 14.

1. There are 80 tables and 160 chairs in a class, what is the ratio of desks to chairs? How did you get your answer?
2. A herd of 52 cows has 12 white and some black cows. What is the ratio of white to black cows? How are you going to tackle this?

15

Exercise 11:

In groups, solve the following questions.

1. Express the following ratios in the simplest form. Show your working
   a) 3:9 b) 72:16 c) 64:12 d) 36:15
2. Find out the ratio of boys to girls in your school.
3. Find out the ratio of teachers to learners in your class. Compare with other groups an find out if there is any difference.
4. In a school, there are 410 learners and 10 teachers. What is the ratio of learners to teachers in that school?
5. A pattern has 5 blue triangles to every 80 yellow triangles. What is the ratio of blue triangles to all triangles?
6. A pattern has 14 blue triangles to every 18 yellow triangles. What is the ratio of yellow triangles to blue triangles?

Proportion

Proportion is a pair of ratios equal to each other

Example 13.

1. Two learners had ten books. How many books do 5 learners have?

2 learners ⟶ 10 books
1 learner ⟶ 10 ÷ 2 = 5 books

5 learners with equal number of books 5 × 5 = **25books**

2. A bottle has $\frac{1}{2}$ litres and another has 1 litre of water. How many $\frac{1}{2}$ litre bottles can fill 2 litre bottles?

$$2 \div \tfrac{1}{2} 1 = 2 \times \tfrac{2}{1}$$

= **4 bottles**

16

Exercise 12

Expected Answers

1. 144 bags
2. 6 learners
3. a) 7: 8 b) 1:5 c) 3:7 d) 1: 3
   e) 7:12 f) 1:5

UNIT 2: MEASUREMENT

Learn about	Key inquiry questions
✍ Learners should investigate the use of millimetres in measurement and estimation. They should compare their findings and analyze the results. Learners should explore circumference and diameter of a circle by carrying out investigations using ropes and strings to understand the relationship and to calculate the value of π. ✍ Learners should be challenged to learn about other units of area such as acres and hectares, and explain the relationship with m^2 and cm^2. They should investigate the area of a triangle. ✍ Learners should investigate capacity through practical problem solving, which builds on learning in science and use the units of volume and capacity, contrast volume and capacity, and convert litres and millilitres. ✍ Learners should revisit their prior learning in science to investigate the relationship between weight and mass, and recognize that kilograms, grams and tonnes are the units of mass. They should develop skills and solve problems in the conversions of tonnes	• Why do we use *millimetre* in measuring length? • How do we describe a circle and its parts? • How do we practically determine the value of π? • How is measuring volume and capacity related? • How do we demonstrate the relation between acres and hectares practically? • How would we calculate the area of a triangle and find practical uses? • Why do we make profits and loss in business? • How do we relate mass of an object to its weight? • Why do we measure mass in the units of grams, kilograms and tonnes?

to kilograms and to grams and vice versa. ✍ Learners should investigate commercial transactions such as buying, selling, and discover the purpose of making profits or loss. They do role play to demonstrate their knowledge and understanding of the unit.	

Learning outcomes		
Knowledge and understanding	**Skills**	**Attitudes**
• Millimetre as units of length and explain its relation with metre. • The parts of a circle: circumference and diameter and the relationships between them and use this relationship to calculate the value of $\pi(pi)$. • Find the area of triangle and circle. • Convert tonnes to kilograms and kilograms to grams and solve problems involving tones, kilograms and grams. • Find areas in units of acres and hectors.	• Solve problems involving length, mass, volume and capacity. • Perform activities to measure the circumference, diameter of varied round objects. • Calculate the values of π using known circumference and diameter of a circle • Calculate areas of triangles. • Able to change millilitre to litre, grams to kilograms and kilograms to tonnes and vice versa. • Analyze profit and loss.	• Appreciate the relationship between diameter and circumference of a circle. • Develop confidence in conversion of unit lengths, mass, volume and capacity. • Self-awareness of business transactions.

• Solve problems involving units of capacity and convert litters to milliliters and vice versa. • Find profit and loss in business transactions.		

Contribution to the competencies: Critical thinking: exploring various ways in measuring circumferences and diameters of circles, areas of triangles and circles as well as in identifying capacities and weights of objects. Communication and Co-operation: presentation, solving problems, and sharing different views and opinions in doing small mathematical projects.
Links to other subjects: Links to all subjects.

Introduction

Measurement is the assignment of a number to a characteristic of an object or event which can be compared with other objects or events.

By the end of this unit the learner should;

- Use millimetres as a unit of length.
- Understand the parts of a circle.
- Calculate the value of pi.
- Understand the units of area in acres and hectares.
- Calculate the area of triangles.
- Solve units of capacity.
- Conversion of tones to kilograms and vice versa.
- Determining profits and loss.

Key words

Millimetres: is a unit of length in the metric system equal to one thousandths of a metre.

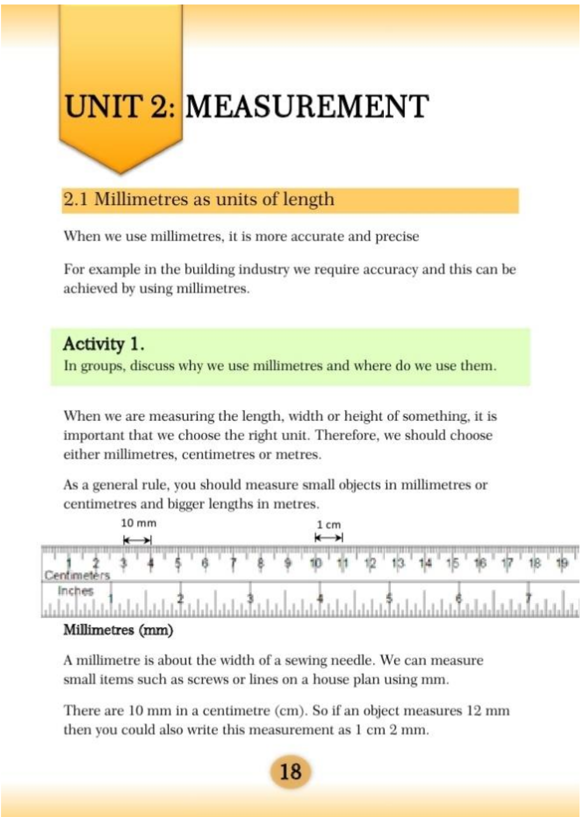
Circle: is a simple closed shape

Area: is the quantity that expresses the extent of a two dimensional figure or shape in the plane.

Capacity: the maximum amount something can contain.

Ask learners to refer other definitions in the learner's book 4 and 5.

2.1 Millimetres as a unit of length



UNIT 2: MEASUREMENT

2.1 Millimetres as units of length

When we use millimetres, it is more accurate and precise

For example in the building industry we require accuracy and this can be achieved by using millimetres.

Activity 1.
In groups, discuss why we use millimetres and where do we use them.

When we are measuring the length, width or height of something, it is important that we choose the right unit. Therefore, we should choose either millimetres, centimetres or metres.

As a general rule, you should measure small objects in millimetres or centimetres and bigger lengths in metres.

Millimetres (mm)

A millimetre is about the width of a sewing needle. We can measure small items such as screws or lines on a house plan using mm.

There are 10 mm in a centimetre (cm). So if an object measures 12 mm then you could also write this measurement as 1 cm 2 mm.

18

Starter activity

Provide learners with objects that are measured in millimetres. Eg rain gauge or a ruler.

Show the Learners how to read the measurements in the objects.

Lesson focus

By using activity 1 in the learner's book guide the learners in groups to discuss the use of millimetres and where they are commonly used.

Centimetres (cm)

A centimetre is roughly the width of a finger.

We can measure the length of our neck-size using cm.

A cm is the same as 10 mm. So if an object like a matchbox measures 6 cm in length then you can also write this as 60 mm.

Metres (m)

A metre is about the length of a person's stride.

We can measure longer things like a room or a garden using metres.

A metre is the same as 1,000 mm, although if things are big enough to be measured in metres then the measurement is not usually shown in millimetres.

10 mm = 1 cm
100 cm = 1 m
1000 m = 1 km

Example 1.

Express 5 810 millimetres in metres.

Solution:

1 metre = 1000 millimetres

Set up the conversion so the desired unit will be cancelled out. In this case, we want m to be the remaining unit.

$$Distance\ in\ m = (distance\ in\ mm) \times (\frac{1\ m}{1000\ mm}).$$
$$Distance\ in\ m = (\frac{5810}{1000})\ m.$$
$$Distance\ in\ m = 5.810\ m.$$

19

Answer:

5810 millimetres is 5.810 metres.

Activity 2.

Measure your mathematics textbook in centimetres (cm). What is the measurement in millimetres (mm).
Share your measurement with your classmates.
Convert the measurements to centimetres (cm).

Exercise 1:

In pairs, convert to the unit in brackets.

a. 3 cm =(mm)	b. 12 cm =(mm)	c. 285 cm =(mm)
d. 6 m =(cm)	e. 2.4 m =(cm)	f. 0.7 m = (cm)
g. 40 mm =(cm)	h. 250 mm = (cm)	i. 400 mm =(cm)
j. 500 cm =(m)	k. 750 cm = (m)	l. 20 cm = (m)

It is clear from the visual comparison of the lengths that a centimetre is a larger unit than a millimetre or conversely that a millimetre is a smaller unit than a centimetre.

Exercise 2:

1. In pairs, convert the following measurements.

   a. 8 cm to mm b. 6 m to cm c. 7 km to m

2. The length of the front of a car park is 2400cm. How long is it in metres?

3. A piece of string measures 1.4M. How long is this in centimetres/

20

Explain to the learners the symbol of millimetres and give the history if you can.

For instance millimetres are mainly used when measuring small objects.

Use the notes in the learner's book to elaborate more on the metric concept.ie how many millimetres make centimetre etc.

Example 1 and activity 2 will enable the learners learn more on millimetres. Add more examples if you can.

Exercise 1

Expected Answers

Convert to the units in brackets

a) 30mm
b) 120mm
c) 2850mm
d) 600cm
e) 240cm
f) 70cm
g) 4cm
h) 25cm
i) 40cm
j) 5m
k) 7.5m
l) 0.2m

Exercise 2

Expected Answers

Convert

1.
a) 80mm
b) 600cm
c) 7000m
2. 24m
3. 140cm

2.2 Parts of a circle

Starter activity

Guide learners to collect all objects with a circular shape.

You can take the learners out of calls and demonstrate on the ground how to draw a circle, divide it into two then into four.

After dividing it into two explain how the term diameter comes across and when divided into four forming a radius.

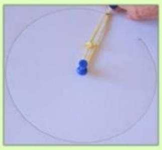
It will be easier for the learners to understand these parts of a circle after carrying out that simple exercise.

2.2 Parts of a circle

A circle is a 2-dimensional shape made by drawing a curve that is always the same distance from a center.

Activity 3.

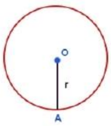
Put a pin in a board or a stick on the ground, put a loop of string or rope around it, and insert a pencil or another stick into the other loop. Keep the string stretched and draw the circle.



Try dragging the point to see how the radius and circumference differences.

Radius, Diameter and Circumference

Radius: It is defined as the distance between the centre of the circle and a point on the circle.
It is represented as r. In the diagram below, OA is the radius of circle.



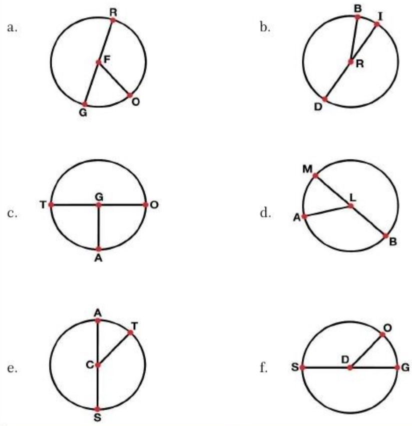
21

Diameter: Diameter is the distance between two points on the circle which passes through the center of the circle. It is represented by d.

$$d = 2r \text{ or } r = \frac{d}{2}$$

Exercise 3:

In groups, identify the radius and diameter of the circles below. How did you get your answer?



22

Lesson focus

Use the notes in the learner's book to elaborate more about diameter and radius as parts of a circle.

It will be easier now to explain to them about the circumference and how to calculate it

The learners to attempt the exercise 2 and assess their understanding on the diameter and radius as parts of a circle.

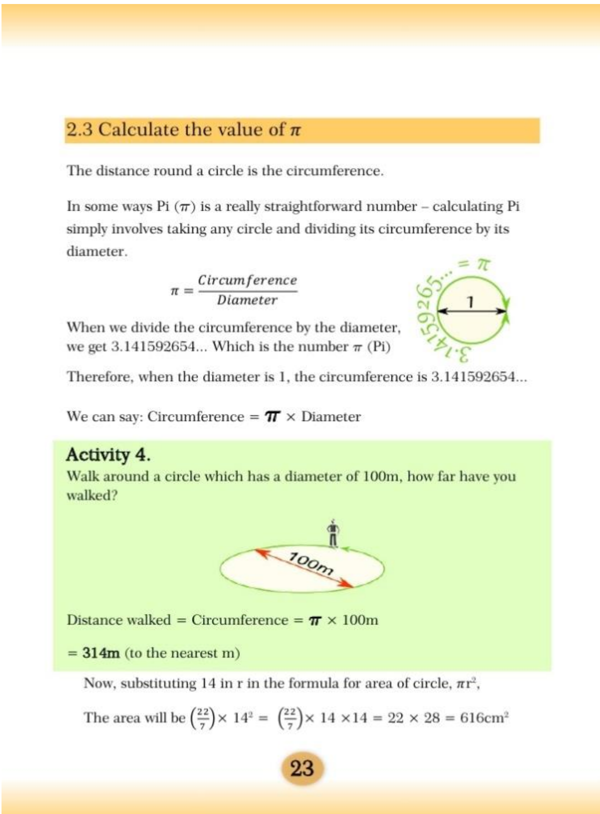
Exercise 3

Expected Answers

a) RG – diameter ; OF – radius
b) ID – diameter ; BR – radius
c) TO – diameter ; GA – radius
d) MB – diameter ; AL – radius
e) AS – diameter ; CT – radius
f) SG – diameter ; DO – radius

Ask learners what they have discovered.

2.3 Calculate the π



2.3 Calculate the value of π

The distance round a circle is the circumference.

In some ways Pi (π) is a really straightforward number – calculating Pi simply involves taking any circle and dividing its circumference by its diameter.

$$\pi = \frac{Circumference}{Diameter}$$

When we divide the circumference by the diameter, we get 3.141592654... Which is the number π (Pi)

Therefore, when the diameter is 1, the circumference is 3.141592654...

We can say: Circumference = π × Diameter

Activity 4.
Walk around a circle which has a diameter of 100m, how far have you walked?

Distance walked = Circumference = π × 100m

= **314m** (to the nearest m)

Now, substituting 14 in r in the formula for area of circle, πr^2,

The area will be $\left(\frac{22}{7}\right) \times 14^2 = \left(\frac{22}{7}\right) \times 14 \times 14 = 22 \times 28 = 616cm^2$

23

Starter activity

Learners to measure diameters and circumference of the objects collected for example that of a plate using a tape measure/ string.

Ensure they are able to read the measurements found. Refer to activity 4 (page 22) in the learners book.

Let learners repeat the process with other objects and know how to measure diameters and circumferences.

Lesson focus

With the circumferences and diameters found from the objects guide the learners on how to calculate the π.

