South Sudan

PRIMARY
4

Mathematics

Teacher's Guide 4

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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

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INTRODUCTION

This Primary 4 Mathematics teacher's guide will be used alongside the learner's book. It places the learner at the center of learning as he or she solves mathematical problems.

The learning activities are based on a variety of situations familiar to the learners. Teaching is an interesting endeavor that requires creativity. Try to relate Mathematics activities and problems to relevant, real-life situations.

Components of the book

This primary four 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 unit are as outlined below.

Unit	Title
1	Numbers: percentages and ratios
2	Measurement: area and volume
3	Geometry: angles and lines
4	Algebra: algebraic expressions
5	Statistics: line graphs and bar chars

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.

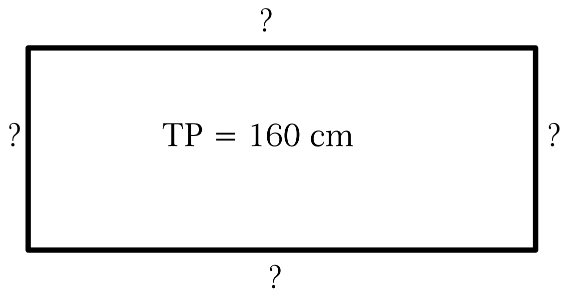
To make the learning explicit, it is important that you create a summary of what has been learnt from solving the problem.

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 $\boldsymbol{50\,cm \times 2 + 30\,cm\ \ 2}$.

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.

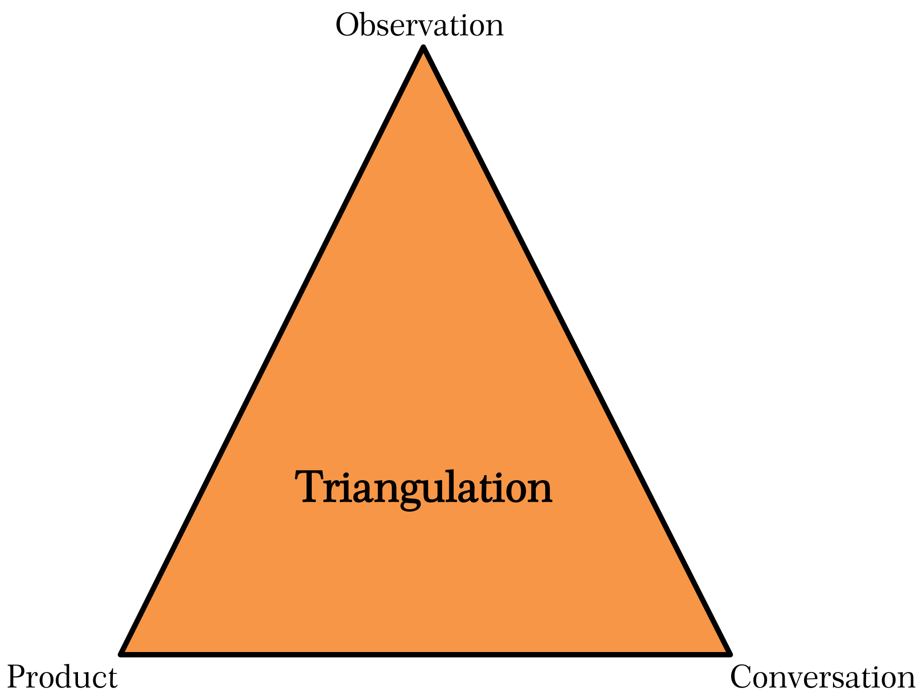
You are advised to set additional exercises depending on the learner's learning abilities.

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

In this unit, learners learn to use local counting systems in the learners' own language as well as learning the formal language used in Mathematics.

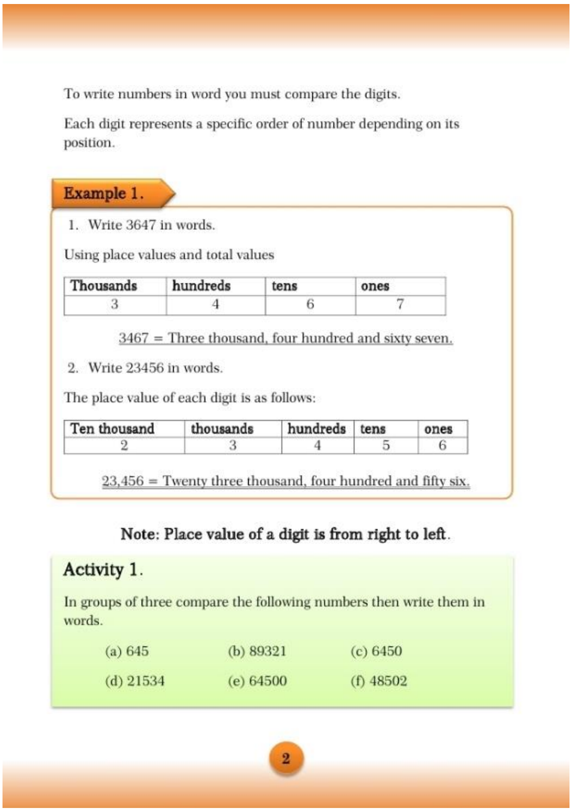
The concept of the four operations (addition, subtraction, multiplication and division) is dealt with in a practical way. The other common forms of numbers such as fractions, decimals and percentage are used in everyday situations.

Learn about	Key inquiry questions
✍ Learners should write read, compare and order numbers up to 5 digits rounding off to the nearest thousands. They should learn to make a quick judgement on estimation using approximate numbers. ✍ Learners should identify multiples and factors of whole numbers which give the product of two exact numbers and investigate the addition and subtraction of fractions with the same denominators and compare equivalent fractions. ✍ Learners should progress from their understanding about fractions to investigate percentages and ratios as a way of comparing quantities.	• How do we write, compare and order numbers up 5 digit numbers? • How do we round a number to the nearest thousand? • What is a multiple of a number 3x3? • Can we give examples of multiples of 3 up to 10? • How do we compare equivalent fractions? • In what other ways do we compare numbers? • How do we use ratio in comparing quantities?

<table>
<tr><th colspan="3">Learning outcomes</th></tr>
<tr><th>Knowledge and understanding</th><th>Skills</th><th>Attitudes</th></tr>
<tr>
<td>• Read, write, compare and order numbers up to 5 digits
• Rounding off numbers to the nearest thousands
• Identify multiples and factors of whole numbers
• Add and subtract fractions with the same denominators
• Compare equivalent fractions
• Recognize percentage and ratio as a way of comparing quantities</td>
<td>• Reading, writing and order numbers up to 5 digits
• Compare quantities
• Simplify fractions
• Solve problems involving percentages and ratios.
• Investigate addition and subtraction of fractions with the same denominator</td>
<td>• Develop the ability to show initiative
• Show confidence in manipulation of resources for learning provided by the rich learning environment
• Challenge children to explore and investigate and take responsibility for their own learning</td>
</tr>
<tr><td colspan="3">Contribution to the competencies:
<u>Critical thinking</u>: activities in solving problems.
<u>Communication</u>: comparison of quantities in the environment using the abacus and presentation of learning facts (solutions to problems).
<u>Co-operation</u>: practical demonstration in investigating solutions to problems.</td></tr>
<tr><td colspan="3">Links to other subjects:
Language.
Social Studies.
Science.</td></tr>
</table>

1.1 Write, read, compare and order numbers up 5 digits

Reading and writing 5 digit numbers



To write numbers in word you must compare the digits.

Each digit represents a specific order of number depending on its position.

Example 1.

1. Write 3647 in words.

Using place values and total values

Thousands	hundreds	tens	ones
3	4	6	7

3467 = Three thousand, four hundred and sixty seven.

2. Write 23456 in words.

The place value of each digit is as follows:

Ten thousand	thousands	hundreds	tens	ones
2	3	4	5	6

23,456 = Twenty three thousand, four hundred and fifty six.

Note: Place value of a digit is from right to left.

Activity 1.

In groups of three compare the following numbers then write them in words.

(a) 645 (b) 89321 (c) 6450

(d) 21534 (e) 64500 (f) 48502

2

Example 1

Use example 1 to explain about reading and writing numbers for the learners to get the concept on how to read and write numbers.

Activity 1

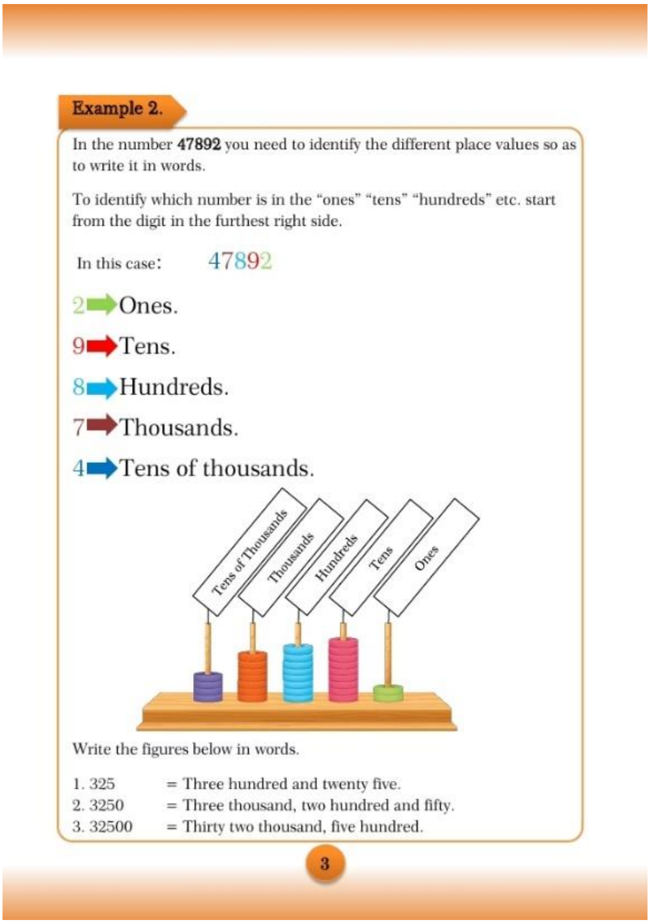
You should organize and help them form the groups, supervise and guide the groups on what to be done.

Ask them to read and write the following numbers

Expected answers

a) Six hundred and forty five.
b) Eighty nine thousand, three hundred and twenty one.
c) Six thousand, four hundred and fifty.
d) Twenty one thousand, five hundred and thirty four.
e) Sixty-four thousand, five hundred.
f) Forty eight thousand, five hundred and two.

Example 2



Example 2.

In the number **47892** you need to identify the different place values so as to write it in words.

To identify which number is in the "ones" "tens" "hundreds" etc. start from the digit in the furthest right side.

In this case: 47892

2 ➡ Ones.

9 ➡ Tens.

8 ➡ Hundreds.

7 ➡ Thousands.

4 ➡ Tens of thousands.

Write the figures below in words.

1. 325 = Three hundred and twenty five.
2. 3250 = Three thousand, two hundred and fifty.
3. 32500 = Thirty two thousand, five hundred.