Activity 5.

Use a string or tape measure to measure circular objects like plates.

Measure around the edge (the **circumference**):

Measure across the circle (the **diameter**):

Divide:

$$\pi = \frac{Circumference}{Diameter}$$

That is how we find π of a circular object.

Try it again and measure more accurately.

24

Also, note that the Diameter is twice the Radius:

Diameter = 2 × Radius

Therefore, this is true:

Circumference = 2 × π × Radius

Area of a circle, technically, is π times the radius squared.

i.e. Area of a circle = $\pi \times r^2$.

Write either $\frac{22}{7}$ or approximately **3.14** for π

Let us solve a few questions on area of a circle, when different parameters are given

Example 2.

1. Find the area of a circle whose radius is 7cm.

Answer:

Substitute 7 in radius, r in the area of a circle, $\pi \times r^2$.

So, area of circle is $\pi \times 7^2 = \left(\frac{22}{7}\right) \times 49$ 7 = 22 × 7 = 154.

Expressed along with units, the area of circle is 154 sq. cm.

2. Find the area of a circle whose circumference is 88cm.

Answer:

Using the formula for circumference of a circle $2\pi r$, let us find radius r:

Since, $2\pi r = 88$, therefore, $2 \times \left(\frac{22}{7}\right) \times r = 88$,

Finally, r = (288 × 7)/44 = 14 cm.

25

Guide them using activity 4 (page 21) in the learners book and elaborate further using example 2.

The π is always constant; 3.141592654… or $\frac{22}{7}$.

When calculating the area of a circle the Pi is important and without it the calculation of the area might be impossible.

The π is rounded off to approximately 3.14 or $\frac{22}{7}$ as stated above hence π is approximately $\frac{22}{7}$ or 3.14.

Here are the formulas of finding the area and circumference;

Circumference = $2 \times \pi \times$ radius(r)

Area of a circle = π ×radius squared (r^2)

2.4 Units of area in acres and hectares

Starter activity

Learners to give example of all that is measured in acres and hectares

Guide the learners in reminding themselves on what they learnt at primary 5 about hectares. This will make the lesson easier because they will have prior knowledge about this concept.

Lesson focus

Use the notes in the learners book to guide the learners have a know-how on the conversion of hectares to acres and vice versa.

2.4 Units of area in acres and hectares

Convert acres to hectares

You may be wondering **how many hectares there are in x acres**.

To convert from acres to hectares multiply your **x** figure by 0.405.

Example 3.

Convert 20 acres to hectares.

Formula:	$Acres \times 0.405 = Hectares$
Calculations:	$20\ Acres \times 0.405 = 8.1\ hectares$
Result:	20 acres is equal to 8.1 hectares

Activity 6.

In pairs, convert the following acres to hectares. Show your working out

a. 164 acres	b. 634 acres	c. 46 acres
d. 363 acres	e. 349 acres	f. 67 acres
g. 797 acres	h. 946 acres	i. 82 acres

Convert hectares to acres

Alternatively, you may want to know **how many acres there are in x hectares**.

To convert from hectares to acres multiply your **x** figure by 2.471.

26

Use example 3 (page 26) to drive out a formula in converting acres to hectares.

Use example 4 (page 27) to also drive out the formula of converting hectares to acres.

$Ha \times 2.471 = acres$

$Acres \times 0.405 = hectares$

The symbol of hectare is (ha) and that of acres is (a).

The learners to attempt activity 6 and 7 for more practice on this subunit.

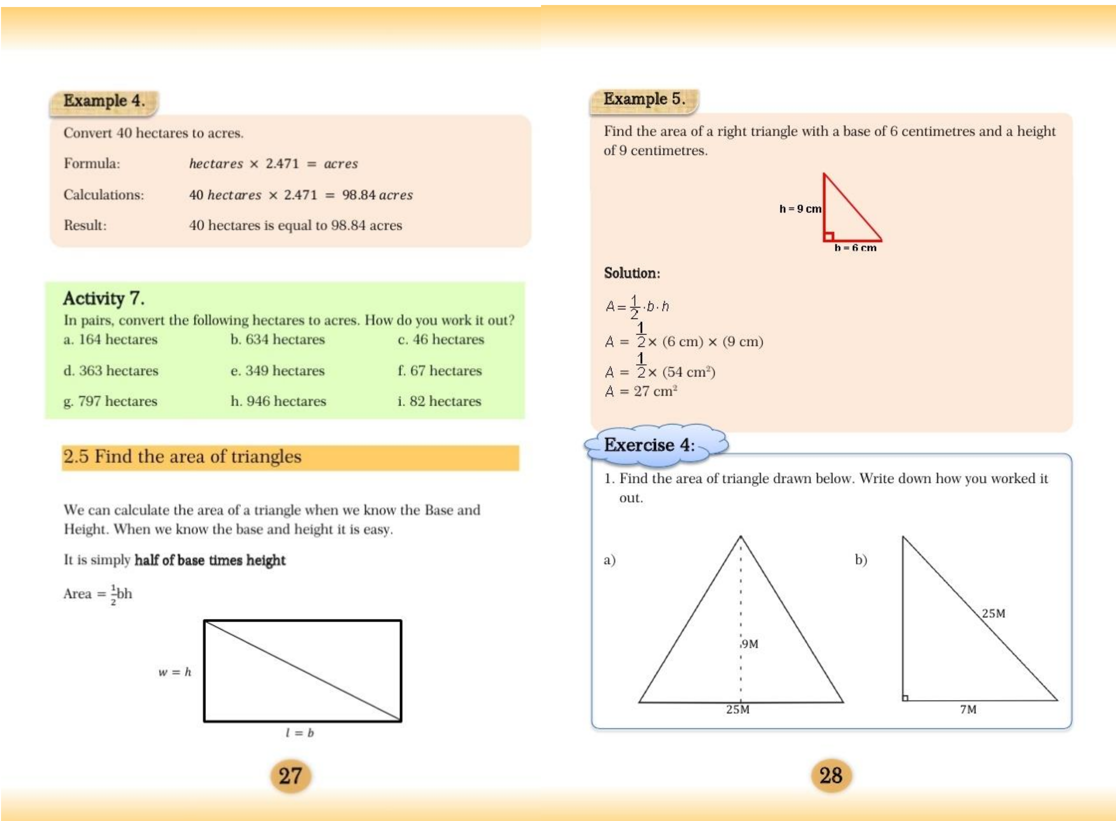
2.5 Find the area of triangles

Starter activity

Ask the learners to name the type of triangles they see. They should recognise that the triangles are right-angled triangles. Ask the learners what the area of one of the triangles will be.

Learners should be able to 'see' that the area of the triangle will be half the area of the rectangle.

Discuss with the class why this is so and how they know the answer is half the area of the rectangle. Write the formula for finding the area of a triangle on the board. Explain to the learners that this is the formula for finding the area of a triangle.



Example 4.

Convert 40 hectares to acres.

Formula:	*hectares* × 2.471 = *acres*
Calculations:	40 *hectares* × 2.471 = 98.84 *acres*
Result:	40 hectares is equal to 98.84 acres

Activity 7.

In pairs, convert the following hectares to acres. How do you work it out?

a. 164 hectares	b. 634 hectares	c. 46 hectares
d. 363 hectares	e. 349 hectares	f. 67 hectares
g. 797 hectares	h. 946 hectares	i. 82 hectares

2.5 Find the area of triangles

We can calculate the area of a triangle when we know the Base and Height. When we know the base and height it is easy.

It is simply **half of base times height**

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

w = h

l = b

27

Example 5.

Find the area of a right triangle with a base of 6 centimetres and a height of 9 centimetres.

h = 9 cm

b = 6 cm

Solution:

$A = \frac{1}{2} \cdot b \cdot h$

$A = \frac{1}{2} \times (6\text{ cm}) \times (9\text{ cm})$

$A = \frac{1}{2} \times (54\text{ cm}^2)$

$A = 27\text{ cm}^2$

Exercise 4:

1. Find the area of triangle drawn below. Write down how you worked it out.

a) 9M, 25M

b) 25M, 7M

28

Ask them if they agree that it is the correct formula and encourage learners to reason their response. Learners should recognize that the area will be 1/2 $l \times w$. Allow learners to discover that $\frac{1}{2}$ $h \times b$ and $\frac{1}{2}l \times w$ are equivalent expressions.

Lesson focus

This lesson introduces the learners to calculating the area of a right-angled triangle. In order that they understand the formula, it is important that the learners see a right angled triangle as half of a rectangle. Work through the example 5 on page 28 in the learner's book and ask learners and check that learners understand. Encourage questions and discussion.

Learners usually find this work quite difficult so allow plenty of time for them to work through the example. Learners should complete all the questions in Exercise 4 page 28 in the learner's book as it will help them to consolidate the content.

Area of a triangle = $\frac{1}{2}$ .b.h where the dot stands for multiplication.

Exercise 4

Expected Answers

a) 112.5 m^2
b) 84m^2

2.6 Solving problems involving units of capacity

Liters are the standard unit for capacity.

Use the notes in the learner's book to guide the learners more about the units in capacity.

Starter activity

Hold up two containers of very different capacities, for example a small plastic glass and a large plastic bottle. Ask your learners to think of different ways in which they can find out how many of the small plastic glasses will fit into the big plastic bottle.

One way is to fill the bottle with water and then count how many times you can fill the glass from the bottle. Another way is to fill the glass with water and empty it into the bottle, counting how many times this process must be repeated. Now place a measuring cylinder or a measuring jug next to the glass and the bottle.

Ask the learners questions such as ‘Does this give us new ways of doing this calculation?’, ‘Which way is easiest?’, ‘Which way is messiest?’ and ‘Which method do you prefer?’

2.6 Solve problems involving units of capacity

We use liter to represent as the standard unit.

1 millilitre = 0.001 litre

1 centiliter = 0.01 litre

1 decilitre = 0.1 litre

1 kilolitre = 1000 litres

Example 6.

A soda can holds 250 ml of liquid. If someone was to pour 20 soda cans of water into a bucket, how many liters of water are transferred to the bucket?

Solution:

First, find the total volume of the water.

Total volume in ml = $20\ cans \times \frac{250\ ml}{cans}$
Total volume in ml = 5000 ml

Second, convert ml to L
1 L = 1000 ml
Set up the conversion so the desired unit will be cancelled out.

In this case, we want L to be the remaining unit.
Volume in L = $(volume\ in\ ml) \times (1\ L/1000\ ml)$
volume in L = $\left(\frac{5000}{1000}\right)$ L
volume in L = 5 L

ANSWER:

5 liters of water was poured into the bucket.

29

Activity 8.
In groups;

Find a variety of containers. Fill them with water, without measuring the amount of water poured into each container.

Estimate the capacity of each container and record these values in the table.

Use measuring devices or container to measure the actual capacity of water in each container and record these values.

Exercise 5:

Work in pairs, tell your partner how you would work out the following.

1. How many ml does 10 L represent?
2. How many L does 4000 ml represent?
3. How many mL does 7.4 L represent?

2.7 Conversion of tonnes to kilograms and kilograms to grams

How to convert Tonnes to Kilograms

1 ton (t) is equal to 1000 kilograms (kg).

1 t = 1000 kg

The mass m in kilograms (kg) is equal to the mass m in ton (t) times 1000:

$m_{(kg)} = m_{(t)} \times 1000$

30

Lesson focus

The focus of this lesson is the definition of capacity and measuring the capacity of everyday objects.

Make sure that all your learners understand what capacity is, as well as the relationship between litres and millilitres. Revise the basic conversion facts:

1 000 ml = 1ℓ and 1ℓ = 1 000 ml. Revise how to multiply and divide by 1 000 quickly. Have five different-sized containers in the class. Write labels for each container, for example 1ℓ; 3 250 ml.

1 500 ml; 4.5ℓ and 2 500 ml. Paste the labels on the containers. Have flash cards with the converted amounts written on them: 1 000 ml; 3.2ℓ; 1.5ℓ; 4 500 ml and 2.5ℓ. Learners need to match the flash card to the correct container. Discuss with the learners why it is necessary to be able to convert milliliters to liters and vice versa.

Use activity 8 for more guidance to help the learners understand the content more.

Work through the examples 6 on page 29 of the learner's book and ask learners to complete Exercise 5 on page 30 of the learners' book.

Exercise 5

Expected Answers

a) 10000ml
b) 4 l
c) 7400ml

2.7 Conversion of tones to kilograms and kilograms to grams

Kilogram is the standard unit for weight.

Starter activity

Remind the learners how many grams make up 1 kg and how many kgs make a tone.

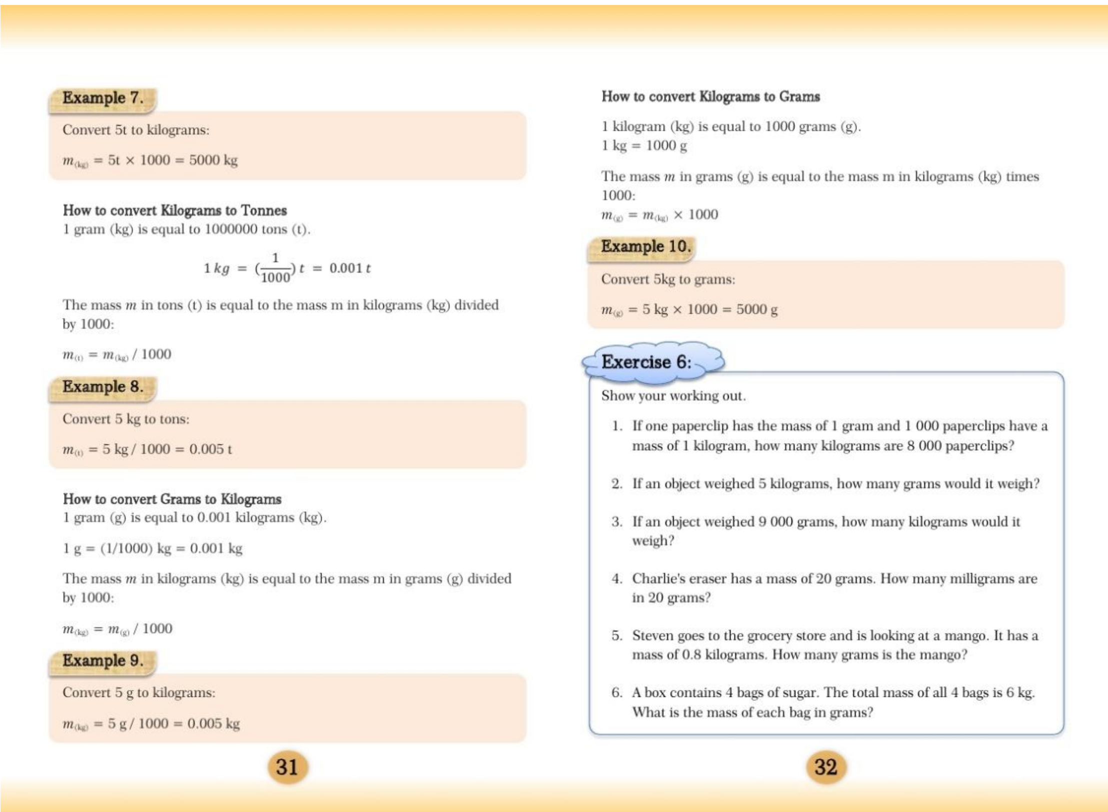
i.e. 1 tone = 1000kg

1 kg = 1000g

Lesson focus

In this lesson, learners are taught to convert between grams and kilograms and vice versa, kilograms to tones and vice versa. They are also required to converting using decimal numbers.

Work through the example 7 and 8 on page 31 in the learner's book explaining to convert kilograms to tones, we divide by 1 000 and to convert tones to kilograms, we multiply by 1 000.



Example 7.

Convert 5t to kilograms:

$m_{(kg)} = 5t \times 1000 = 5000$ kg

How to convert Kilograms to Tonnes

1 gram (kg) is equal to 1000000 tons (t).

$$1\,kg = (\frac{1}{1000})\,t = 0.001\,t$$

The mass m in tons (t) is equal to the mass m in kilograms (kg) divided by 1000:

$m_{(t)} = m_{(kg)} / 1000$

Example 8.

Convert 5 kg to tons:

$m_{(t)} = 5$ kg / 1000 = 0.005 t

How to convert Grams to Kilograms

1 gram (g) is equal to 0.001 kilograms (kg).

1 g = (1/1000) kg = 0.001 kg

The mass m in kilograms (kg) is equal to the mass m in grams (g) divided by 1000:

$m_{(kg)} = m_{(g)} / 1000$

Example 9.

Convert 5 g to kilograms:

$m_{(kg)} = 5$ g / 1000 = 0.005 kg

31

How to convert Kilograms to Grams

1 kilogram (kg) is equal to 1000 grams (g).
1 kg = 1000 g

The mass m in grams (g) is equal to the mass m in kilograms (kg) times 1000:

$m_{(g)} = m_{(kg)} \times 1000$

Example 10.

Convert 5kg to grams:

$m_{(g)} = 5$ kg × 1000 = 5000 g

Exercise 6:

Show your working out.

1. If one paperclip has the mass of 1 gram and 1 000 paperclips have a mass of 1 kilogram, how many kilograms are 8 000 paperclips?
2. If an object weighed 5 kilograms, how many grams would it weigh?
3. If an object weighed 9 000 grams, how many kilograms would it weigh?
4. Charlie's eraser has a mass of 20 grams. How many milligrams are in 20 grams?
5. Steven goes to the grocery store and is looking at a mango. It has a mass of 0.8 kilograms. How many grams is the mango?
6. A box contains 4 bags of sugar. The total mass of all 4 bags is 6 kg. What is the mass of each bag in grams?

32

The same applies when converting from grams to kilograms and vice versa. Use examples 8, 9 and 10 for further practise.

Emphasize the importance of understanding and working with inverses. When working through the worked examples, pay special attention to converting with decimal numbers. This may challenge the learners at first. Allow them to work through all the questions as this skill requires practice.

Complete Exercise 6 on page 32 of the learners' book.

Exercise 6

Expected Answers

1. 8kg
2. 5000g
3. 9kg
4. 20000mg
5. 800g
6. 1500g

2.8 Profit and loss

Starter activity

Use the real life examples of commodities in the market to explain the selling prices, cost prices, profits and losses. These terms will be easier to define because they have been used in the previous grades.

Lesson focus

Refer to the notes in the learner's book to elaborate this concept.

Use example 11 in the learners book page 33 for learners practise and assess the capability using exercise 7 page 34 also in the learners' book.

2.8 Profit and loss

Formulas of profit and loss are given below.

When the Selling Price (SP) is greater than Cost Price (CP) the man makes a Profit or Gain.

Selling Price (SP) > Cost Price (CP) → Profit or Gain

Profit = Selling Price (SP) – Cost Price (CP)

When the Selling Price (SP) is less than Cost Price (CP) the man suffers a Loss.

Selling Price (SP) < Cost Price (CP) → Loss

Loss = Cost Price (CP) - Selling Price (SP)

Example 11.

John bought a bicycle for SSP 3 390 and sold to a buyer for SSP 3 820. Did he make profit or loss by selling the bicycle? .How much is the loss or profit?

Solution

As the selling price is more than the cost price, John has profit in selling the bicycle.

Profit = SP – CP

= SSP 3 820 – SSP 3 390 = SSP 430

33

Exercise 7:

Work in groups to write some word problems that:

1. The answer shows the profit.
2. The answer shows the loss.

Give your problem to another group to work it out.

Check that they have solved the problem correctly.

34

Exercise 7

Expected Answers

Learners should come up with the questions and try to solve them.

UNIT 3: GEOMETRY

Learn about	Key inquiry questions
✍ Learners should revisit their prior knowledge of drawing parallel lines to understand bisection of lines to identify vertically opposite angles and supplementary angles (angles that complete180°). ✍ Learner should understand angles as a measure of turn and use a protractor to measure angles. They should investigate the construction of circles of different radii using a pair of compass, a sharp pencil and a ruler and do more practical exercises to consolidate the concepts. ✍ Learners should investigate translation on grids to explore how a shape can slide from one place to another without rotating or flipping over. ✍ Learners should construct cubes and cuboids using papers or mud to explain the drawing of cubes and cuboids and measure the dimensions of the constructed cubes and cuboids and convert them to a different scale. Using this knowledge and understanding of representing length in small or large scale form, they should then interpret scale in ratio form and investigate problems solving exercises to consolidate the concept.	• How are geometrical lines constructed and bisected? • How would you differentiate between vertically opposite and supplementary angles? • How can we construct patterns of circles of different radii? • How can we practically construct cubes and cuboids and represent their length in scale forms? • How do we write scales in the ratio forms?

<table>
<tr><th colspan="3">Learning outcomes</th></tr>
<tr><th>Knowledge and understanding</th><th>Skills</th><th>Attitudes</th></tr>
<tr><td>Constructing and bisecting lines.
Identifying vertically opposite and supplementary angles.
Constructing a circle of a given radius.
Making patterns with circles.
Making cubes and cuboids.
Conversion of scale and length, writing scale in ratio form.
Making scale drawing.</td><td>Construction and bisection of lines.
Identify vertical opposite and supplementary angles.
Investigate patterns of circles of different radii.
Be able to write scale in ratio form.
Convert length in scale form.</td><td>Appreciate construction and bisection of geometrical lines and objects.
Curious to generate ideas of drawing and construction.
Develop co-learning and better understanding of constructing patterns of circles.
Confidence to investigate and to take responsibility for their own learning.</td></tr>
<tr><td colspan="3">Contribution to the competencies:
<u>Critical thinking</u>: through understanding of constructing and bisecting geometrical lines and applies these techniques in their daily life.
<u>Communication and Co-operation</u>: group work.</td></tr>
<tr><td colspan="3">Links to other subjects:
Links to a range of subjects such as Science and Social Studies.</td></tr>
</table>

Objectives

By the end of this unit, learners should be able to:

- Construct and bisect lines.
- Identify vertically opposite and supplementary angles.
- Identify the components of a circle – radius, diameter, and circumference of a circle.
- Differentiate between radius and diameter.
- Making patterns with circles.
- Conversion of scales and lengths
- Writing scales in ratio form.
- Making scale drawing.

Key word definitions

Bisect: to divide into two equal parts.

Supplementary angles: are two angles whose sum is 180 degrees.

Vertically opposite angles: are angles opposite each other when two lines cross.

Circle: is a simple closed shape.

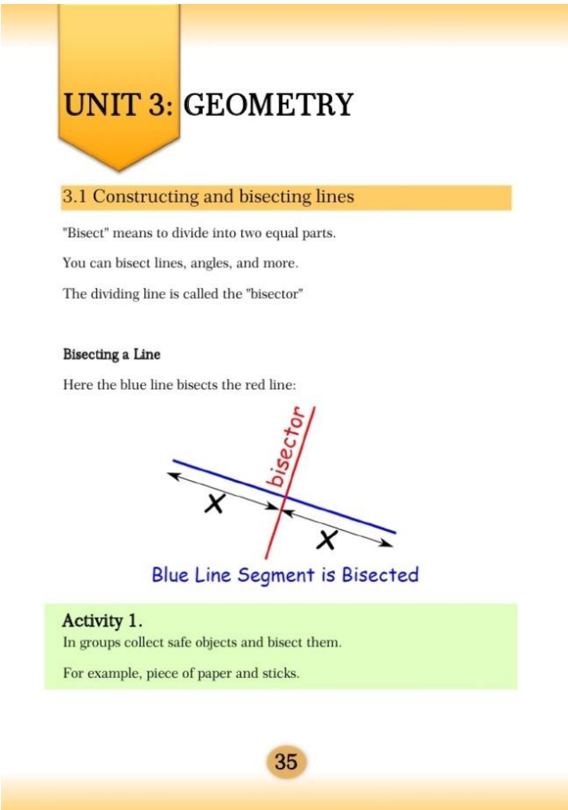
Radius of a circle: a line from the centre of a circle to any part of the circumference.

Diameter: a line that joins two points on a circle and passes through the centre of the circle. It is twice the radius.

Circumference: this is the distance around a circle.

3.1 Constructing and bisecting lines and angles

It's easy to bisect a line but when it comes to bisecting an angle the learners need to use a pair of compass and a ruler to do so.


UNIT 3: GEOMETRY

3.1 Constructing and bisecting lines

"Bisect" means to divide into two equal parts.

You can bisect lines, angles, and more.

The dividing line is called the "bisector"

Bisecting a Line

Here the blue line bisects the red line:

Activity 1.
In groups collect safe objects and bisect them.

For example, piece of paper and sticks.

35

Bisecting a line

Starter activity

Find real life examples like an orange and use it as an example. Cut it into two equal parts. That will mean you have bisected the orange.

Lesson focus

Introduce bisection of a line by constructing it on a line.

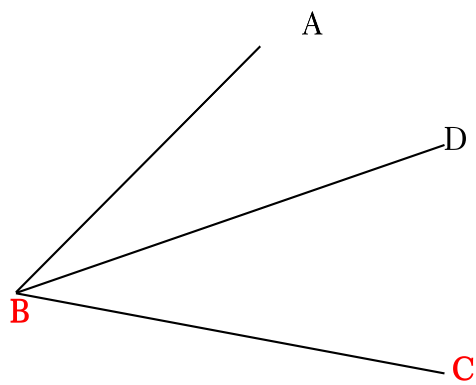
Use the notes in the learner's book to elaborate to the learners on how to bisect a line. Activity one will enable the learner understand how to bisect a line using real life examples.

Bisecting angles

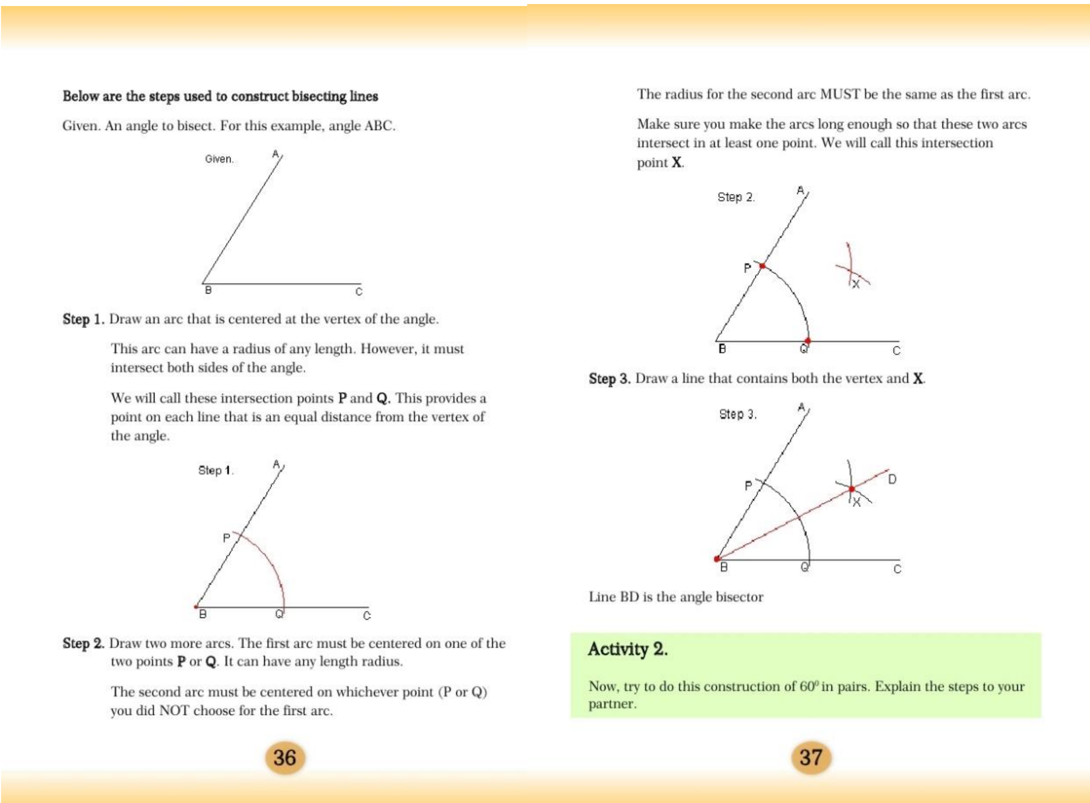
Lesson focus

The bisector of an angle is a ray whose end point is the vertex of the angle and which divides the angle into two equal angles.

For instance, in the diagram below the ray BD is the bisector of the angle ABC.



For angle, ABC to be bisected a line should cut the angle at point be equally such that the angles found after bisecting should be equal. Therefore, angle ABD should be equal to angle DBC.



Below are the steps used to construct bisecting lines

Given. An angle to bisect. For this example, angle ABC.

Given.

Step 1. Draw an arc that is centered at the vertex of the angle.

This arc can have a radius of any length. However, it must intersect both sides of the angle.

We will call these intersection points **P** and **Q.** This provides a point on each line that is an equal distance from the vertex of the angle.

Step 1.

Step 2. Draw two more arcs. The first arc must be centered on one of the two points **P** or **Q**. It can have any length radius.

The second arc must be centered on whichever point (P or Q) you did NOT choose for the first arc.

36

The radius for the second arc MUST be the same as the first arc.

Make sure you make the arcs long enough so that these two arcs intersect in at least one point. We will call this intersection point **X**.

Step 2.

Step 3. Draw a line that contains both the vertex and **X**.

Step 3.

Line BD is the angle bisector

Activity 2.

Now, try to do this construction of 60° in pairs. Explain the steps to your partner.

37

Use the steps in the learner's book to explain to the learners on how to bisect angles. The notes in the learner's book are simple and clear hence will be easier for the learners to understand and easily draw.

Let the learners try to construct bisect angles on their own and assess what they are doing to know their understanding.

You can give them specific angles for example 60^0 and let them bisect it on their own.

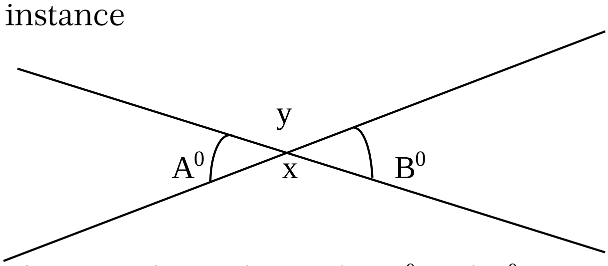
3.2 Identifying vertically opposite and supplementary angles

Vertically opposite angles

Starter activity

On the chalk board draw two crossing lines.

For instance



The diagram shows the angles A^0 and B^0 are vertically opposite angles.

Lesson focus

Vertical in this case means they share the same vertex (corner points). These angles are always equal.

When calculating the angles remember the total angles are equal to a full circle which is 360^0.

For instance, let's say the angle of A = 80^0. That means the angle of B = 80^0 because vertically opposite angles are equal.

Exercise 1:

Draw an angle of any size and bisect the angle.