3

Guide learners to collect locally available material that can be used to make an abacus.

- They will need:
- Five sticks or smooth pieces of wood around 12 inches long.
- Flat wood.
- Wood glue.
- 50 small coloured beads or bottle tops – in groups of ten of the same colour.
- Ruler.
- A pencil.

Guide them on how to make abacus.

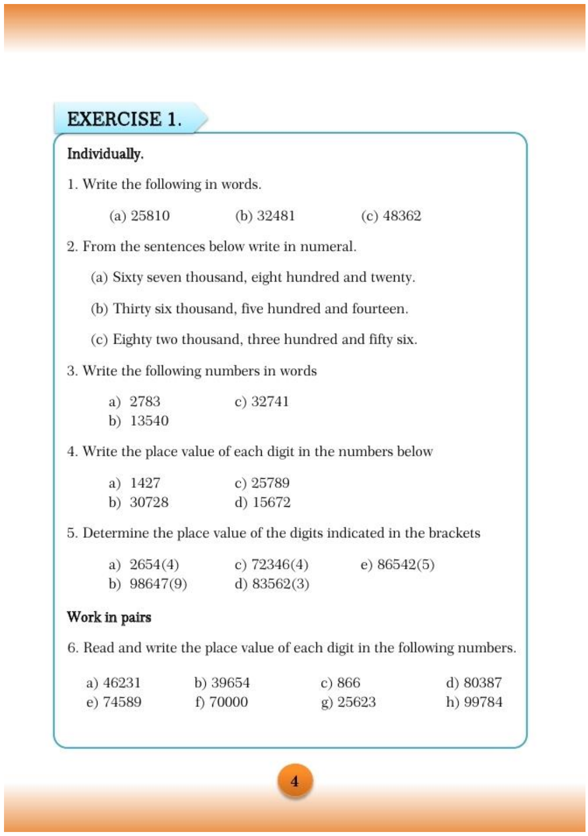
Instructions

1. On the flat wood, make 5 pencil marks down the length, each of equal distance apart.
2. Put a thin layer of glue along each of the pencil marks on one side of the abacus only.
3. Carefully stick the five sticks on each glued pencil point on one side. Press down and allow to dry fully.
4. Make holes on the bottle tops to fit in the sticks
5. Once the glue is dry, your abacus is ready to use.

Learners can be guided on how to use abacus to identify place values like in example 2.

Exercise 1

- Learners should be given time to attempt the exercises.
- Learner with disabilities should be given more time to attempt the exercise.



EXERCISE 1.

Individually.

1. Write the following in words.

(a) 25810 (b) 32481 (c) 48362

2. From the sentences below write in numeral.

(a) Sixty seven thousand, eight hundred and twenty.

(b) Thirty six thousand, five hundred and fourteen.

(c) Eighty two thousand, three hundred and fifty six.

3. Write the following numbers in words

a) 2783 c) 32741
b) 13540

4. Write the place value of each digit in the numbers below

a) 1427 c) 25789
b) 30728 d) 15672

5. Determine the place value of the digits indicated in the brackets

a) 2654(4) c) 72346(4) e) 86542(5)
b) 98647(9) d) 83562(3)

Work in pairs

6. Read and write the place value of each digit in the following numbers.

a) 46231 b) 39654 c) 866 d) 80387
e) 74589 f) 70000 g) 25623 h) 99784

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Answers

1. a) Twenty five thousand, eight hundred and ten.
   b) Thirty two thousand, four hundred and eighty one.
   c) Forty eight thousand, three hundred and sixty two.

2. a) 67,820
   b) 36,514
   c) 82,356

3. a) Two thousand, seven hundred and eighty three.
   b) Thirteen thousand, five hundred and forty.
   c) Thirty two thousand, seven hundred and forty one.

4.

	Ten Thousands	Thousands	Hundreds	Tens	Ones
a.		1	4	2	7
b.	3	0	7	2	8
c.	2	5	7	8	9
d.	1	5	6	7	2

5. a) 4 - Ones
   b) 9 - Ten thousands
   c) 4 - Tens

d) 3 - Thousands
e) 5 – Hundreds

6.

	Ten Thousands	Thousands	Hundreds	Tens	Ones
a.	4	6	2	3	1
b.	3	9	6	5	4
c.			8	6	6
d.	8	0	3	8	7
e.	7	4	5	8	9
f.	7	0	0	0	0
g.	2	5	6	2	3
h.	9	9	7	8	4

7. a)Tens
b) Thousands
c) Ones
d) Hundreds
e) Ten thousands
f) Thousands
g) Tens
h) Thousands

8. a) 4 - Thousands
b) 1 - Ones
c) 0 - Hundreds
d) 9 – Ten thousands
e) 1 – Ten thousands
f) 9 – Ten thousands
g) 3 – Ones
e) 4 – Tens

9. Ten thousands
10. Ones
11. Thousands
12. Ten Thousands
13. Ten Thousands
14. 4010
15. 80000

Compare and order numbers up to 5 digits

Emphasize on example 3 to help learners to understand the numbers and know which digit is greater than the other.

After explaining the example Learners should be able to work out exercise 2.

7. Read and write the place value of the digit 9 in the following numbers.

a) 57691	b) 79841	c) 1869	d) 50927
e) 94641	f) 59243	g) 6293	h) 69342

8. Read and write the place value of the underlined digit in each of the numerals below.

a) 64516	b) 97201	c) 16037	d) 97165
e) 10000	f) 99999	g) 87923	h) 67245

9. Tell your partner the place value of the digit 7 in 79651.

10. Find the place value of the digit 0 in 56880. Explain why this is the value of the digit.

11. Tell your partner the place value of the 4th digit in 6345?

12. Find the place value of the fifth digit in 53210.

13. What is the place value of the forth digit in 100000? Explain your answer

14. What is the sum in the place value of the 4th and 2nd digits in 34261? How would you work out this?

15. What is the difference in the place value of the 5th and 3rd digits in 82046? How would you work out this?

Compare and order numbers up to 5 digits

When you are comparing numbers up to 10,000 you need to look at the value of the thousands digit (unless the number is 10,000).

The number with the larger thousands digit will be the bigger number.

If the numbers have the same thousands digit, then look at the hundreds digit next and see which is more.

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If the numbers have the same hundreds digit, then look at the tens digit to find out which is bigger, and so on.

For Example:

4263 > 4193

The thousands digits are the same, but the 1st number has a bigger hundreds digit.

7826 < 9014

The 1st number's thousands digits is 7, the 2nd number's is 9.

1407 < 1423

The thousands and hundreds digits are the same, but the 2nd number has a higher tens digit.

Example 3.

1. Arrange 1, 5, 9, 3 to form four different numbers and then arrange the formed numbers from the largest to the smallest (descending).

Solution

1359, 5931, 9531, 3951

So from the largest to the smallest.

9531, 5931, 3951, 1359

2. Use 8, 6, 5, 3 to form two different numbers then arrange them from the smallest to largest (ascending).

Solution

86531, 13568

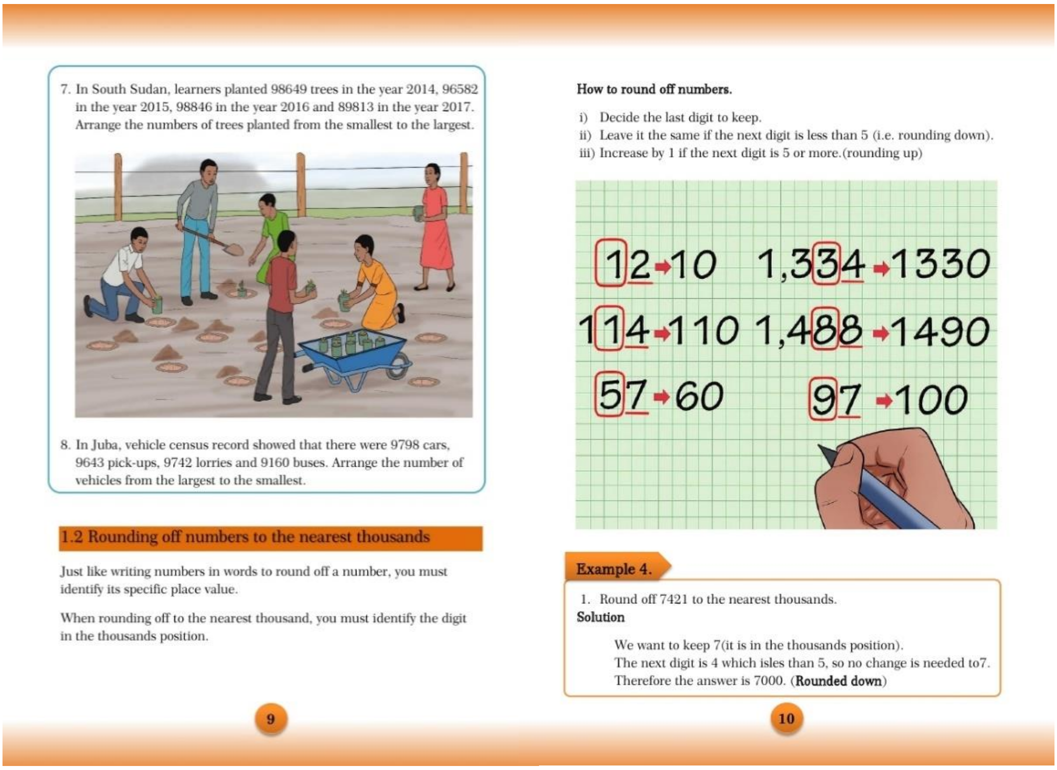
So from the smallest to the largest in the number formed.

13568, 86531

6

1.2 Rounding off numbers to the nearest thousands

- Using example 4 & 5 guide learners on how to round off to the nearest thousands.
- The teacher can develop more examples to help learners understand more.



7. In South Sudan, learners planted 98649 trees in the year 2014, 96582 in the year 2015, 98846 in the year 2016 and 89813 in the year 2017. Arrange the numbers of trees planted from the smallest to the largest.

8. In Juba, vehicle census record showed that there were 9798 cars, 9643 pick-ups, 9742 lorries and 9160 buses. Arrange the number of vehicles from the largest to the smallest.

1.2 Rounding off numbers to the nearest thousands

Just like writing numbers in words to round off a number, you must identify its specific place value.

When rounding off to the nearest thousand, you must identify the digit in the thousands position.

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How to round off numbers.

i) Decide the last digit to keep.
ii) Leave it the same if the next digit is less than 5 (i.e. rounding down).
iii) Increase by 1 if the next digit is 5 or more.(rounding up)

Example 4.

1. Round off 7421 to the nearest thousands.

Solution

We want to keep 7(it is in the thousands position).
The next digit is 4 which isles than 5, so no change is needed to7.
Therefore the answer is 7000. (**Rounded down**)

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Activity 2

- Help learners by guiding them to form groups/ pairs.
- Explain to them example 4 and also come up with more examples to help the learners understand how to round off.

Answers

a) 87000
b) 22000
c) 74000

Assign roles to each group members before leaving the school compound.
When assigning roles of collecting information, please take into consideration proficiency levels of the learners:

2. Round off 8697 to the nearest thousands.

Solution

We want to keep 8 (it is in the thousands position).
The next digit is 6, it is more than 5 so 8 increases by 1 = 9.
Hence the number is **rounded up** to 9000.

In the number **36178** the digit 6 is in the thousands position.

36178

8 → Ones
7 → Tens
1 → Hundreds
6 → Thousands
3 → Tens of thousands

After identifying the different place values, check the number that comes immediately after the thousands position.

In this case the number is one (1) so add a zero into the digit in the thousands position.

If the number is between (0) and (4) add a zero (0) to the digit in the thousands position.

If the number is (5) and above add one (1) to the digit in the thousands position.

Example 5.

(a) 36178

36178 thus = 36000

In this case we add a zero (0) as one (1) is below five (5)

(b) 57812

57812 Thus =58000

In example (b) add one (1) for eight (8) is above five (5)

(c) 96574

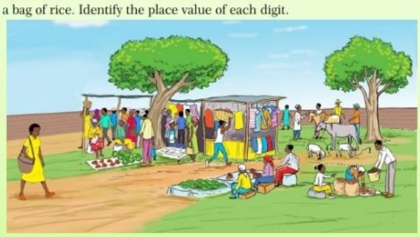
96574 Thus =97000

Activity 2.

In pairs, round off the following numbers to the nearest thousands.

(a) 87163 (b) 21875 (c) 74169

Visit a nearby market place and find out the prices of a bag of maize and a bag of rice. Identify the place value of each digit.



EXERCISE 2.

1. Round off the following numbers to the nearest thousands.

(a) 58712 (d) 15062
(b) 72162 (e) 90762

2. Add the numbers below then round them off to the nearest thousands.

(A) 25812+404 (D) 39418+600
(B) 82167+523 (E) 91276+723

Exercise 2

Guide learners to work in groups.

Expected Answers

1. a) 59000
   b) 72000
   c) 15000
   d) 91000

2. <u>Addition</u> <u>rounded off</u>

Addition	rounded off
a) 26216	**26000**
b) 82690	**83000**
c) 40018	**40000**
d) 91999	**92000**

1.3 Multiples and factors of whole numbers

Use example 6 to emphasize on multiples and factors.

The teacher should come up with more examples to help learners understand and be able to work on the exercises given.

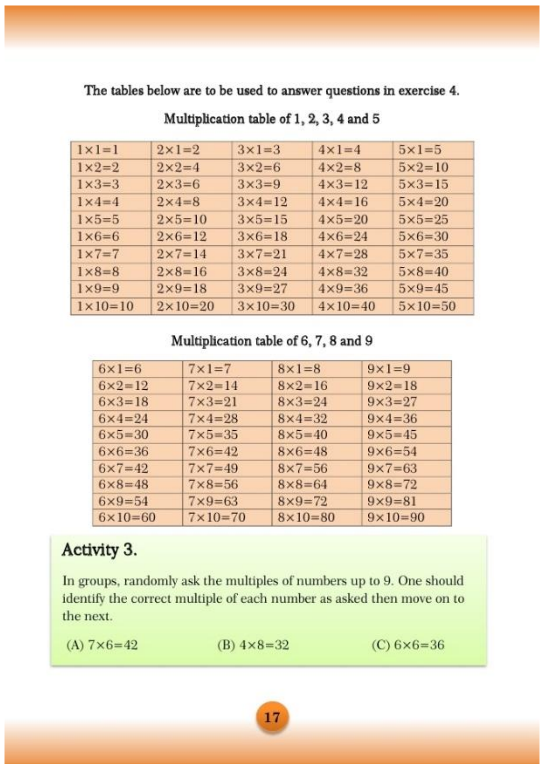
The teacher should guide the learners on how to choose multiples, use multiples, factors and multiplication.

Guide on how to multiply numbers by 10, 100, 1000.

Pair up learners and let them discuss the multiplication table of 1-9

Activity 3

- Guide learners to form groups
- In their groups guide them to randomly ask the multiples of numbers up to 9. One should identify the correct multiple of each number as asked then move on to the next.



The tables below are to be used to answer questions in exercise 4.

Multiplication table of 1, 2, 3, 4 and 5

1×1=1	2×1=2	3×1=3	4×1=4	5×1=5
1×2=2	2×2=4	3×2=6	4×2=8	5×2=10
1×3=3	2×3=6	3×3=9	4×3=12	5×3=15
1×4=4	2×4=8	3×4=12	4×4=16	5×4=20
1×5=5	2×5=10	3×5=15	4×5=20	5×5=25
1×6=6	2×6=12	3×6=18	4×6=24	5×6=30
1×7=7	2×7=14	3×7=21	4×7=28	5×7=35
1×8=8	2×8=16	3×8=24	4×8=32	5×8=40
1×9=9	2×9=18	3×9=27	4×9=36	5×9=45
1×10=10	2×10=20	3×10=30	4×10=40	5×10=50

Multiplication table of 6, 7, 8 and 9

6×1=6	7×1=7	8×1=8	9×1=9
6×2=12	7×2=14	8×2=16	9×2=18
6×3=18	7×3=21	8×3=24	9×3=27
6×4=24	7×4=28	8×4=32	9×4=36
6×5=30	7×5=35	8×5=40	9×5=45
6×6=36	7×6=42	8×6=48	9×6=54
6×7=42	7×7=49	8×7=56	9×7=63
6×8=48	7×8=56	8×8=64	9×8=72
6×9=54	7×9=63	8×9=72	9×9=81
6×10=60	7×10=70	8×10=80	9×10=90

Activity 3.

In groups, randomly ask the multiples of numbers up to 9. One should identify the correct multiple of each number as asked then move on to the next.

(A) 7×6=42 (B) 4×8=32 (C) 6×6=36

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Exercise 4

Answers

Learners should try these individually

1. a) 9 x 6=54
   b) 8 x 7=56
   c) 4 x 9=36
2. John + 9friends=10people
   Each 5 sweets; total number of sweets=10 x 5=50 sweets

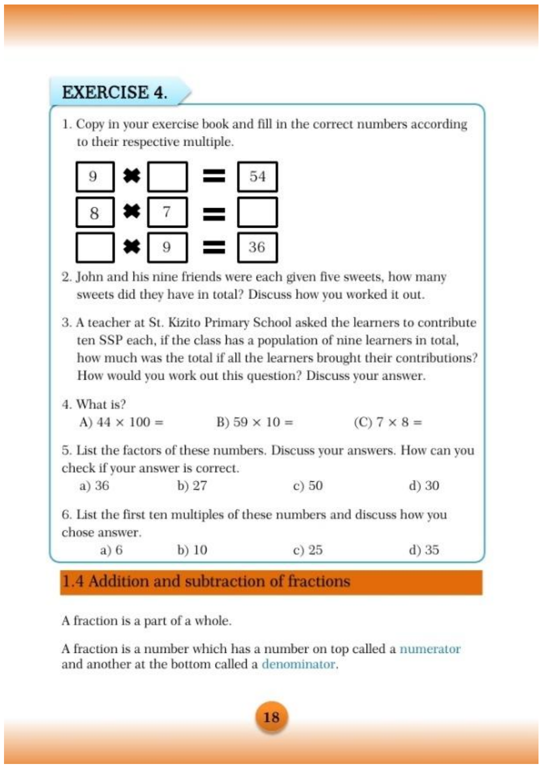
3. 9 learners, each contributing 10ssp=90ssp

4. a) 44 x 100 = 4400
   b) 59 x 10=
   c) 7 x 8=56

1.4 Addition and subtraction of fractions

Use example 10 to help the learners understand about numerator and denominator.

- ☑ You should expound on fractions.
- ☑ Use varied approaches to make fractions be real to learners. This can be done using objects that can be shared like pens and books.
- ☑ Discuss the different types of fractions; proper, improper, mixed, equivalent.
- ☑ Discuss equivalent fractions using real life situations.
- ☑ Emphasize on addition, subtraction of fractions with same denominator.



EXERCISE 4.

1. Copy in your exercise book and fill in the correct numbers according to their respective multiple.

$\boxed{9} \times \boxed{} = \boxed{54}$

$\boxed{8} \times \boxed{7} = \boxed{}$

$\boxed{} \times \boxed{9} = \boxed{36}$

2. John and his nine friends were each given five sweets, how many sweets did they have in total? Discuss how you worked it out.
3. A teacher at St. Kizito Primary School asked the learners to contribute ten SSP each, if the class has a population of nine learners in total, how much was the total if all the learners brought their contributions? How would you work out this question? Discuss your answer.
4. What is?
   A) 44 × 100 =   B) 59 × 10 =   (C) 7 × 8 =
5. List the factors of these numbers. Discuss your answers. How can you check if your answer is correct.
   a) 36   b) 27   c) 50   d) 30
6. List the first ten multiples of these numbers and discuss how you chose answer.
   a) 6   b) 10   c) 25   d) 35

1.4 Addition and subtraction of fractions

A fraction is a part of a whole.

A fraction is a number which has a number on top called a numerator and another at the bottom called a denominator.

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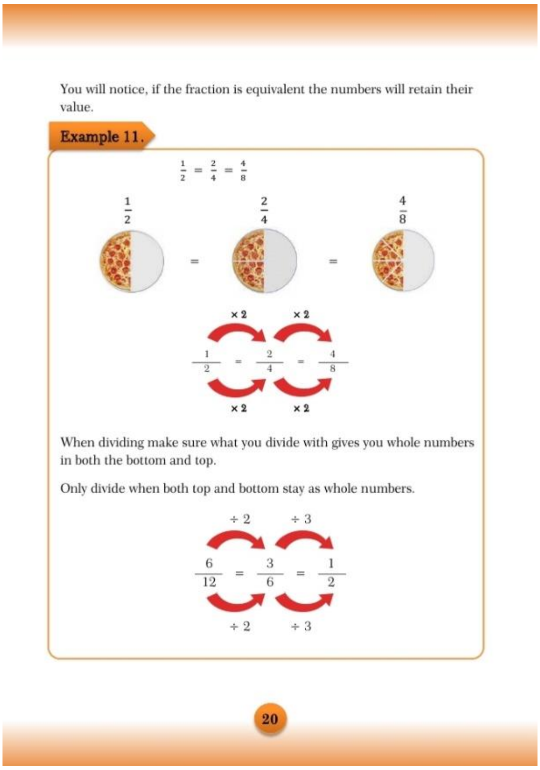
Equivalent fractions

Use the notes in the learner's book to explain.
Also use real objects like mangoes to explain like example 8.



You will notice, if the fraction is equivalent the numbers will retain their value.

Example 11.

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

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

$\frac{1}{2} \xrightarrow{\times 2} \frac{2}{4} \xrightarrow{\times 2} \frac{4}{8}$

When dividing make sure what you divide with gives you whole numbers in both the bottom and top.

Only divide when both top and bottom stay as whole numbers.