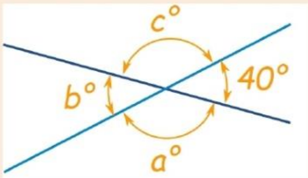
3.2 Identifying vertically opposite and supplementary angles

Vertically Opposite Angles

Vertically Opposite Angles are the angles opposite each other when two lines cross.

Example 1.

Find angles a°, b° and c° below:



Because b° is vertically opposite 40°, it must also be 40°

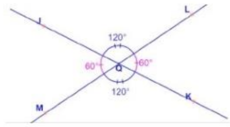
A full circle is 360°, so that leaves 360° − 2×40° = 280°

Angles a° and c° are also vertically opposite angles, so must be equal, which means they are 140° each.

Answer: **a = 140°, b = 40° and c = 140°.**

38

Observe the angles below.



Angle MQK is vertically opposite to angle JQL.

Angle MQJ is vertically opposite to angle KQL.

Activity 3.

In groups, collect the materials required to do the activity below and follow the steps.

Material required:

Paper, carbon paper, ruler, pencil, pair of scissors, glue.

Procedure:

Step1: On a sheet of paper draw two intersecting lines AB and CD. Let the two lines intersect at O.

Step 2: Label the two pairs of vertically opposite angles as angle1 opposite to angle 2 and angle 3 opposite to angle 4.

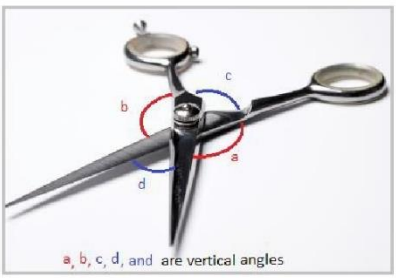
Step 3: Make a duplicate of angle 2 and angle 3 and cut it.

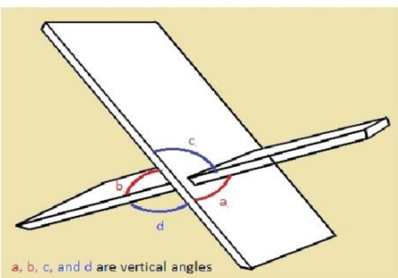
Step 4: Place the cut out of angle 2 on angle 1. Are they equal?

Step 5: Place the cut out of angle 3 on angle 4. Are they equal? Write your observations and result.

39

In real life, vertical angles are shown as follows:





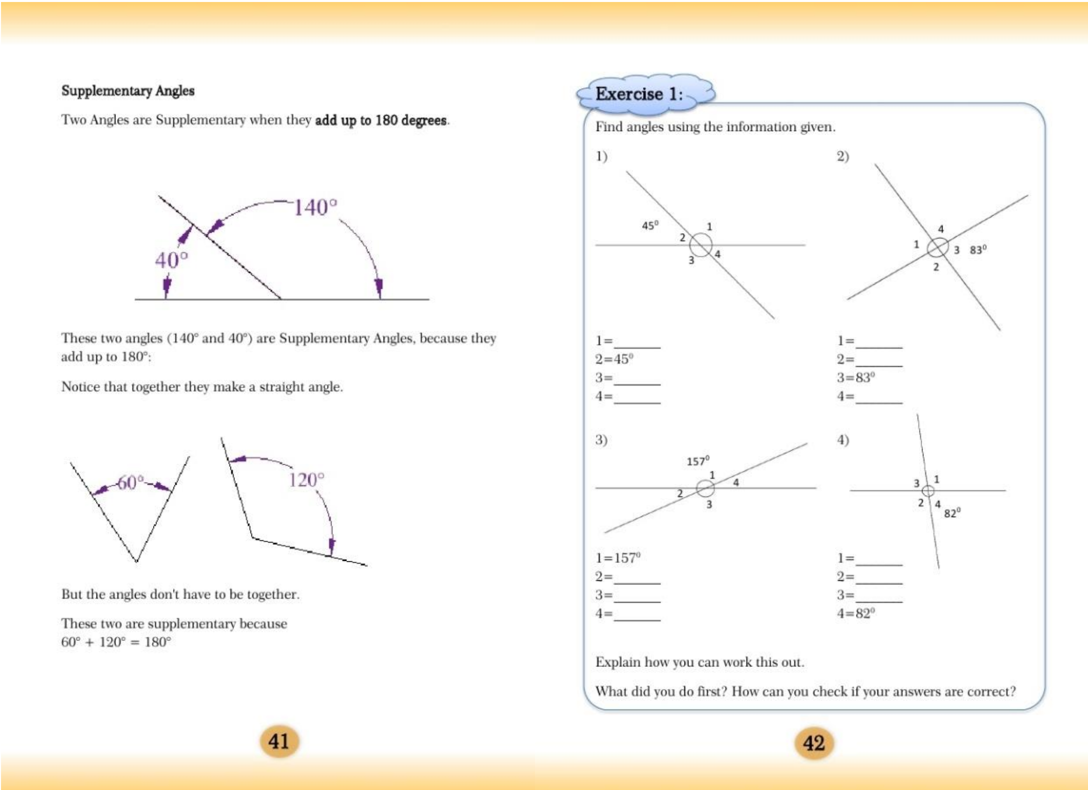
40

To calculate the angles that are unknown;
Remember y=x let

$360^0 = A+B+y+x$

Use the notes and example 1 in the learner's book to explain further on how to find the angles that are unknown in relation to the vertically opposite angles.

Activity 3 should be used by the learners to practise using the objects that they make. Assess them thoroughly to ensure they understand this concepts and how to apply them in real life.


Supplementary Angles

Two Angles are Supplementary when they **add up to 180 degrees**.

These two angles (140° and 40°) are Supplementary Angles, because they add up to 180°:

Notice that together they make a straight angle.

But the angles don't have to be together.

These two are supplementary because
60° + 120° = 180°

41

Exercise 1:

Find angles using the information given.

1)
1=_____
2=45°
3=_____
4=_____

2)
1=_____
2=_____
3=83°
4=_____

3)
1=157°
2=_____
3=_____
4=_____

4)
1=_____
2=_____
3=_____
4=82°

Explain how you can work this out.

What did you do first? How can you check if your answers are correct?

42

Supplementary angles.

Lesson focus

Either of the two angles adds up to 180^0. That is when they are put together they make a straight line.
When the two angles add up to 180^0 we say they supplement each other.
Use the notes in the learner's book to elaborate more to the learners.

Exercise 1

Expected Answer

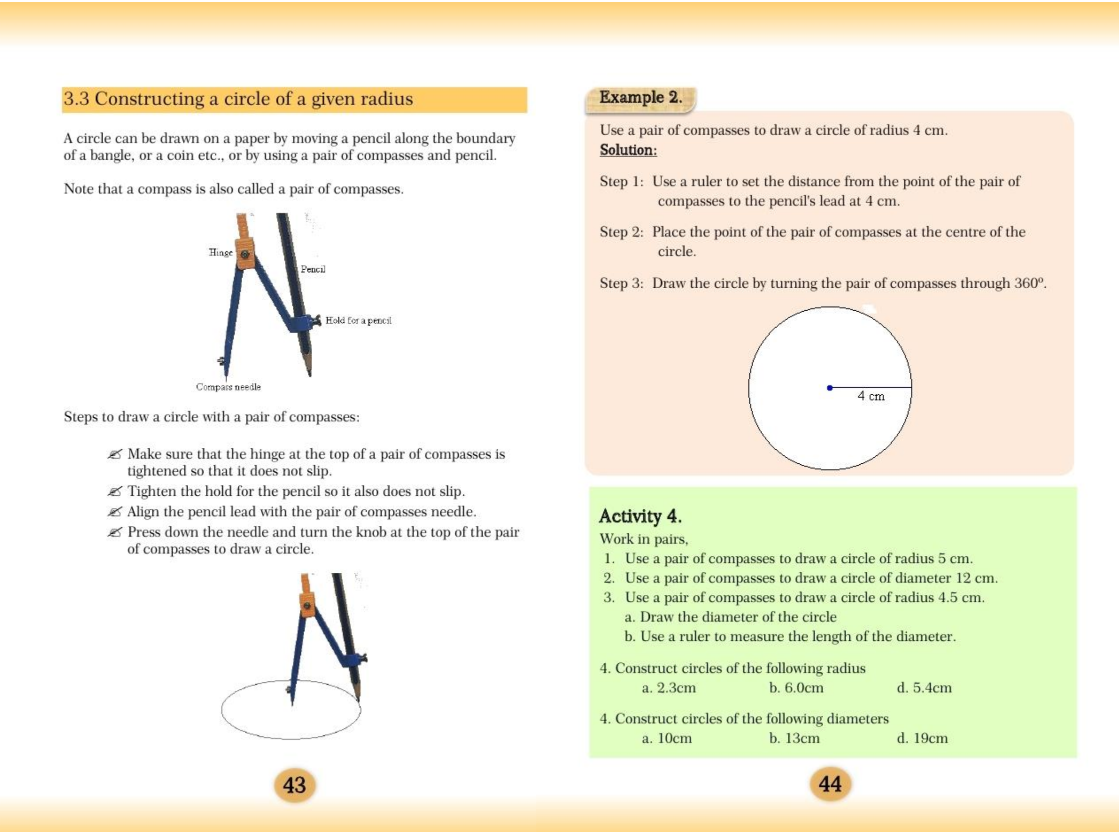
1. 1=135^0 2= 45^0 3= 135^0 4= 45^0
2. 1= 83^0 2= 97^0 3= 83^0 4= 97^0
3. 1= 157^0 2= 23^0 3= 157^0 4= 23^0
4. 1= 98^0 2= 98^0 3= 82^0 4=82^0

Ask learners how they got their answer assess their understanding.

3.3 Constructing a circle of a given radius

Starter activity

Provide a chalkboard, a pair of compasses, a ruler and a pencil or a mathematical set. Take the learners outside and demonstrate how to draw a circle on the ground before they come back for demonstration on how to draw same on paper.



3.3 Constructing a circle of a given radius

A circle can be drawn on a paper by moving a pencil along the boundary of a bangle, or a coin etc., or by using a pair of compasses and pencil.

Note that a compass is also called a pair of compasses.

Steps to draw a circle with a pair of compasses:

- Make sure that the hinge at the top of a pair of compasses is tightened so that it does not slip.
- Tighten the hold for the pencil so it also does not slip.
- Align the pencil lead with the pair of compasses needle.
- Press down the needle and turn the knob at the top of the pair of compasses to draw a circle.

43

Example 2.

Use a pair of compasses to draw a circle of radius 4 cm.

Solution:

Step 1: Use a ruler to set the distance from the point of the pair of compasses to the pencil's lead at 4 cm.

Step 2: Place the point of the pair of compasses at the centre of the circle.

Step 3: Draw the circle by turning the pair of compasses through 360°.

Activity 4.

Work in pairs,

1. Use a pair of compasses to draw a circle of radius 5 cm.
2. Use a pair of compasses to draw a circle of diameter 12 cm.
3. Use a pair of compasses to draw a circle of radius 4.5 cm.
   a. Draw the diameter of the circle
   b. Use a ruler to measure the length of the diameter.

4. Construct circles of the following radius
   a. 2.3cm b. 6.0cm d. 5.4cm

4. Construct circles of the following diameters
   a. 10cm b. 13cm d. 19cm

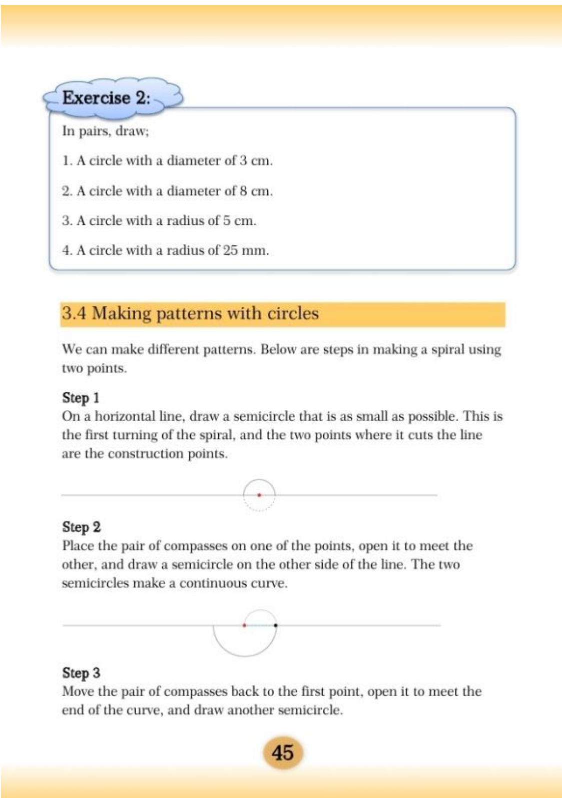
44

Lesson focus

Introduce the lesson by discussing the difference between a **free-hand sketch** or drawing, and a drawing or construction made to specified dimensions. First show learners how they can draw neat accurate circles by tracing around circular objects.

Allow learners to draw a few circles of their own and ask them to measure the diameters and radii of the circles they have drawn. Explain the different concepts of radius, diameter and circumference of a circle. Ensure that all learners can measure correctly using a ruler and protractor and that they are comfortable using a compass. Demonstrate how to draw a circle using a compass when given a certain radius or diameter. Refer to the steps on drawing a circle on page 43 in the learners' book.

Use example 2 in the learner's book for more practise.



Exercise 2:

In pairs, draw;

1. A circle with a diameter of 3 cm.
2. A circle with a diameter of 8 cm.
3. A circle with a radius of 5 cm.
4. A circle with a radius of 25 mm.

3.4 Making patterns with circles

We can make different patterns. Below are steps in making a spiral using two points.

Step 1
On a horizontal line, draw a semicircle that is as small as possible. This is the first turning of the spiral, and the two points where it cuts the line are the construction points.

Step 2
Place the pair of compasses on one of the points, open it to meet the other, and draw a semicircle on the other side of the line. The two semicircles make a continuous curve.

Step 3
Move the pair of compasses back to the first point, open it to meet the end of the curve, and draw another semicircle.

45

Give the learners activity 4 to attempt in pairs then assess their work.

The exercise in the learner's book should be attempted by the learners individually to assess their understanding on this concept of drawing circles using given radius and diameters.

Exercise 2

Expected Answer

Mark this according to the learners drawing and your knowledge on construction.