$\frac{6}{12} \xrightarrow{\div 2} \frac{3}{6} \xrightarrow{\div 3} \frac{1}{2}$

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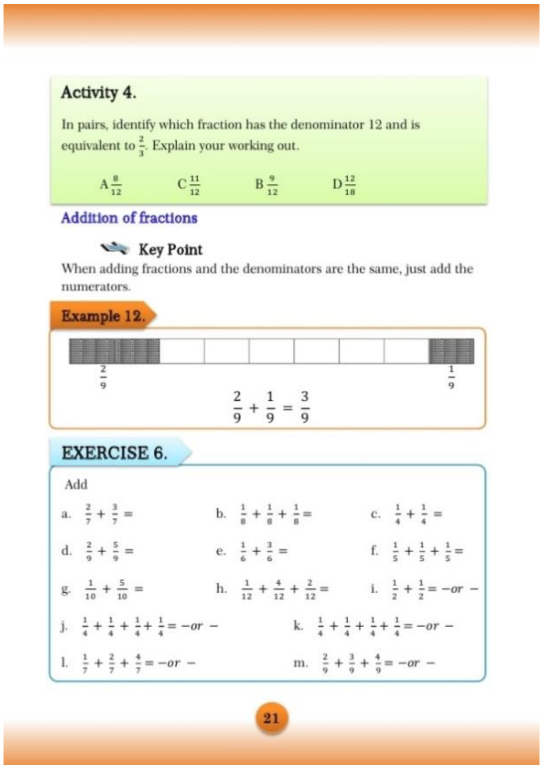

Activity 4.

In pairs, identify which fraction has the denominator 12 and is equivalent to $\frac{2}{3}$. Explain your working out.

A $\frac{8}{12}$ C $\frac{11}{12}$ B $\frac{9}{12}$ D $\frac{12}{18}$

Addition of fractions

Key Point

When adding fractions and the denominators are the same, just add the numerators.

Example 12.

$\frac{2}{9}$ $\frac{1}{9}$

$\frac{2}{9} + \frac{1}{9} = \frac{3}{9}$

EXERCISE 6.

Add

a. $\frac{2}{7} + \frac{3}{7} =$ b. $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} =$ c. $\frac{1}{4} + \frac{1}{4} =$

d. $\frac{2}{9} + \frac{5}{9} =$ e. $\frac{1}{6} + \frac{3}{6} =$ f. $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} =$

g. $\frac{1}{10} + \frac{5}{10} =$ h. $\frac{1}{12} + \frac{4}{12} + \frac{2}{12} =$ i. $\frac{1}{2} + \frac{1}{2} = - or -$

j. $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = - or -$ k. $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = - or -$

l. $\frac{1}{7} + \frac{2}{7} + \frac{4}{7} = - or -$ m. $\frac{2}{9} + \frac{3}{9} + \frac{4}{9} = - or -$

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Activity 4

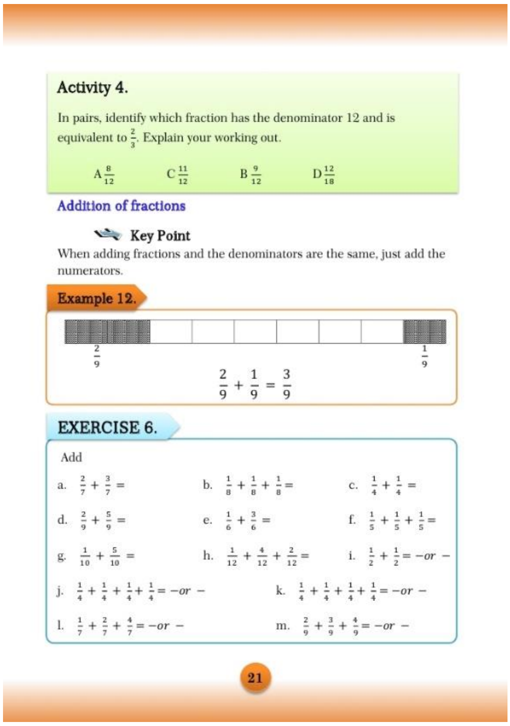
A has denominator 12 and is equivalent to $\frac{2}{3}$ i.e. $\frac{8}{12}$ and $\frac{12}{18}$ are also equivalent to $\frac{2}{3}$.

Addition of fractions

- Example 12 can be used to explain addition of fractions.
- Allow learners to come up with more examples. This will help in expressing their understanding on addition of fractions.

Exercise 6

This exercise should be done individually.



Activity 4.

In pairs, identify which fraction has the denominator 12 and is equivalent to $\frac{2}{3}$. Explain your working out.

A $\frac{8}{12}$ C $\frac{11}{12}$ B $\frac{9}{12}$ D $\frac{12}{18}$

Addition of fractions

Key Point

When adding fractions and the denominators are the same, just add the numerators.

Example 12.

$\frac{2}{9}$ $\frac{1}{9}$

$$\frac{2}{9}+\frac{1}{9}=\frac{3}{9}$$

EXERCISE 6.

Add

a. $\frac{2}{7}+\frac{3}{7}=$ b. $\frac{1}{8}+\frac{1}{8}+\frac{1}{8}=$ c. $\frac{1}{4}+\frac{1}{4}=$

d. $\frac{2}{9}+\frac{5}{9}=$ e. $\frac{1}{6}+\frac{3}{6}=$ f. $\frac{1}{5}+\frac{1}{5}+\frac{1}{5}=$

g. $\frac{1}{10}+\frac{5}{10}=$ h. $\frac{1}{12}+\frac{4}{12}+\frac{2}{12}=$ i. $\frac{1}{2}+\frac{1}{2}=-or-$

j. $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=-or-$ k. $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=-or-$

l. $\frac{1}{7}+\frac{2}{7}+\frac{4}{7}=-or-$ m. $\frac{2}{9}+\frac{3}{9}+\frac{4}{9}=-or-$

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Expected Answers

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

b. $\frac{3}{8}$

c. $\frac{2}{4}$ or $\frac{1}{2}$

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

e. $\frac{3}{6}$ or $\frac{1}{3}$

Subtraction of fractions

Example 13 can be used to explain subtraction of fractions. Allow learners to come up with more examples. This will help in expressing their understanding on subtraction of fractions.

Exercise 7

This exercise should be done individually or in groups.

Answers

1. a) $\frac{8}{12}=\frac{2}{3}$

   b) $\frac{16}{24}=\frac{2}{3}$

   c) $\frac{8}{20}=\frac{2}{5}$

   d) $\frac{9}{21}=\frac{3}{7}$

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

2. a) $\frac{7}{9}-\frac{2}{9}=\frac{5}{9}$

   b) $\frac{6}{19}-\frac{4}{19}=\frac{2}{19}$

   c) $\frac{8}{11}-\frac{7}{11}=\frac{1}{11}$

   d) $\frac{4}{5}-\frac{1}{5}=\frac{3}{5}$

   e) $\frac{12}{17}-\frac{3}{17}=\frac{9}{17}$

   f) $\frac{3}{4}-\frac{1}{4}=\frac{2}{4}=\frac{1}{2}$(on simplification)

1.5 Ratio

You should expound on ratios and help learners appreciate that ratios have the same meaning as fractions.

This can be done using the notes on the learner's book (Page 21).

Subtraction of fractions

Key Point

In subtraction, when the denominator is the same, we just subtract the numerator then divide by the denominator.

Example 13.

Subtract;

$\frac{3}{7} - \frac{2}{7} = \frac{1}{7}$ $\quad$ $\frac{4}{8} - \frac{2}{8} = \frac{2}{8} = \frac{1}{4}$ $\quad$ $\frac{5}{9} - \frac{2}{9} = \frac{3}{9} = \frac{1}{3}$

EXERCISE 7.

1. Write the missing numbers to complete the fraction.

a. $\frac{8}{12} = \frac{2}{?}$ $\quad$ c. $\frac{8}{20} = \frac{?}{5}$ $\quad$ e. $\frac{8}{24} = \frac{1}{?}$

b. $\frac{16}{24} = \frac{?}{3}$ $\quad$ d. $\frac{9}{21} = \frac{?}{7}$

2. Subtract the following fractions

a) $\frac{7}{9} - \frac{2}{9} =$ $\quad$ c) $\frac{8}{11} - \frac{7}{11} =$ $\quad$ e) $\frac{12}{17} - \frac{3}{17} =$

b) $\frac{6}{19} - \frac{4}{19} =$ $\quad$ d) $\frac{4}{5} - \frac{1}{5} =$ $\quad$ f) $\frac{3}{4} - \frac{1}{4} =$

1.5 Ratio

We have looked at fractions. Ratios are not so different from fractions.

A ratio says how much of one there is compared to another thing.

In ratio a number is used to express the relation of another number.

It is used to show how much one thing is compared to another.

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Example 14.

A student uses 3 cups of flour and 1 cup of water to prepare asida.

The ratio of flour to water is 3:1

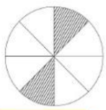
The ratio of water to flour is 1:3

In a class, there are 2 boys and three girls. Therefore the ration of boys to girls is 2:3

The ratio of girls to boys is 3:2

These ratios can be written as fraction i.e. $\frac{2}{3}$

The ratio of boys to girls is 3:2 as a fraction is $\frac{2}{3}$



The ratio of shaded to unshaded is 2:6.
What is the ratio of unshaded to shaded?

This ratio expressed as a fraction is 2/6. The fraction of the shaded to whole part is 2/8.

Example 15.

There are three green mangoes to one yellow one thus the ratio of green to yellow is 3:1

To separate the values in ratio you can use;

A) ":" 3:1

B) The word "to" 3 to 1

C) A fraction $\frac{3}{1}$

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Activity 5

Learners should be guided to work in groups.

Answers

1. Green : red=5:6

2. Total number of people=36
   With gumboots=14
   Without gumboots=34 -14 = 22

Ratio of people without gumboots: with gumboot =22:14=11:7(on simplification)

3. Teacher to guide learners as instructed.

Exercise 8.

Learners should work as a whole class to understand collaboration.

Answers

1. i) milk: water=3:2

   ii) Water to milk=2:3

   iii) Fraction of milk = $\frac{3}{5}$

2. i) Mathematics books: English books=80:70=8:7(**on simplification**)

   ii) Fraction of English books to total=$\frac{70}{150}=\frac{7}{15}$ (on simplification)

3. Black: blue=8:4=2:1

4. Leaves 71

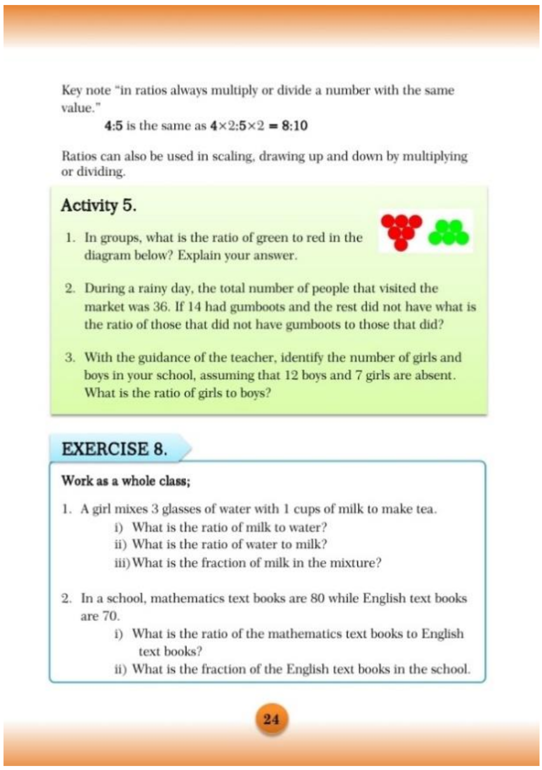
   9 collected nothing

   Stems=32-(11+9)=12

   Stems: leaves=12:11

5. a) Brown to white squares=5:11

   b) As a fraction=$\frac{5}{11}$



Key note "in ratios always multiply or divide a number with the same value."