3.4 Making patterns with circles

Starter activity

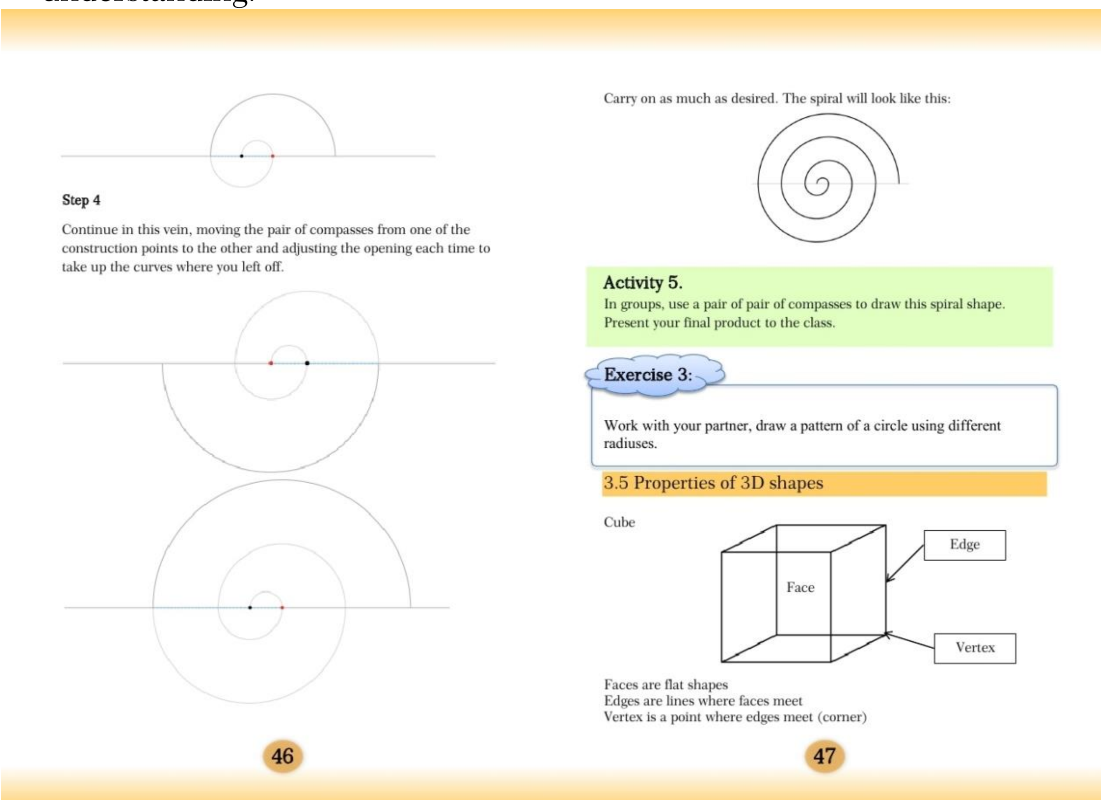
Take the learners outside with you leading with an example let every learner draw atleast two patterns with circle. Come back to class and demonstrate to them on how to draw the same on a paper.

Lesson focus

This is a practical lesson and as teacher each learner's participation is key. Ensure each learner is active in this lesson.

Use the notes and the steps in the learner's book to demonstrate, explain and elaborate on making patterns with circles. Give real life examples.

Let the learners attempt exercise 3 and assess their capability and understanding.



Step 4

Continue in this vein, moving the pair of compasses from one of the construction points to the other and adjusting the opening each time to take up the curves where you left off.

46

Carry on as much as desired. The spiral will look like this:

Activity 5.
In groups, use a pair of pair of compasses to draw this spiral shape. Present your final product to the class.

Exercise 3:

Work with your partner, draw a pattern of a circle using different radiuses.

3.5 Properties of 3D shapes

Cube

Faces are flat shapes
Edges are lines where faces meet
Vertex is a point where edges meet (corner)

47

3.5 Making cubes and cuboids

Faces are flat shapes
Edges are lines where faces meet
Vertex is a point where edges meet (corner)

A cube has:
- 6 square faces
- 8 vertices
- 12 Edges

3.6 Making cubes and cuboids

Cubes and cuboids are familiar objects you encounter numerous times in daily lives.

Starter activity

Learners to give real life objects that are in cubes and cuboid shapes.

Lead the learners in differentiating between a cube and a cuboid.

Similarities

Cubes and cuboids have six faces, twelve edges and eight corners.

They contain exclusively right angles.

The formulas of finding both of their volumes are the same.

Differences

Each face of a cube is a square, and all of these squares are of equal size.

Each face of a cuboid is a rectangle. At least four of these rectangles will be identical.

Cubes and cuboids

Lesson focus

Simple steps to do with the learners:

1. Get some cardstock paper. It’s important that the paper is thick enough that it will hold its shape and will not bend if you fill it with an object. It should not be too thick which will prevent from being able to make a crisp.
2. Use a rule to draw a cross shape on the paper. The cross should be composed of a square in the centre with four squares adjacent on all sides. These squares will fold up to form the sides of the box.
3. Add an extra square to the bottom of the cross. Make sure there is enough space.
4. Add flaps. These should be on the sides of the top, left and right of the cross leaving the joint two squares at the bottom as they are.
5. Cut out the cross shape with a pair of scissors. Cut outside the line of the flaps and do not cut any of the lines connecting the squares.
6. Fold the left and the right sides of the cross upwards making a right angle.
7. Fold the longest part of the cross upright forming a right angle too.
8. Fold the top square of the longest part of the cross over forming the top cube.
9. Put glue to all six sides together hence forming a cube.

NOTE: same process appears to the cuboid but all faces are rectangles.

Use activity 6 and 7 for more practices.

3.7 Conversion of length

Starter activity

Length is measured in metric form.
Remind the learners on what they were taught in primary 5.

Lesson focus

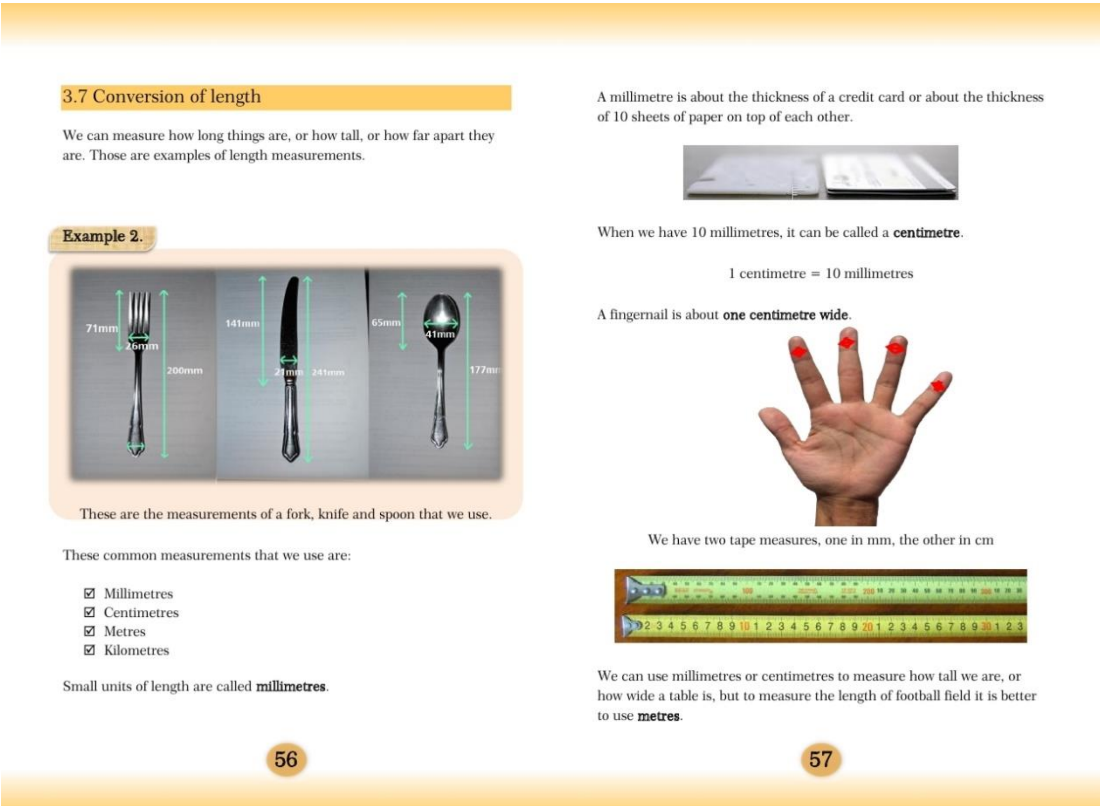
Common measurements used include;

Millimetres (mm)

Centimetres (cm)

Metres (m)

Kilometres (km)



3.7 Conversion of length

We can measure how long things are, or how tall, or how far apart they are. Those are examples of length measurements.

Example 2.

These are the measurements of a fork, knife and spoon that we use.

These common measurements that we use are:

- ☑ Millimetres
- ☑ Centimetres
- ☑ Metres
- ☑ Kilometres

Small units of length are called **millimetres**.

56

A millimetre is about the thickness of a credit card or about the thickness of 10 sheets of paper on top of each other.

When we have 10 millimetres, it can be called a **centimetre**.

1 centimetre = 10 millimetres

A fingernail is about **one centimetre wide**.

We have two tape measures, one in mm, the other in cm

We can use millimetres or centimetres to measure how tall we are, or how wide a table is, but to measure the length of football field it is better to use **metres**.

57

Explain to the learners how to convert given lengths using the examples given in the learner's book.

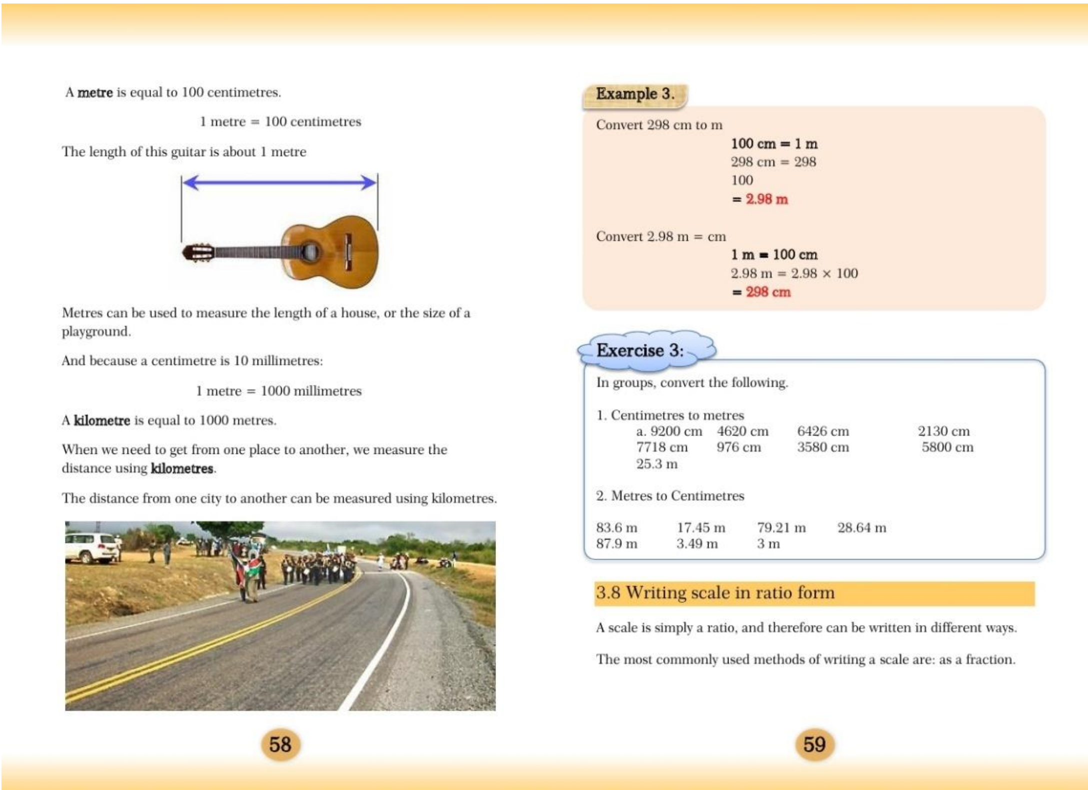
Guide learners to measure real life objects like spoons plates, and parade ground. Convert the found lengths into millimetres, centimetres metres and kilometres.

With the help of these let the learners practice more on conversion of length.

1cm = 10mm

1m = 100cm

1km = 1000m



A **metre** is equal to 100 centimetres.

1 metre = 100 centimetres

The length of this guitar is about 1 metre

Metres can be used to measure the length of a house, or the size of a playground.

And because a centimetre is 10 millimetres:

1 metre = 1000 millimetres

A **kilometre** is equal to 1000 metres.

When we need to get from one place to another, we measure the distance using **kilometres**.

The distance from one city to another can be measured using kilometres.

58

Example 3.

Convert 298 cm to m

100 cm = 1 m

298 cm = 298

100

= 2.98 m

Convert 2.98 m = cm

1 m = 100 cm

2.98 m = 2.98 × 100

= 298 cm

Exercise 3:

In groups, convert the following.

1. Centimetres to metres

a. 9200 cm 4620 cm 6426 cm 2130 cm
7718 cm 976 cm 3580 cm 5800 cm
25.3 m

2. Metres to Centimetres

83.6 m 17.45 m 79.21 m 28.64 m
87.9 m 3.49 m 3 m

3.8 Writing scale in ratio form

A scale is simply a ratio, and therefore can be written in different ways.

The most commonly used methods of writing a scale are: as a fraction.

59

Use example 2 and 3 for more explanation and demonstration of this concept.

Exercise 3

Expected Answer

Centimetres to metres

1. a) 92m b) 46.2m c) 64.26m
   d) 21.3 m e) 77.18m f) 9.76m

g) 35.8m   h) 58m   i) 25.3m

Metres to centimetres

2. a) 8360cm   b) 1745cm   c) 7921cm
   d) 2864cm   e) 8790cm   f) 349cm
   g) 3000cm

3.8 Writing scale in ratio form

As learnt in the previous unit on ratios it will be easier to tackle this sub unit.

Use the notes in the learner's book to elaborate more.

Example 4(page 60) will help you explain this concept to learners and be able to come up with more examples.

For example; when writing a ratio of 1cm = 10mm

Write into fractions which is $\frac{1}{10}$

To ratio it will be 1: 10

3.9 Making scale drawing

Starter activity

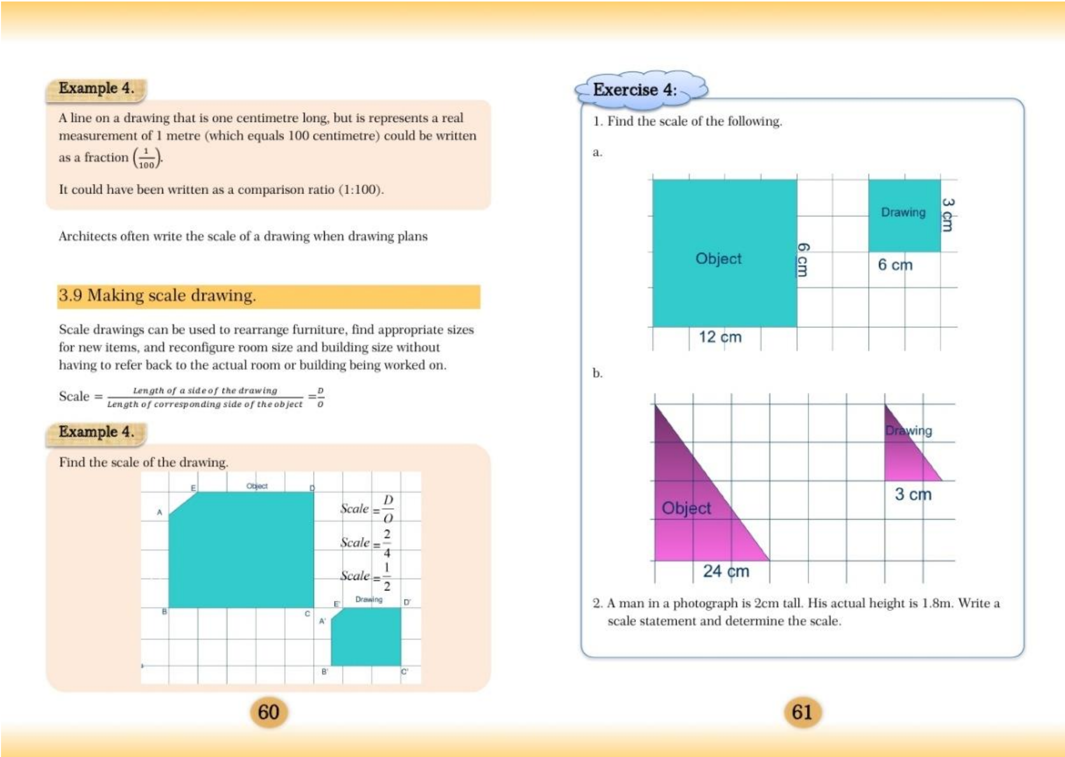
With your help, review solving proportions in primary 5. Learners to give real life examples to be drawn into scale. For example a real car cannot fit into a piece of paper, it has to be drawn by scale to fit in a piece of paper.