4:5 is the same as **4**×2:**5**×2 **= 8:10**

Ratios can also be used in scaling, drawing up and down by multiplying or dividing.

Activity 5.

1. In groups, what is the ratio of green to red in the diagram below? Explain your answer.
2. During a rainy day, the total number of people that visited the market was 36. If 14 had gumboots and the rest did not have what is the ratio of those that did not have gumboots to those that did?
3. With the guidance of the teacher, identify the number of girls and boys in your school, assuming that 12 boys and 7 girls are absent. What is the ratio of girls to boys?

EXERCISE 8.

Work as a whole class;

1. A girl mixes 3 glasses of water with 1 cups of milk to make tea.
   i) What is the ratio of milk to water?
   ii) What is the ratio of water to milk?
   iii) What is the fraction of milk in the mixture?

2. In a school, mathematics text books are 80 while English text books are 70.
   i) What is the ratio of the mathematics text books to English text books?
   ii) What is the fraction of the English text books in the school.

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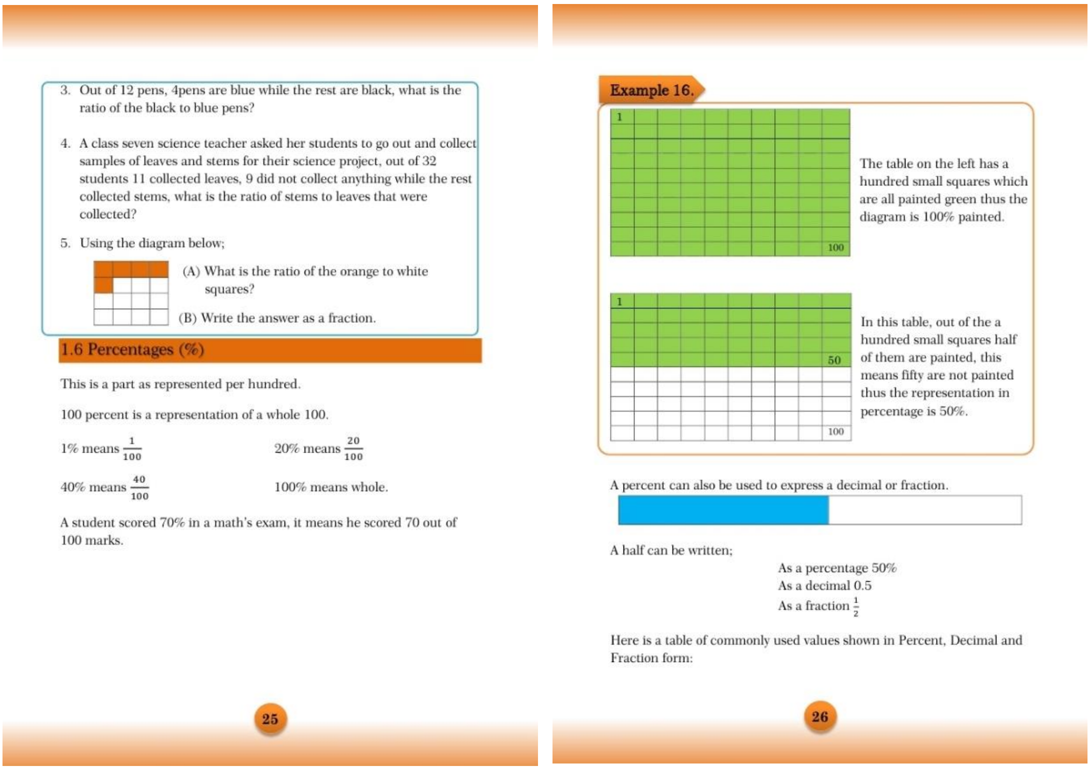
1.6 Percentages (%)



3. Out of 12 pens, 4pens are blue while the rest are black, what is the ratio of the black to blue pens?

4. A class seven science teacher asked her students to go out and collect samples of leaves and stems for their science project, out of 32 students 11 collected leaves, 9 did not collect anything while the rest collected stems, what is the ratio of stems to leaves that were collected?

5. Using the diagram below;

(A) What is the ratio of the orange to white squares?

(B) Write the answer as a fraction.

1.6 Percentages (%)

This is a part as represented per hundred.

100 percent is a representation of a whole 100.

1% means $\frac{1}{100}$ 20% means $\frac{20}{100}$

40% means $\frac{40}{100}$ 100% means whole.

A student scored 70% in a math's exam, it means he scored 70 out of 100 marks.

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Example 16.

The table on the left has a hundred small squares which are all painted green thus the diagram is 100% painted.

In this table, out of the a hundred small squares half of them are painted, this means fifty are not painted thus the representation in percentage is 50%.

A percent can also be used to express a decimal or fraction.

A half can be written;

As a percentage 50%
As a decimal 0.5
As a fraction $\frac{1}{2}$

Here is a table of commonly used values shown in Percent, Decimal and Fraction form:

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Use example 16 to emphasize for the learner to understand percentages

After learner have understood what is percentage then use example 17 to teach learners on how to convert percentages to decimals and vice versa.

Activity 6

Learners should be guided to works out the following in pairs.

1. 15% of 500 are bad

   Bad apples= $\frac{15}{100} \times 500 = 75$

   Good apples = 500 – 75 = 425 apples.

Alternatively

If 15% of the apples are bad,

Then 85 % of the apples are good $= \frac{85}{100} \times 500 = 425$ apples

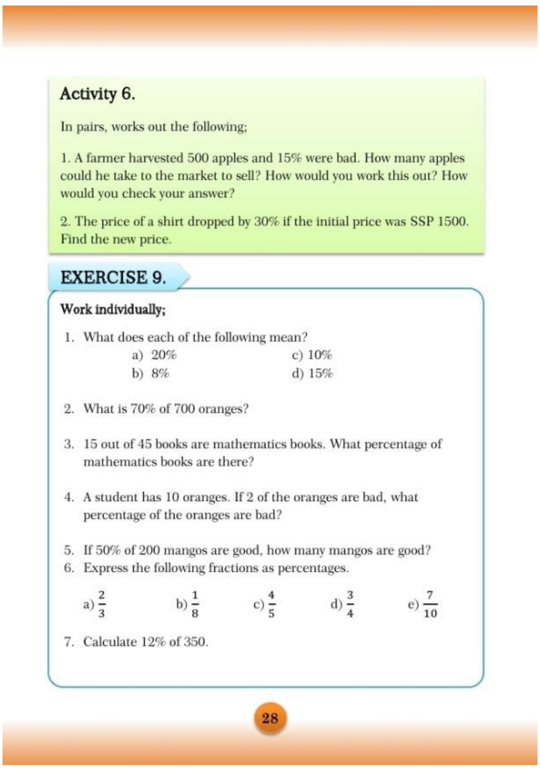
2. $\frac{30}{100}\ of\ 1500 = 450$

New price $= 1500 - 450 =$ SSP 1050

Alternatively

If it drops by 30%, it is sold at 70%

Therefore new selling price $= \frac{70}{100}\ of\ 1500 =$ SSP 1050



Activity 6.

In pairs, works out the following;

1. A farmer harvested 500 apples and 15% were bad. How many apples could he take to the market to sell? How would you work this out? How would you check your answer?

2. The price of a shirt dropped by 30% if the initial price was SSP 1500. Find the new price.

EXERCISE 9.

Work individually;

1. What does each of the following mean?
   a) 20% c) 10%
   b) 8% d) 15%
2. What is 70% of 700 oranges?
3. 15 out of 45 books are mathematics books. What percentage of mathematics books are there?
4. A student has 10 oranges. If 2 of the oranges are bad, what percentage of the oranges are bad?
5. If 50% of 200 mangos are good, how many mangos are good?
6. Express the following fractions as percentages.
   a) $\frac{2}{3}$ b) $\frac{1}{8}$ c) $\frac{4}{5}$ d) $\frac{3}{4}$ e) $\frac{7}{10}$
7. Calculate 12% of 350.

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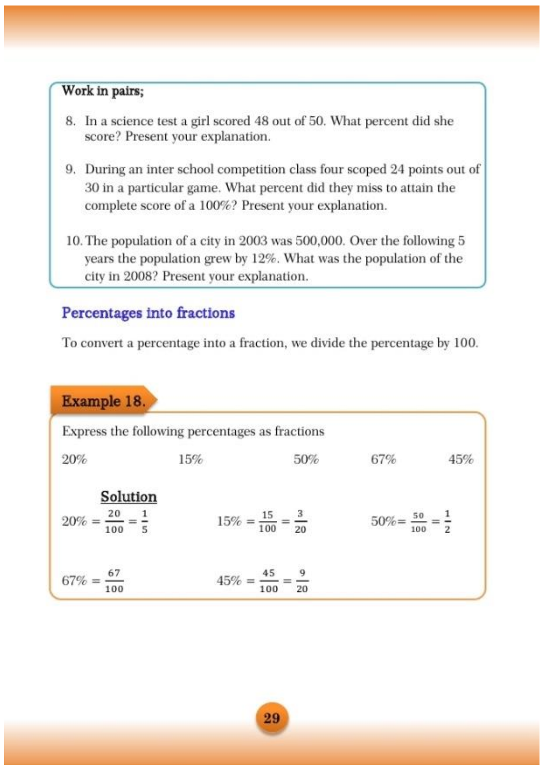

Work in pairs;

8. In a science test a girl scored 48 out of 50. What percent did she score? Present your explanation.
9. During an inter school competition class four scoped 24 points out of 30 in a particular game. What percent did they miss to attain the complete score of a 100%? Present your explanation.
10. The population of a city in 2003 was 500,000. Over the following 5 years the population grew by 12%. What was the population of the city in 2008? Present your explanation.

Percentages into fractions

To convert a percentage into a fraction, we divide the percentage by 100.

Example 18.

Express the following percentages as fractions

20% 15% 50% 67% 45%

Solution

$20\% = \frac{20}{100} = \frac{1}{5}$ $15\% = \frac{15}{100} = \frac{3}{20}$ $50\% = \frac{50}{100} = \frac{1}{2}$

$67\% = \frac{67}{100}$ $45\% = \frac{45}{100} = \frac{9}{20}$

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Exercise 9

Learners should do the exercise individually.

Answers

1. a) $20\% = \frac{20}{100}$

b) $8\% = \frac{8}{100}$

c) $10\% = \frac{10}{100}$

d) $15\% = \frac{15}{100}$

2. 70% of 700 oranges= $\frac{70}{100} \times 700 = 490$ oranges

3. $\frac{15}{45} \times 100\% = 33\frac{1}{3}\%$

4. 2 out of 10 are bad as a % = $\frac{2}{10} \times 100 = 20\%$

5. 50% of 200=$\frac{50}{100} \times 200$=100 are good

6. as %

a) $\frac{2}{3} \times 100\% = 66\frac{2}{3}\%$

b)$\frac{1}{8} \times 10\% = 12.5\%$

c) $\frac{4}{5} \times 100\% = 80\%$

d) $\frac{3}{4} \times 100\% = 75\%$

e) $\frac{7}{10} \times 100\% = 70\%$

7. 12% of 350=$\frac{12}{100}$ $of\ 350 = 42\%$

8. $\frac{48}{50} \times 100\% = 96\ \%$

9. Attained 24 out 30

   Missed=6 out of 30

   % missed=$\frac{6}{30}\ of\ 100 = 20\%$

   Alternatively

   % attained = $\frac{24}{30} \times 100 = 80\%$

   % missed=100% - 80% = 20%

10. Growth by 12% means 112%

    $= \frac{112}{100}\ of\ 500{,}000 = 560{,}000$

    Or

    In 5 years' time; $\frac{12}{100}\ of\ 500{,}000 = 60{,}000$

    2008 population= 500,000 + 60,000 = 560,000

Percentages into fractions

To convert a percentage into a fraction, we divide the percentage by 100

To emphasize this, you can use example 18 on the learner's book to teach how to change percentages to fractions.

Percentages and ratios

Expressing a percentage as a ratio, we compare the given percentage to 100.

To emphasize this, teacher can use example 19 on the learner's book to teach percentages and ratios.

Exercise 10

Learners should do the exercise individually.

Answers

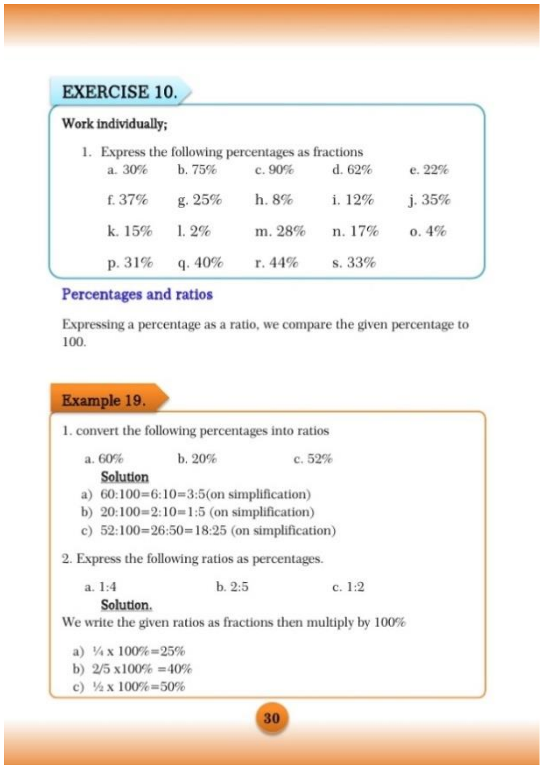
1. a) $30\% = \frac{30}{100} = \frac{3}{10}$

   b) $75\% = \frac{75}{100} = \frac{3}{4}$

   c) $90\% = \frac{90}{100} = \frac{9}{10}$

   d) $62\% = \frac{62}{100} = \frac{31}{30}$

   e) $22\% = \frac{22}{100} = \frac{11}{50}$



EXERCISE 10.

Work individually;

1. Express the following percentages as fractions

a. 30%	b. 75%	c. 90%	d. 62%	e. 22%
f. 37%	g. 25%	h. 8%	i. 12%	j. 35%
k. 15%	l. 2%	m. 28%	n. 17%	o. 4%
p. 31%	q. 40%	r. 44%	s. 33%	

Percentages and ratios

Expressing a percentage as a ratio, we compare the given percentage to 100.

Example 19.

1. convert the following percentages into ratios

a. 60% b. 20% c. 52%

Solution

a) 60:100=6:10=3:5(on simplification)
b) 20:100=2:10=1:5 (on simplification)
c) 52:100=26:50=18:25 (on simplification)

2. Express the following ratios as percentages.

a. 1:4 b. 2:5 c. 1:2

Solution.

We write the given ratios as fractions then multiply by 100%

a) ¼ x 100%=25%
b) 2/5 x100% =40%
c) ½ x 100%=50%

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Exercise 11

Learners should do the exercise individually.

Answers

1. a) 30:100 = 3:10

   b) 90:100 = 9:10

   c) 80:100 = 8:10=4:5

   d) 72:100 = 36:50=18:25

   e) 58:100 = 29:50

2. a) 0.28, b) 20%, c)0.3%, d) 25%, e) 0.09

3. a) $\frac{1}{3} \times 100\% = 33\frac{1}{3}\%$

b) $\frac{2}{3} \times 100\% = 66\frac{2}{3}\%$

c) $\frac{10}{13} \times 100\% = 76\frac{12}{13}\%$

d) $\frac{1}{4} \times 100\% = 25\%$

e) $\frac{1}{5} \times 100\% = 20\%$

4. a) $2:5 = \frac{2}{5}$

b) $7:9 = \frac{7}{9}$

c) $10:17 = \frac{10}{17}$

d) $1:4 = \frac{1}{4}$

e) $1:3 = \frac{1}{3}$

EXERCISE 11.

Work individually;

1. Express the following percentages as ratios
   a. 30% b. 90% c. 80% d. 72% e. 58%

2. Convert the percentages into decimals and the decimals to percentages
   a. 28% b. 0.2 c. 30% d. 0.25 e. 96%

3. Express the following ratios as percentages
   a. 1:3 b. 2:3 c. 10:13 d. 1:4 e. 1:5

4. Express the following ratios as fractions
   a. 2:5 b. 7:9 c. 10:17 d. 1:4 e. 1:3

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UNIT 2: MEASUREMENT

This unit concentrates on measurement and how it is applied in everyday living.

The concepts in this unit focuses on ways of estimating and measuring using local measurements as well as standard measurements.

Learners should estimate, measure, calculate, record and present their measurements in meaningful ways.

Learn about	Key inquiry questions
✍ Learners should solve problems using cm and metres to consolidate the knowledge of units of measurement of length and area of a square and rectangle by counting squares on a grid and use of formula to develop understanding that the area of a square is given by side x side (s^2): area of a rectangle is length x width (lw) using cm^2 and m^2. ✍ Learners should investigate volume by arranging cubes and solve problems in cm^3 and m^3, estimate capacity and mass using small containers of different sizes, objects of different mass and practice using a beam balance to develop the notion of 'balance' either side of '='. ✍ Learners should read the time on the clock face in hours and minutes and tell time using the 24 hour clock system.	• What are the units for measuring length, capacity volume and weight? • How do you find the area of a square and rectangle? • How do you estimate the volume, capacity and weights of objects? • How do you show the use of money in buying and selling? • How do you convert time in the 12 hour clock system to the 24 hour clock system and vice versa?

<table>
<tr><th colspan="3">Learning outcomes</th></tr>
<tr><th>Knowledge and understanding</th><th>Skills</th><th>Attitudes</th></tr>
<tr>
<td>

Measuring and drawing length to the nearest cm
Solving problems using cm, and meters
Find the area of squares and rectangles in cm^2 and m^2, and volume by counting cubes
Estimate capacity, estimating weight, time in hours and minutes, simple calculation of money
Solving problems involving the area of squares and rectangles in cm^2 and m^2, and volume by counting cubes
Estimate capacity and weight
Tell time in hours and minutes
Understand simple calculations on money
Tell time using the 24-hour system

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<td>

Measuring and drawing length to the nearest cm and metre
Calculating area of a square and a rectangle
Solve problems involving volume and capacity
Investigate the relationship between mass and weight and volume and capacity
Solve problems involving money
Tell the time in the 24 hour clock system

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<td>

Develop the ability to concentrate on a task through estimation and investigation
Appreciate contribution from colleagues for furthering acquisition of mathematical knowledge
Challenge children to explore and investigate and take responsibility for their own learning

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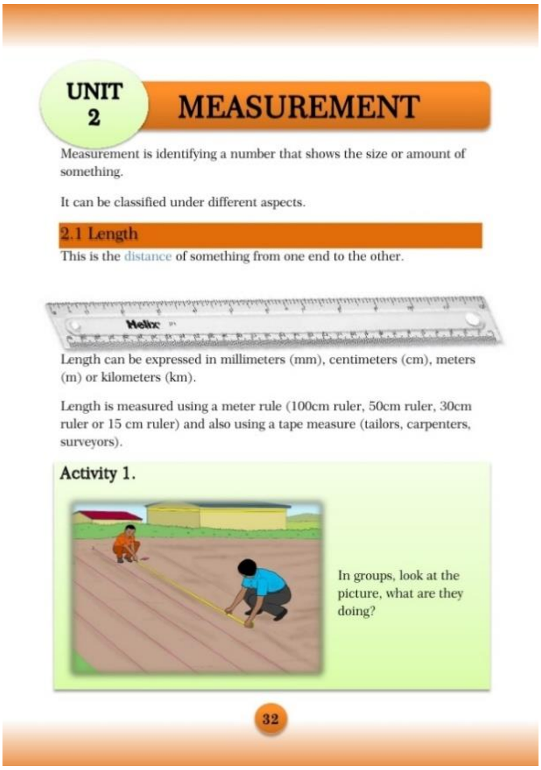
</tr>
<tr><td colspan="3">Contribution to the competencies:
<u>Critical thinking</u>: measuring the length to find out the areas in (cm squared)
<u>Communication and Co-operation</u>: problems solving in groups</td></tr>
<tr><td colspan="3">Links to other subjects:
Links to a range of subjects such as Science and Social Studies where numbers are used</td></tr>
</table>

2.1 Length


UNIT 2

MEASUREMENT

Measurement is identifying a number that shows the size or amount of something.

It can be classified under different aspects.

2.1 Length

This is the distance of something from one end to the other.

Length can be expressed in millimeters (mm), centimeters (cm), meters (m) or kilometers (km).

Length is measured using a meter rule (100cm ruler, 50cm ruler, 30cm ruler or 15 cm ruler) and also using a tape measure (tailors, carpenters, surveyors).

Activity 1.

In groups, look at the picture, what are they doing?

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This is the distance of something from one end to the other.

Using their previous experience on measurement ask the learners what they can remember from primary three measurement.

They may also use their experiences on day to day lives e.g how long do they walk from home to school? Distance between their class and Primary 1 class? How many steps they can make from their desks to the board.

Activity 1

- ☑ Learners should be able to mention that they are measuring.
- ☑ Other learners may mention that they are planting.
- ☑ You should ensure that the learners do the activity as indicated.
- ☑ You should provide a string or any other measuring tool which is locally available, like rope and guide the learners to estimate different measurements.