Lesson focus

To find the scale, length of a side of the drawing is divided by the length of the corresponding side of the object.

Use example 4 to elaborate more of this basic concept.

The learners to attempt the exercise 3 and assess their understanding.



Example 4.

A line on a drawing that is one centimetre long, but is represents a real measurement of 1 metre (which equals 100 centimetre) could be written as a fraction $\left(\frac{1}{100}\right)$.

It could have been written as a comparison ratio (1:100).

Architects often write the scale of a drawing when drawing plans

3.9 Making scale drawing.

Scale drawings can be used to rearrange furniture, find appropriate sizes for new items, and reconfigure room size and building size without having to refer back to the actual room or building being worked on.

$$\text{Scale} = \frac{\text{Length of a side of the drawing}}{\text{Length of corresponding side of the object}} = \frac{D}{O}$$

Example 4.

Find the scale of the drawing.

$Scale = \frac{D}{O}$

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

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

60

Exercise 4:

1. Find the scale of the following.

a.

b.

2. A man in a photograph is 2cm tall. His actual height is 1.8m. Write a scale statement and determine the scale.

61

Exercise 4

Expected Answer

a) ½

b) 1/8

UNIT 4: ALGEBRA

Learn about	Key inquiry questions
✍ Learners should review their prior learning about the significance of the equals sign and balancing either side of the equals sign. This includes the use of algebraic notation and substitution. ✍ In groups, they should investigate algebraic expressions with and without brackets (e.g. $3x + y - 8x + 3y \textit{ and } 3x(y + 1 + 2y)$) and simplify them, and develop their skills and knowledge to solve more complex equations (e.g. $3x + 6 = 2x$) with one unknown. ✍ Learners should understand that numbers and figures in brackets should be worked out first, then any powers, then division and multiplication, and finally addition and subtraction. The acronym BODMAS can be helpful.	• How do we describe simple equations in one unknown? • How do we form algebraic expressions and how do we simplify with or without brackets? • Why do we apply algebraic expressions in daily activities?

<table>
<tr><th colspan="3">Learning outcomes</th></tr>
<tr><th>Knowledge and understanding</th><th>Skills</th><th>Attitudes</th></tr>
<tr><td>• Simple equations with one unknown.
• Simplification of algebraic expressions with and without brackets.</td><td>• Be able to solve simple equations in one variable.
• Simplify algebraic expressions.</td><td>• Enjoy solving simple equations and working with algebraic expressions.
• Appreciate the uses of algebraic equations and expressions.
• Confidence to investigate and to take responsibility for their own learning.</td></tr>
<tr><td colspan="3">Contribution to the competencies:
<u>Critical thinking</u>: through solving problems involving algebraic expressions and equations and their applications in their daily life
<u>Communication and Co-operation</u>: group work</td></tr>
<tr><td colspan="3">Links to other subjects:
Links to a range of subjects such as Science and Social Studies using algebra</td></tr>
</table>

Introduction

This unit has been taught in primary 4, 5 and now six therefore it will be easier to introduce it because the learners have ideas on what algebra is.

Objectives

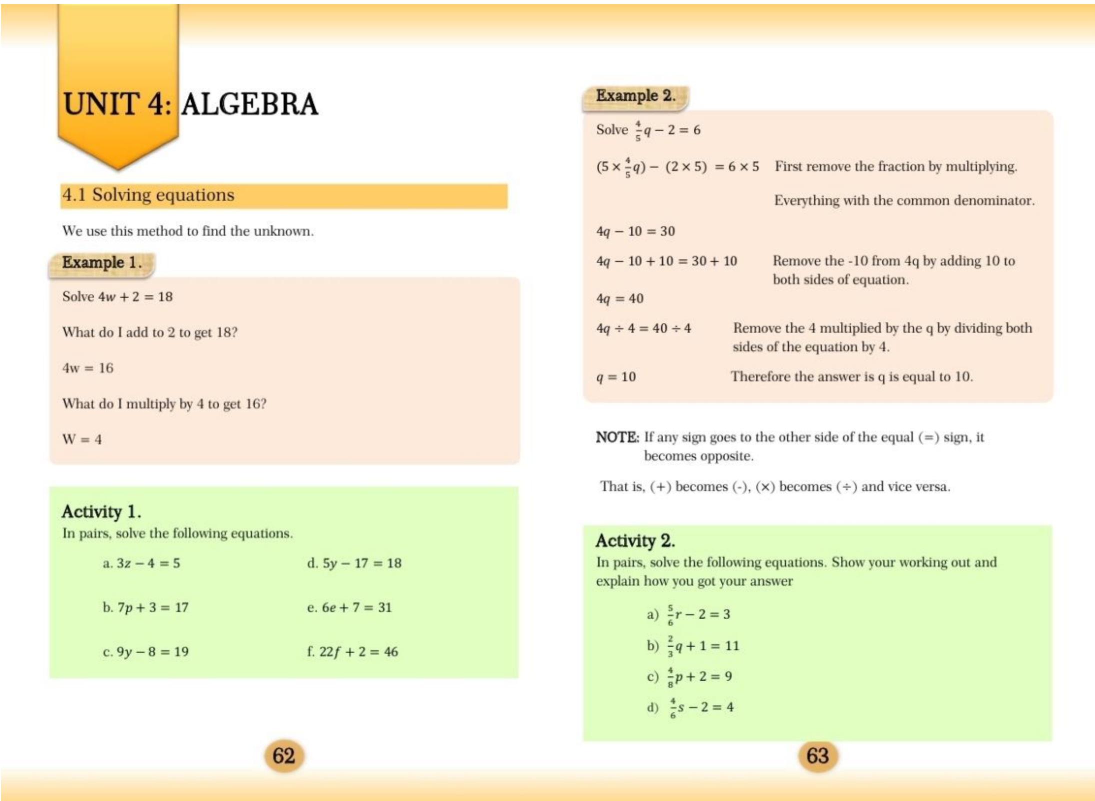
By end of the unit the learners should be able to;

- Solve equations i.e. finding the value of the unknown.
- Simplify the equations.

4.1 Solving equations

Starter activity

Remind the learners on what they learnt in primary five about algebra. Allow the learners to give out a few examples on algebraic expressions Real life example is encouraged because it will not be easily be forgotten by the learners.



UNIT 4: ALGEBRA

4.1 Solving equations

We use this method to find the unknown.

Example 1.

Solve $4w + 2 = 18$

What do I add to 2 to get 18?

4w = 16

What do I multiply by 4 to get 16?

W = 4

Activity 1.

In pairs, solve the following equations.

a. $3z - 4 = 5$

b. $7p + 3 = 17$

c. $9y - 8 = 19$

d. $5y - 17 = 18$

e. $6e + 7 = 31$

f. $22f + 2 = 46$

62

Example 2.

Solve $\frac{4}{5}q - 2 = 6$

$(5 \times \frac{4}{5}q) - (2 \times 5) = 6 \times 5$ First remove the fraction by multiplying.

Everything with the common denominator.

$4q - 10 = 30$

$4q - 10 + 10 = 30 + 10$ Remove the -10 from 4q by adding 10 to both sides of equation.

$4q = 40$

$4q \div 4 = 40 \div 4$ Remove the 4 multiplied by the q by dividing both sides of the equation by 4.

$q = 10$ Therefore the answer is q is equal to 10.

NOTE: If any sign goes to the other side of the equal (=) sign, it becomes opposite.

That is, (+) becomes (-), (×) becomes (÷) and vice versa.

Activity 2.

In pairs, solve the following equations. Show your working out and explain how you got your answer

a) $\frac{5}{6}r - 2 = 3$

b) $\frac{2}{3}q + 1 = 11$

c) $\frac{4}{8}p + 2 = 9$

d) $\frac{4}{6}s - 2 = 4$

63

Lesson focus

Notes in the learner's book will be much useful therefore use the examples in the learner's book to teach your lessons.
Explain further using the activities provided. Let the learners attempt the exercise provided to assess the capability and understanding.

Activity 1

Expected Answers

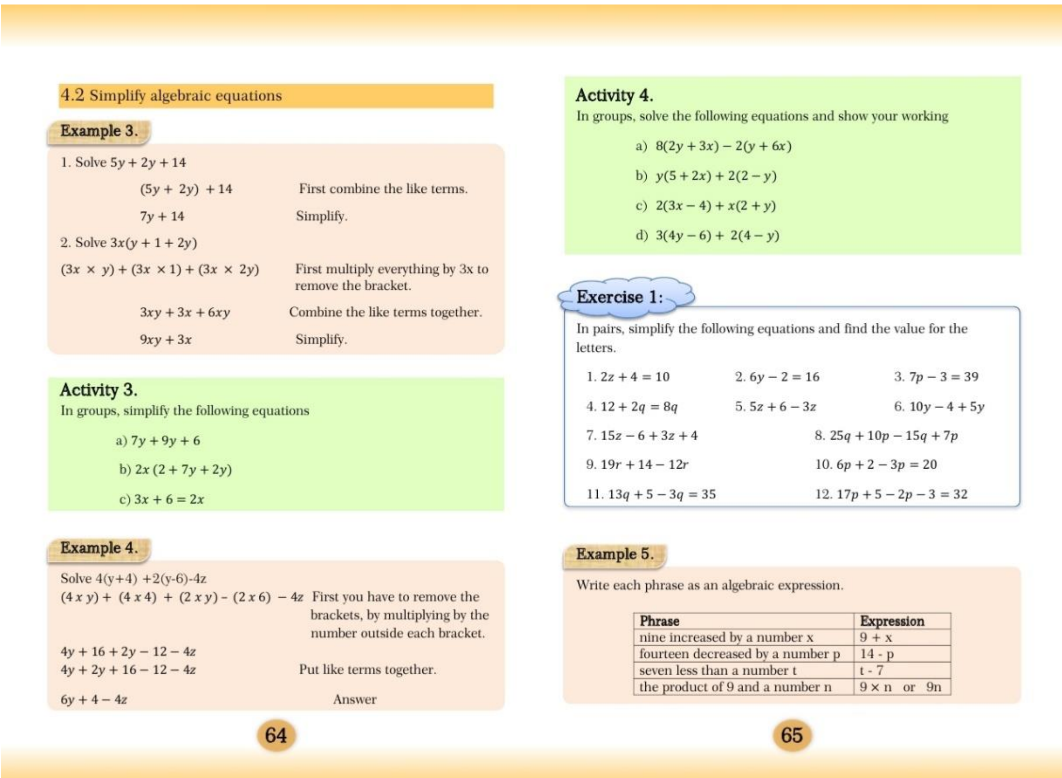
a. 3
b. 2
c. 3
d. 7
e. 4
f. 2

Activity 2

Expected Answers

a. 6
b. 15
c. 14
d. 9

4.2 Simplify algebraic equations


4.2 Simplify algebraic equations

Example 3.

1. Solve $5y + 2y + 14$

$(5y + 2y) + 14$ — First combine the like terms.

$7y + 14$ — Simplify.

2. Solve $3x(y + 1 + 2y)$

$(3x \times y) + (3x \times 1) + (3x \times 2y)$ — First multiply everything by 3x to remove the bracket.

$3xy + 3x + 6xy$ — Combine the like terms together.

$9xy + 3x$ — Simplify.

Activity 3.

In groups, simplify the following equations

a) $7y + 9y + 6$
b) $2x(2 + 7y + 2y)$
c) $3x + 6 = 2x$

Example 4.

Solve 4(y+4) +2(y-6)-4z

$(4 x y) + (4 x 4) + (2 x y) - (2 x 6) - 4z$ — First you have to remove the brackets, by multiplying by the number outside each bracket.

$4y + 16 + 2y - 12 - 4z$

$4y + 2y + 16 - 12 - 4z$ — Put like terms together.

$6y + 4 - 4z$ — Answer

64

Activity 4.

In groups, solve the following equations and show your working

a) $8(2y + 3x) - 2(y + 6x)$
b) $y(5 + 2x) + 2(2 - y)$
c) $2(3x - 4) + x(2 + y)$
d) $3(4y - 6) + 2(4 - y)$

Exercise 1:

In pairs, simplify the following equations and find the value for the letters.

1. $2z + 4 = 10$
2. $6y - 2 = 16$
3. $7p - 3 = 39$
4. $12 + 2q = 8q$
5. $5z + 6 - 3z$
6. $10y - 4 + 5y$
7. $15z - 6 + 3z + 4$
8. $25q + 10p - 15q + 7p$
9. $19r + 14 - 12r$
10. $6p + 2 - 3p = 20$
11. $13q + 5 - 3q = 35$
12. $17p + 5 - 2p - 3 = 32$

Example 5.

Write each phrase as an algebraic expression.

Phrase	Expression
nine increased by a number x	9 + x
fourteen decreased by a number p	14 - p
seven less than a number t	t - 7
the product of 9 and a number n	9 × n or 9n

65

Activity 5.

Work in pairs, solve the following equations. Discuss how you arrived at your answers.

1) $5z+4=19$	2) $10=\frac{y}{3}+6$	3) $7-3x=-26$
4) $7=\frac{y-5}{2}$	5) $-21=-3+9x$	6) $\frac{n}{7}-5=-2$
7) $-5x+3y-8x$	8) $12-13a+5+7b$	9) $8(-3x+7)$
10) $9-3(8-5x)$	11) $7(5n+8)-12n$	12) $3m-5=19$
13) $45=z+23$	14) $-7+4x=-43$	15) $17=11-x$

Word problems

In life, many problems are disguised in the form of mathematical equations, and if we know the mathematics, it is simple to solve those problems.

Example 6.

Find three consecutive numbers whose sum is 216.

Solution:

1. Understand the problem

The task is to find three consecutive numbers whose total is 216.

2. Write the variable

Let "x" represent the first number

So, x = First number

$x+1$ = Second number

$x+2$ = Third number

3. Write the equation

When you add up all the numbers, you are supposed to get 216.

$x+(x+1)+(x+2) = 216$

$3x+3 = 216$

4. Solve the equation

Subtract 3 from both sides

$3x+3-3 = 216 - 3$

$3x = 213$

Divide each side by 3

$\frac{3x}{3} = 213 \div 3$

$x=71$

5. Check your answer

First number + Second number + Third number = 216

$x+(x+1)+(x+2)$

$71 + (71 + 1) + (71 + 2)$

$71 + 72 + 73 = 216$

So the three numbers whose sum is 216 are 71, 72 and 73

Example 7.

The area of a rectangle is $72cm^2$, in which the width is twice its length. What is the dimension of the rectangle?

Solution:

1. Understand the problem

The area of a rectangle is 72 cm. The width is twice its length. What is the length and width of the rectangle?

2. Write the variable

Let "x" be the length and "$2x$" be the width

3. Write the equation

Length × Width = Area

$x \times (2x) = 2x^2$ = Area

4. Solve the equation

$2x^2$ = Area

$2x^2 = 72$

$x^2 = \frac{72}{2}$

$x2 = 36$

$x = 6$

x = Length

So, the length is 6 cm

The width is twice its length

$2x = 2x6 = 12$

So, the width is 12 cm

5. Check your answer

The length is 6 cm and width is 12 cm

The perimeter i.e. the distance around the edges is the sum of lengths and widths. Since rectangle has two lengths and two breadths, hence the equation is,

2 × (Length + Width)

$2 \times (6 + 12) = 2x18 = 36$ cm

Exercise 2:

Using the strategy shares, solve the equations below;

1) $4(3y-5)-7y=-60$	2) $19=9+2(x-7)$	3) $10x-7x=12$
4) $9z+11-5z=27$	5) $-7+6n-9=-4$	6) $6(y+7)=66$

In pairs, write the equations for the problems below then solve them.

a) The product of negative 4 and y increased by 11 is equivalent to -5.

b) Eight more than five times a number is negative 62.

c) 8 less than twice a number is twelve.

d) The product of 5 and x decreased by 7 is as much as 42.

e) How old am I if 400 reduced by 2 times my age is 244?

f) For a field trip 4 learners rode in cars and the rest filled nine buses. How many learners were in each bus if 472 learners were on the trip?

g) You bought a magazine for SSP100 and four erasers. You spent a total of SSP 180. How much did each eraser cost?

Activity 3

Expected Answers

a. $16y + 6$ b. $4x + 18xy$ c. $x = -6$

Activity 4

Expected Answers

a. $14y + 12x$

b. $3y + 2xy + 4$

c. $8x - 8 + xy$

d. $10y - 10$

Exercise 1

Expected Answers.

1) 3. 2) 6. 3) 6. 4) 2. 5) -3. 6)$\frac{4}{15}$. 7) 1/9. 8)$q = -\frac{17}{10}q$. 9) -2. 10) 3. 11) 3. 12) 2.

Exercise 2

Expected Answers.

2) 1) -8. 2) 12. 3) 4. 4) 4. 5) 2. 6) 4

a) 4. b) -14. C) 10. d) $\frac{49}{5}$. e) 78. f) 52. g) 20

UNIT 5: STATISTICS

Learn about	Key inquiry questions
✍ Learners should build on their previous knowledge and understanding of presenting and interpreting data in simple tables and charts by conducting surveys and work together to read, interpret and describe data in tabular form. The approach should encourages co-learning and challenge misconceptions. They should present statistical data in pictures, lines, bars, circles and graphs and understand about x and y (vertical and horizontal) axes, scales, and co-ordinates, and investigate problems and develop tools where conversion is required.	• How do we interpret data in a given table? • Why do we interpret data in pictures and circular graphs? • Why do we recognize pictures, bars, lines and circular (pie charts) graphs and their applications in daily life?

Learning outcomes

Knowledge and understanding	Skills	Attitudes
• Reading and interpretation of data from tables. • Recognising and interpreting picture, line and circle graphs.	• Able to read and interpret data from the given table. • Draw, recognize and interpret data in form of pictures, lines, bars and circle graphs.	• Appreciate data interpretation and the importance of statistical pictures, bars, lines and circular graphs and their interpretation. • Confidence to investigate and take responsibility for their own learning.

Contribution to the competencies:
Critical thinking: in the interpretation of data.
Communication and Co-operation: group work.

Links to other subjects:
Links to a range of subjects such as Science and Social Studies using statistics.

Objectives

By the end of this unit, learners should be able to:

- Read and interpret data from tables.
- Prepare a tally of data.
- Draw charts, graphs, and pictograms of information collected locally and be able to read and interpret them.

5.1 Reading and interpretation of data from tables

Key word definitions

Tally: a recorded count of scores.

Pictogram: a graph using pictures to represent numbers.

Data: a set of facts or numbers.

Table: information arranged in rows and columns.

Graph: a diagram that represents data.

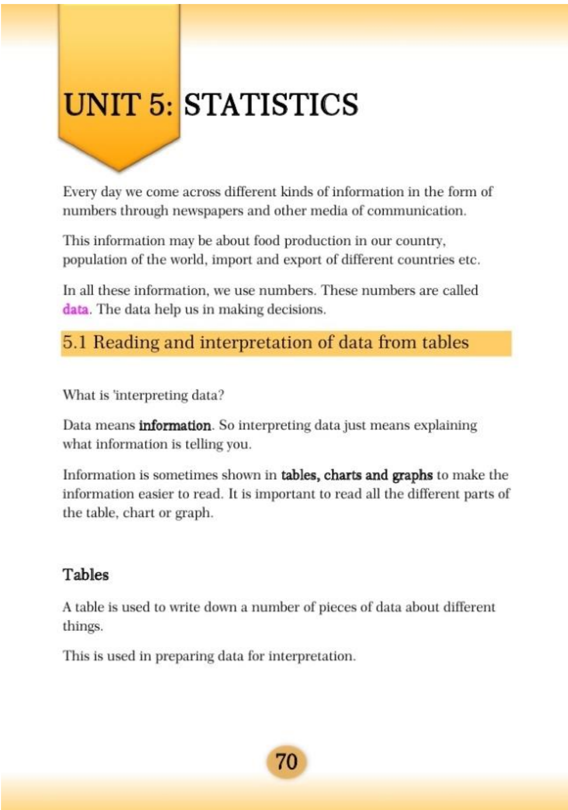
Tables

Starter activity

Revise the concept of a table by showing learners examples of different types of tables. Point out to learners that tables are used to represent information.

Tables also allow us to interpret the information easier. Hands out copies of tables that represent different types of information and ask learners to explain what information each of their tables represent.

Learners to collect data from the school compound for example the number of boys and girls from primary 4 to primary 8.


UNIT 5: STATISTICS

Every day we come across different kinds of information in the form of numbers through newspapers and other media of communication.

This information may be about food production in our country, population of the world, import and export of different countries etc.

In all these information, we use numbers. These numbers are called **data**. The data help us in making decisions.

5.1 Reading and interpretation of data from tables

What is 'interpreting data?

Data means **information**. So interpreting data just means explaining what information is telling you.

Information is sometimes shown in **tables, charts and graphs** to make the information easier to read. It is important to read all the different parts of the table, chart or graph.

Tables

A table is used to write down a number of pieces of data about different things.

This is used in preparing data for interpretation.

70

Lesson focus

Make sure learners understand how to represent data using tables. This lesson should not cause problems as it follows on from work in previous years.

If possible remind them on primary 5 work on tables. The learners should be able to represent the information or data collect into the tables.

Use the notes in the learner's book to elaborate more about tables.

Example 1(page 72) is an example of a table.

Tables make information easily understood.

Tally marks and frequency tables

Starter activity

Revise the concept of a table by showing learners examples of different types of tallies. Point out to learners that tables are used to represent information.

Tables also allow us to interpret the information easier. Hand out copies of frequency tables that represent different types of information and ask learners to explain what information each of their frequency tables represent.

Lesson focus

This lesson focuses on the interpretation and representation of data in frequency tables. The lesson also shows how the uses of tally tables are extended. Work through the example on page 61 of the learner's book and explain how a given set of data is transformed into a tally table and then a frequency table.

Emphasis that a tally table and a frequency table do much the same thing with the data set.

Refer notes more notes on the learners book.

You can give out more examples.

Example 1.

Table example

Name	Colour	Number of gears	Price
Ranger	Silver	5	£140
Outdoor	Blue	10	£195
Tourer	Red	15	£189
Starburst	Silver	15	£215
Mountain	White	5	£129

The **title** of the table tells us what the table is about.

The **headings** tell us what data is in each column.

To find out the colour of the tourer bike, you look across the Tourer row until it meets the colour column. So a Tourer bike is red.

Tally marks and frequency tables

Tally marks are used for **counting** things. They are small vertical lines (like the number 1) each one representing one unit.

The 5th tally mark in a group is always drawn across the first four - as this makes it easier to count the total in groups of five.

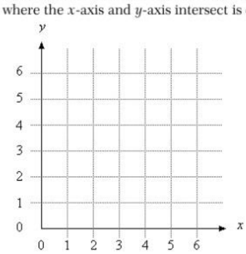
In the second column of the table below, we have used tally marks to keep track of how many bikes we have sold.

This table is known as a **frequency table** and it shows the totals of the tally marks at the bottom.

Bike	Tally	Total
Ranger	|||	3
Outdoor	~~||||~~	5
Tourer		0
Starburst	||	2
Mountain	~~||||~~ ~~||||~~	10
Total bikes sold	~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~	20

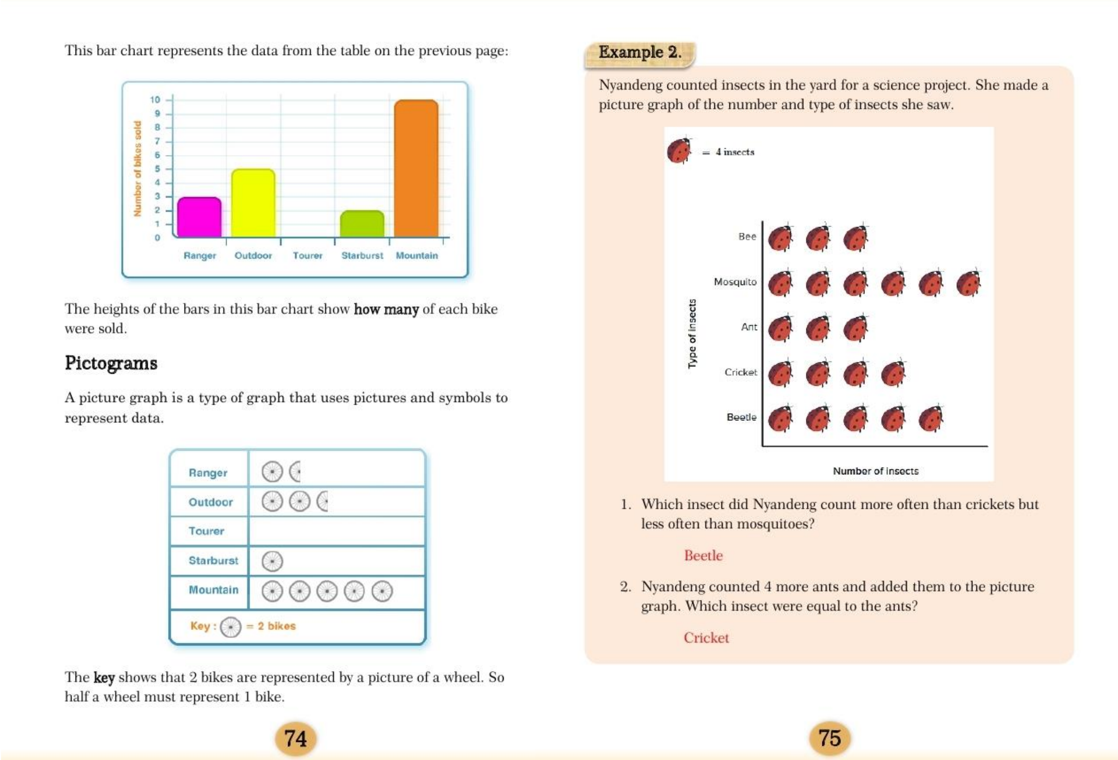
5.2 *x* and *y* axes, scale and co-ordinates

x and y axes are two perpendicular lines, labeled like number lines. The **horizontal axis** is called the ***x*-axis**. The **vertical axis** is called the ***y*-axis**. The point where the *x*-axis and *y*-axis intersect is called the **origin**.



5.2 x and y axes, scale and co-ordinates

x and y axes are two perpendicular lines, labeled like number lines. The **horizontal axis** is called the ***x*-axis**. The **vertical axis** is called the ***y*-axis**. The point where the x-axis and y-axis intersect is called the **origin**.



This bar chart represents the data from the table on the previous page:

The heights of the bars in this bar chart show **how many** of each bike were sold.

Pictograms

A picture graph is a type of graph that uses pictures and symbols to represent data.

The **key** shows that 2 bikes are represented by a picture of a wheel. So half a wheel must represent 1 bike.

74

Example 2.

Nyandeng counted insects in the yard for a science project. She made a picture graph of the number and type of insects she saw.

1. Which insect did Nyandeng count more often than crickets but less often than mosquitoes?

   Beetle

2. Nyandeng counted 4 more ants and added them to the picture graph. Which insect were equal to the ants?

   Cricket

75

Pictogram

Lesson focus

This lesson focuses on the interpretation and representation of data in pictograms. Pictograms are normally colorful and visually appealing graphs.

With the drawn pictograms let the learners read interpret and help them understand how to read it.

Us e the example in page 76 and 77 of the learner's book to elaborate reading and interpreting more on pictograms.

Bar charts

Starter activity

Draw a table on the board to summarize the ages of the learners in your class. The table below is an example. Adapt the first column to reflect the actual ages of your learners. Complete the table by asking your learners to put up their hands for questions such as 'How many of you are 11 years old?' and so on.

Make sure that the total number of learners matches the number of learners present in your class. If your class has narrower age gaps, adapt the first column to reflect the actual ages of your learners. You should aim for about six age groups.

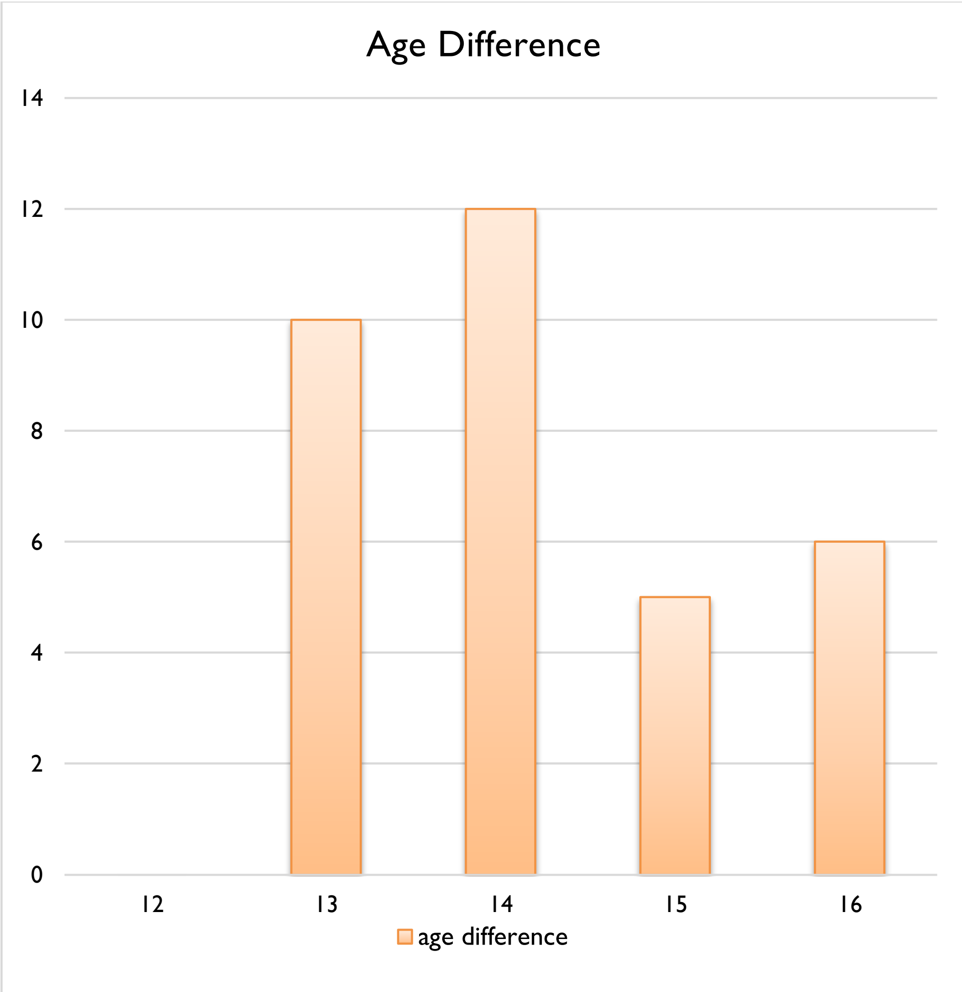
If you have a narrower age range, then use smaller age divisions, for example six, four or three months apart. Now draw a bar chart for the age differences.