Conversion of units of length (cm and m)

Use example 1 to explain how conversion of lengths is done from centimetres to metres

Exercise 1

When measuring length over a short distance you can even use a piece of string, a rope or paper then translate the readings on an actual ruler to identify the exact length.

Place the edge of the string or paper on the object to be measured and then make a mark or tie a knot on the very end of the object then place it on an actual ruler to record the units.

Length can be used to express a specific distance like in which an individual covered by either foot or any other means of transport.

Types of length: Width, length, perimeter, circumference.

Conversion of units of length (cm and m)

Cm is smaller compared to m. therefore, converting cm into m, we divide the value of the cm by 100.

Example 1.

Use a 1metre ruler to convert the following;

1. Convert 10 cm into m

Solution

100 cm =1m

10cm=? $\quad 10\text{cm} \times \frac{1\text{m}}{100\text{cm}} = 0.1\text{m}$

Note: we take the value in cm and divide it by 100cm.

2. Convert 70cm into m

Solution

100cm=1m

70cm=? $\quad 70\text{cm} \times \frac{1\text{m}}{100\text{cm}} = 0.7\text{m}$

3. Convert 250cm into m.

Solution

100cm=1m

250cm=? $\quad 250 \times \frac{1\text{m}}{100\text{cm}} = 2.5\text{m}$

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Note: to convert from m into cm, we multiply the value in m by 100 cm.

1. Convert 100m into cm

Solution

100cm =1m

?=100m $\quad 100\text{m} \times \frac{100\text{cm}}{1\text{m}} = 10{,}000\text{cm}$

2. Convert 2.7 m into cm

Solution

100cm = 1m

? = 2.7m $\quad 2.7\text{m} \times \frac{100\text{cm}}{1\text{m}} = 270\text{cm}.$

EXERCISE 1.

Work individually;

1. Convert from cm into m.
   a) 20cm c) 57cm e) 500cm
   b) 420cm d) 3709cm f) 6050cm
2. Convert into cm.
   a) 2m c) 3.7m e) 1.4m
   b) 5m d) 20m f) 400m
3. How many metres are there in 2000 centimetres?
4. My sister walks 1000cm every day. How many metres does she walk in a day? How would you work out?
5. Electricity was connected to two houses. One at 102m and the other 70m away. How long was the wire in metres?
6. A water pipe is branched into two houses. One is 10.5m and the other is 7m long. How many centimetres are the two pipes?

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Learners should do the exercise individually.

Answers

1. a) 0.2 m b) 4.2 m
   c) 0.57m d) 37.09m
   e) 05m f) 60.5m
2. a) 200cm b) 500cm
   c) 370cm d) 2000 cm
   e) 140 cm f) 40000cm
3. 20 metres
4. 10 metres
5. 102metres+70metres=172metres
6. 1050centimetres+700centimetres=1750centimetres

2.2 Area

Using the notes in the learner's book (page 35 – 36) explain to the learner, what area means.

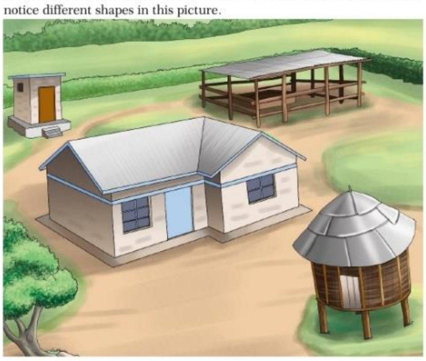
Activity 2.

1. Estimate the length of your desk. Using your thirty-centimeter ruler, measure the length of your desk. Compare your answer with your partner.

2.2 Area

Area is the amount of space the shape takes.

In pairs, look at the picture below. Which areas in the school compound or home can be measured? Explain why you choose those areas. Did you notice different shapes in this picture.



35

It tells us the size of squares, rectangles, circles, triangles, other polygons, or any enclosed figure.

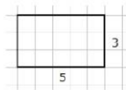
Why is it important to knowing the area of a shape?

Knowing the area can be very important. Think of getting tiles fitted in a room in your home.

Calculating Area

Area is measured in squares (or square units).

How many squares are in the rectangle below?



We can count the squares or we can take the length and width and use multiplication. The rectangle above has an area of 15 square units.

The area of a rectangle is = length × width.

Examples of calculating the area of a rectangle.

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Emphasize using practical example like;

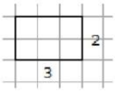
- Going out to the field to get the area covered by the football field.
- Using a piece of paper.

Exercise 2

Learners should do the exercise in pairs by counting the number of squares. Let them explain how they arrived at their answers.

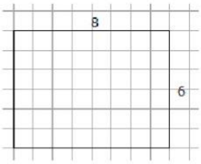
Answers

a. 24	b. 40	c. 64	d. 27	e. 55
f. 36	g. 36	h. 15	i. 117	j. 28
k. 180	l. 80	m. 81		



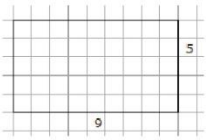
Area = Length x Width.

Area = 3 × 2 = 6 square units.



Area = Length x Width.

Area = 8 × 6 = 48 square units.



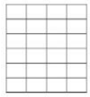
Area = Length x Width.

Area = 9 × 5 = 45 square units.

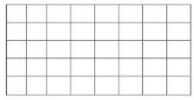
EXERCISE 2.

Tell your partner; How can you work out the area of these shapes? Work out the area of each shape. Compare your answers with another pair and explain how you worked it out.

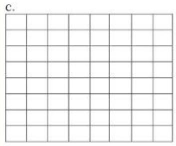
a.



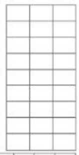
b.



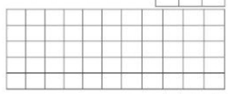
c.



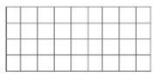
d.



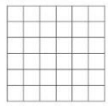
e.



f.



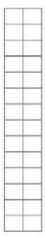
g.



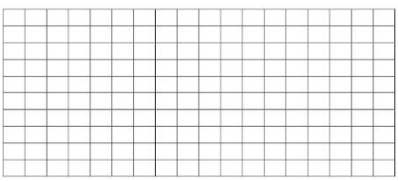
h.

i.

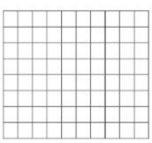
j.



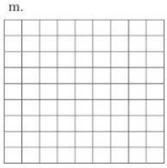
k.



l.



m.



Units for measuring area

We measure area using squares. We use different sizes of squares depending on how big or small an area is.

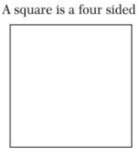
Example	Length of side on Squares	Unit
Size of piece of paper	Centimeter	cm^2
Size of a room	Meter	m^2

We write square sizes using a small ^{2} next to the unit. We write cm^2, m^2.

We can say "63 millimeters squared" or "63 square millimeters"

Area of a Square

A square is a four sided figure whose sides are all equal.



This figure is a shape of a square. All sides are equal.

The area of a square is length of a side x length of a side.

If each length is 4cm. Then the area of the square shall be:

A = length × length

$4cm \times 4cm = 16cm^2$

NOTE: ($CM \times CM = CM^2$)

Units for measuring area

Explain to learners that we can also measure area using squares. We use different sizes of squares depending on how big or small an area is.

Example	Length of side on Squares	Unit
Size of piece of paper	Centimeter	cm^2
Size of a room	Meter	m^2

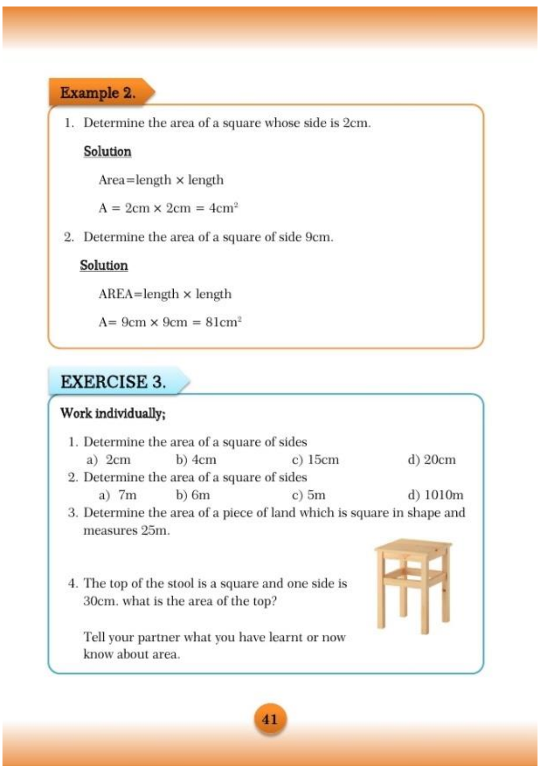
Area of a Square

Explain to learners how to calculate area of a square.

Emphasize using example 2 (page 34 Learner's book).

Exercise 3

Learners should do the exercise individually.



Example 2.

1. Determine the area of a square whose side is 2cm.

   Solution

   Area=length × length

   $A = 2cm \times 2cm = 4cm^2$

2. Determine the area of a square of side 9cm.

   Solution

   AREA=length × length

   $A = 9cm \times 9cm = 81cm^2$

EXERCISE 3.

Work individually;

1. Determine the area of a square of sides
   a) 2cm b) 4cm c) 15cm d) 20cm
2. Determine the area of a square of sides
   a) 7m b) 6m c) 5m d) 1010m
3. Determine the area of a piece of land which is square in shape and measures 25m.
4. The top of the stool is a square and one side is 30cm. what is the area of the top?

Tell your partner what you have learnt or now know about area.

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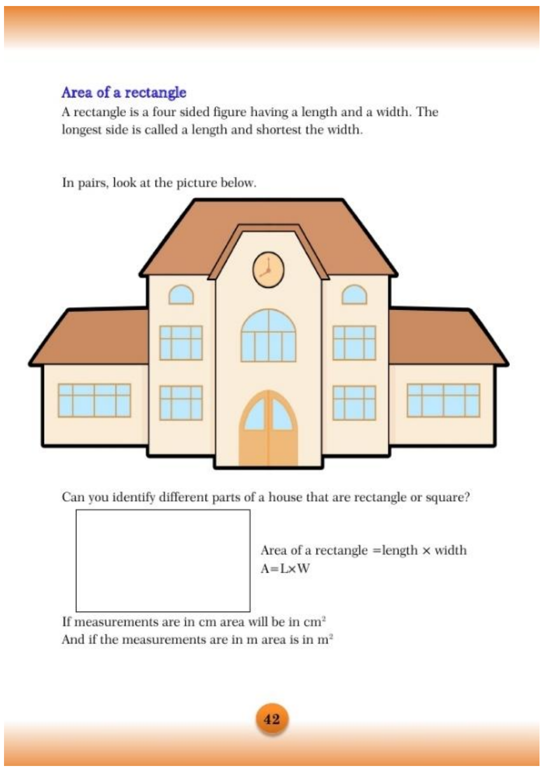

Area of a rectangle

A rectangle is a four sided figure having a length and a width. The longest side is called a length and shortest the width.

In pairs, look at the picture below.

Can you identify different parts of a house that are rectangle or square?