Lesson focus

This lesson focuses on the representation of data in bar chart. This lesson is an extension of the previous lessons and teaches another method of representing data visually.

For instance, using the data collected in class.

Number of learners	0	10	12	5	6
Age	12	13	14	16	17



This is just an example.

The learners should be able to read different bar graphs and answer appropriate answers from bar graphs drawn.

Use the example in the learner's book to elaborate more.

Pie charts

This is one of the concepts discussed in primary 5 and the learners should remind themselves with your help on what they were taught.

Pie charts

A circle graph is a visual way of displaying data that is written in percentages.

The circle represents 100%. The circle is divided into sections.

Each section shows what part of 100 that item represents.

The circle graph uses different colors for each category being described.

The colours are used to show different segments.

Example 4.

This circle graph describes a Nick's spending habits. Looking at it with your partner discuss how Nick spends his money.

What percent is not spent on saving?

Solution:

Each color represents what money is spent on. Orange is savings, blue is cloth, and purple is food.

First, look at the wedge that represents savings.

The orange wedge represents the amount spent on savings.

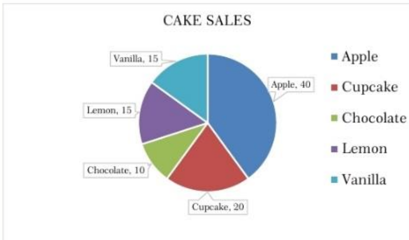
Then, determine about how much of the total is spent on savings.

The orange wedge takes up about half or 50% of the circle.

This circle graph shows that half of the money is saved.

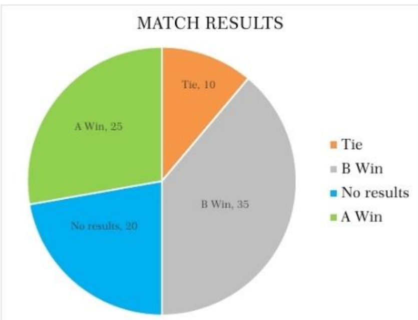
Exercise 1:

1. John has a cake shop. This month he sold the following number of cakes.



a) How many apple cakes sold in a month?
b) Which two cakes sold in the same volume?
c) Which cake sold more than lemon cakes?
d) Which cakes were most popular?
e) Which cakes were the least popular?

2. Two Teams A & B played some matches. Here are the results:



a) Which team won the most matches?
b) Which team loss the most matches?
c) How many more matches did one team get over the other?
d) What is the difference between ties and no result matches?
e) How many matches did the teams play?

It's a circular statistical graphic which is divided into slices to illustrate numerical proportion.

Pie charts are really good way of showing relative sizes.

Ensure the learners are able to read and interpret draw pie charts.

Use the examples in the learner's book for more demonstration and elaboration on pie charts.

Line graphs

Also known as the line chart. It's used to visualize the value of something over time.

Starter activity

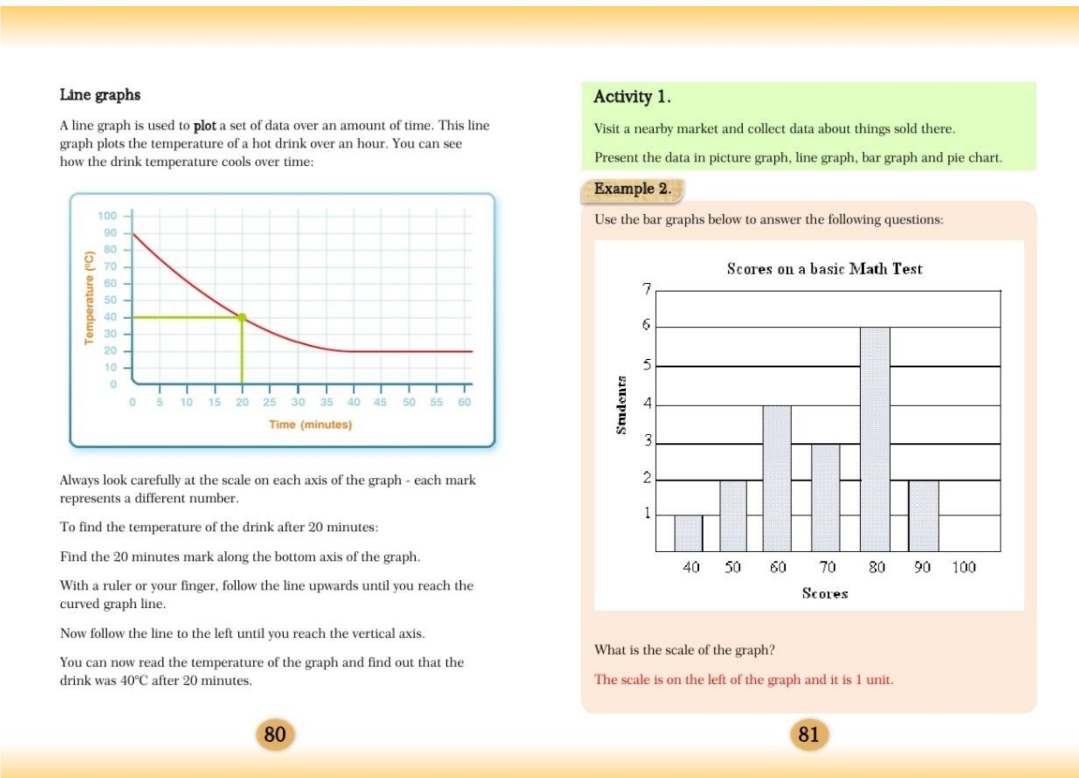
Let the learners collect data on the population around the school.

The population should be easy to the learners which will enable them draw a line graph.

Lesson focus

The line graphs are usually drawn to represent the time series data related to the temperature, rainfall, population growth, birth rates and the death rates.

Use the data and follow the following steps to construct a line graph.



Line graphs

A line graph is used to **plot** a set of data over an amount of time. This line graph plots the temperature of a hot drink over an hour. You can see how the drink temperature cools over time:

Always look carefully at the scale on each axis of the graph - each mark represents a different number.

To find the temperature of the drink after 20 minutes:

Find the 20 minutes mark along the bottom axis of the graph.

With a ruler or your finger, follow the line upwards until you reach the curved graph line.

Now follow the line to the left until you reach the vertical axis.

You can now read the temperature of the graph and find out that the drink was 40°C after 20 minutes.

80

Activity 1.

Visit a nearby market and collect data about things sold there.

Present the data in picture graph, line graph, bar graph and pie chart.

Example 2.

Use the bar graphs below to answer the following questions:

What is the scale of the graph?

The scale is on the left of the graph and it is 1 unit.

81

Construction of a Line Graph

a. Simplify the data by converting it into round numbers such as the growth rate

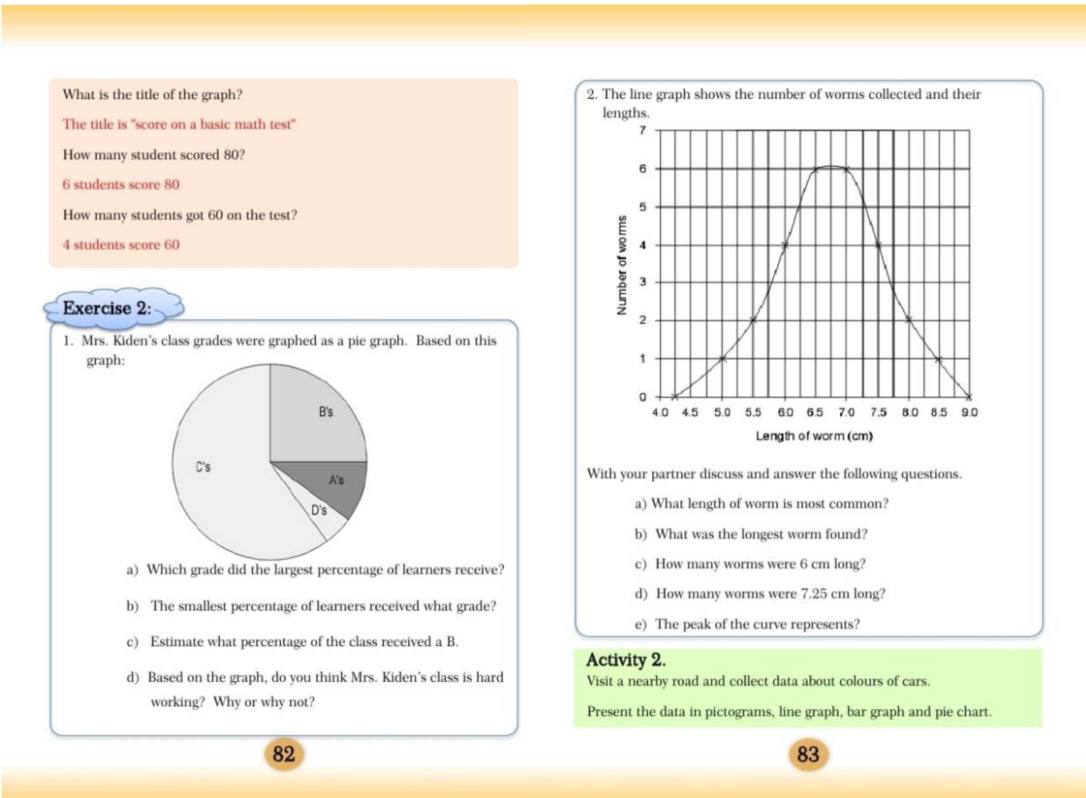
b. Draw X and Y-axis. Mark the time series variables (years/months) on the X axis and the data quantity/value to be plot on Y axis.

c. Choose an appropriate scale and label it on Y-axis. If the data involves a negative figure then the selected scale should also show.

d. Plot the data to depict year/month-wise values according to the selected scale on Y-axis, mark the location of the plotted values by a dot and join these dots by a free hand drawn line.

The learners should be able to read are interpret data from line graphs.

Use activity 1 and 2 to do more practise with the learners and asses their capabilities.



What is the title of the graph?

The title is "score on a basic math test"

How many student scored 80?

6 students score 80

How many students got 60 on the test?

4 students score 60

Exercise 2:

1. Mrs. Kiden's class grades were graphed as a pie graph. Based on this graph:

a) Which grade did the largest percentage of learners receive?

b) The smallest percentage of learners received what grade?

c) Estimate what percentage of the class received a B.

d) Based on the graph, do you think Mrs. Kiden's class is hard working? Why or why not?

82

2. The line graph shows the number of worms collected and their lengths.

With your partner discuss and answer the following questions.

a) What length of worm is most common?

b) What was the longest worm found?

c) How many worms were 6 cm long?

d) How many worms were 7.25 cm long?

e) The peak of the curve represents?

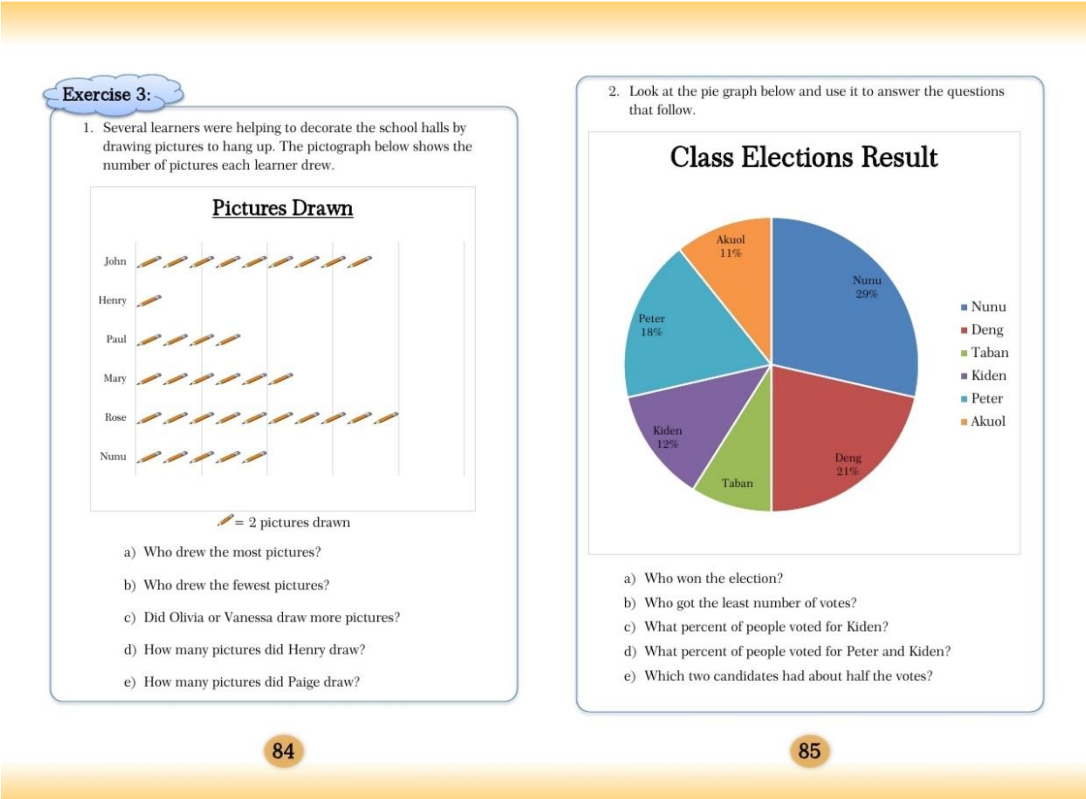
Activity 2.

Visit a nearby road and collect data about colours of cars.

Present the data in pictograms, line graph, bar graph and pie chart.

83

Let the learners attempt exercise one to assess their knowledge and understanding on this unit.



Exercise 3:

1. Several learners were helping to decorate the school halls by drawing pictures to hang up. The pictograph below shows the number of pictures each learner drew.

Pictures Drawn

John
Henry
Paul
Mary
Rose
Nunu

= 2 pictures drawn

a) Who drew the most pictures?

b) Who drew the fewest pictures?

c) Did Olivia or Vanessa draw more pictures?

d) How many pictures did Henry draw?

e) How many pictures did Paige draw?

84

2. Look at the pie graph below and use it to answer the questions that follow.

Class Elections Result

Nunu 29%
Deng 21%
Taban
Kiden 12%
Peter 18%
Akuol 11%

Nunu
Deng
Taban
Kiden
Peter
Akuol

a) Who won the election?

b) Who got the least number of votes?

c) What percent of people voted for Kiden?

d) What percent of people voted for Peter and Kiden?

e) Which two candidates had about half the votes?

85

EXPECTED ANSWERS

Exercise 2

1. a) C's b) D's
   c) Around 90% (measure with a protractor) d) yes he is.

2. a) 6.75cm b) 9cms c) 4 worms d) 3 worms
   e) 6 worms with 6.75 cm