Area of a rectangle =length × width

$A = L \times W$

If measurements are in cm area will be in cm^2

And if the measurements are in m area is in m^2

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Answers

2. a) A=2cm x 2 cm=4 cm^2
   b) A=4cm X4 cm =16cm ^{2}
   c) A=15 cm X15 cm=225cm ^{2}
   d) A= 20cm X 20 cm=400cm^2

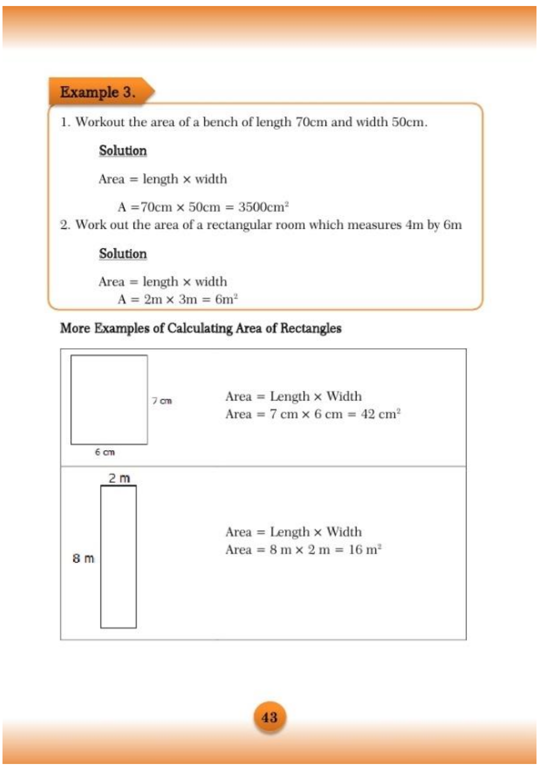
2. a) 49 m^2 b) 36m^2 c) 25m^2 d) 100m^2
3. Area of piece of land=25m by 25m=625m^2

Area of a rectangle

Explain to learners how to calculate area of a rectangle.
Emphasize using example 3 (page 43 Learner's book).

Exercise 4

Learners should do the exercise individually and also in groups.



Example 3.

1. Workout the area of a bench of length 70cm and width 50cm.

   Solution

   Area = length × width

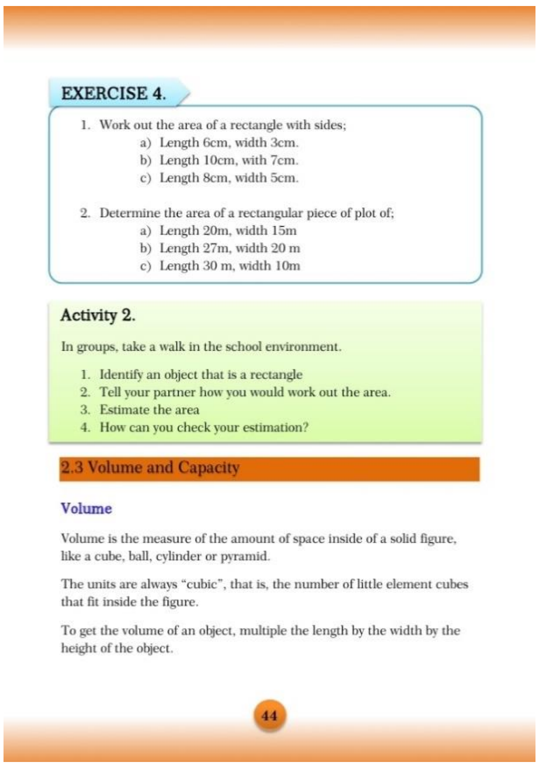
   A =70cm × 50cm = 3500cm^2

2. Work out the area of a rectangular room which measures 4m by 6m

   Solution

   Area = length × width
   A = 2m × 3m = 6m^2

More Examples of Calculating Area of Rectangles



EXERCISE 4.

1. Work out the area of a rectangle with sides;
   a) Length 6cm, width 3cm.
   b) Length 10cm, with 7cm.
   c) Length 8cm, width 5cm.
2. Determine the area of a rectangular piece of plot of;
   a) Length 20m, width 15m
   b) Length 27m, width 20 m
   c) Length 30 m, width 10m

Activity 2.

In groups, take a walk in the school environment.

1. Identify an object that is a rectangle
2. Tell your partner how you would work out the area.
3. Estimate the area
4. How can you check your estimation?

2.3 Volume and Capacity

Volume

Volume is the measure of the amount of space inside of a solid figure, like a cube, ball, cylinder or pyramid.

The units are always "cubic", that is, the number of little element cubes that fit inside the figure.

To get the volume of an object, multiple the length by the width by the height of the object.

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Answers

1. a) A=L X W= 6cm X 3 cm= 18 cm ^{2}
   b) A= 70 cm^2
   c) A= 40 cm^2

2. a) 300m^2 b)540m^2 c)300m^2

Activity 2

Guide Learners on how to measure and let them measure.

1. Learners should be able to use a metre or centimetre ruler, measure the width and the length of the class door and determine its area.
2. Learners should be able to measure the length and the width of the floor of the classroom and determine its area.

2.3 Volume and Capacity

Define volume as the amount of space occupied by an object. Also called capacity.

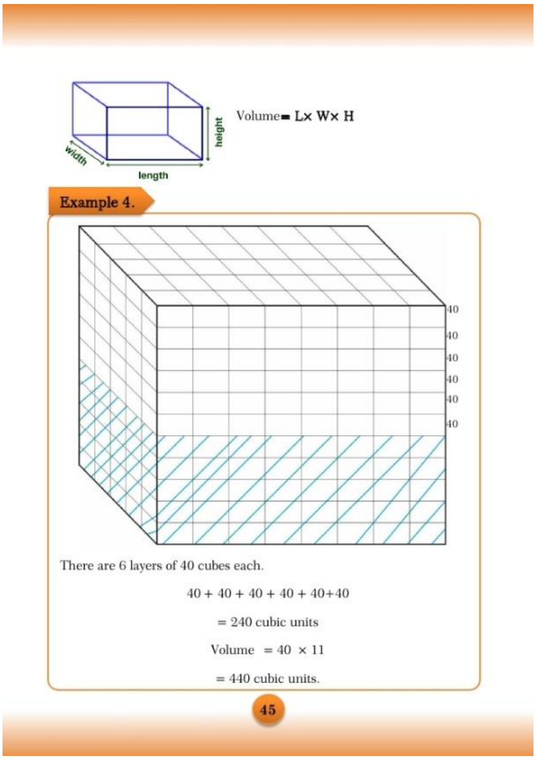
Use objects like stones, bucket, desk etc.

Use example 4 (page 45 learner's book) to emphasize the idea.

Exercise 5

Learners should do the exercise individually and also in groups.
Learners can do the exercise by counting and multiplying the squares.

Capacity can be measured in litres



Volume= L× W× H

Example 4.

There are 6 layers of 40 cubes each.

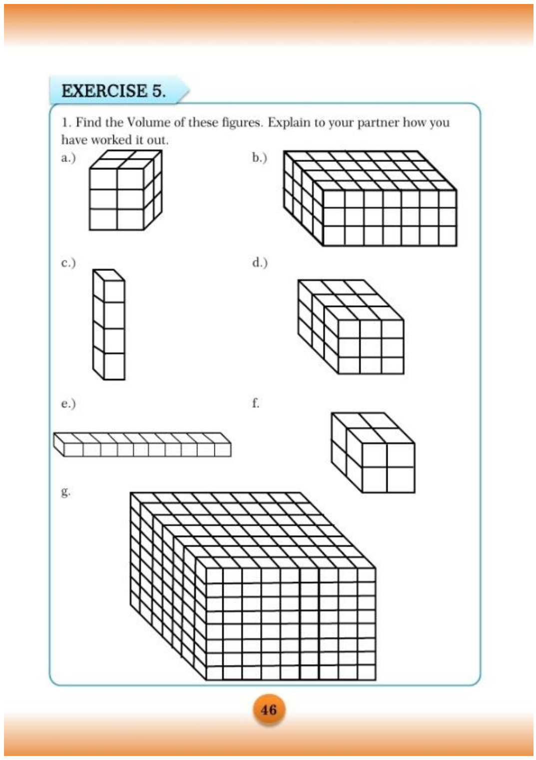
40 + 40 + 40 + 40 + 40+40

= 240 cubic units

Volume = 40 × 11

= 440 cubic units.

45



EXERCISE 5.

1. Find the Volume of these figures. Explain to your partner how you have worked it out.

a.) b.) c.) d.) e.) f. g.

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Activity 3.

This should be done practically using water and the different types of containers.

Exercise 6

Learners should do the exercise individually and also in groups.

Answers

1. Twenty ½ litre bottles
2. Eighty ½ litre bottles
3. Sixty bottles
4. a) 1 litres
   b) 3 litres
   c) 4 litres
   d) 5 litres
   e) 6 litres

5.
a) 6 litres
b) 9 litres
c) 20 litres
d) 2 litres
e) 8 litres
f) 10 litres
g) 4 litres
h) 1 litre

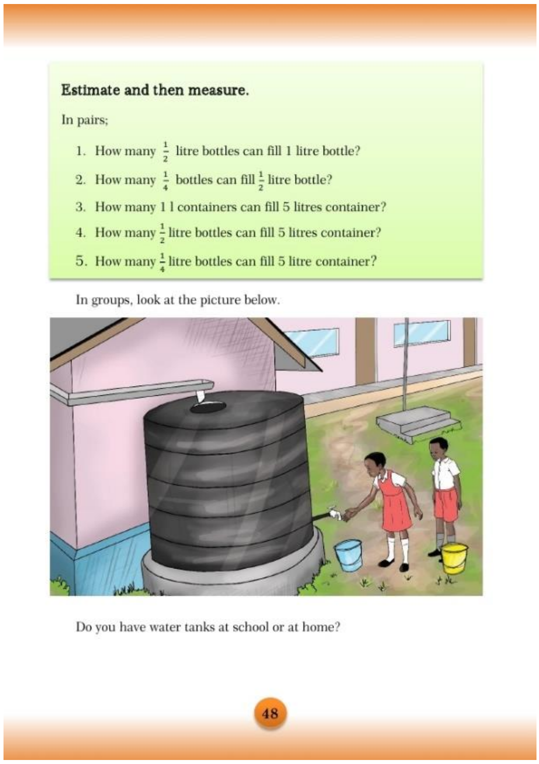

Capacity

This is the quantity a container can hold.

Capacity is measured in litres.

Activity 3.

In pairs, use $\frac{1}{2}$ litre, $\frac{1}{4}$ litre, and 1 litre to fill the containers of 3litres and 5 litres.


Estimate and then measure.

In pairs;

1. How many $\frac{1}{2}$ litre bottles can fill 1 litre bottle?
2. How many $\frac{1}{4}$ bottles can fill $\frac{1}{2}$ litre bottle?
3. How many 1 l containers can fill 5 litres container?
4. How many $\frac{1}{2}$ litre bottles can fill 5 litres container?
5. How many $\frac{1}{4}$ litre bottles can fill 5 litre container?

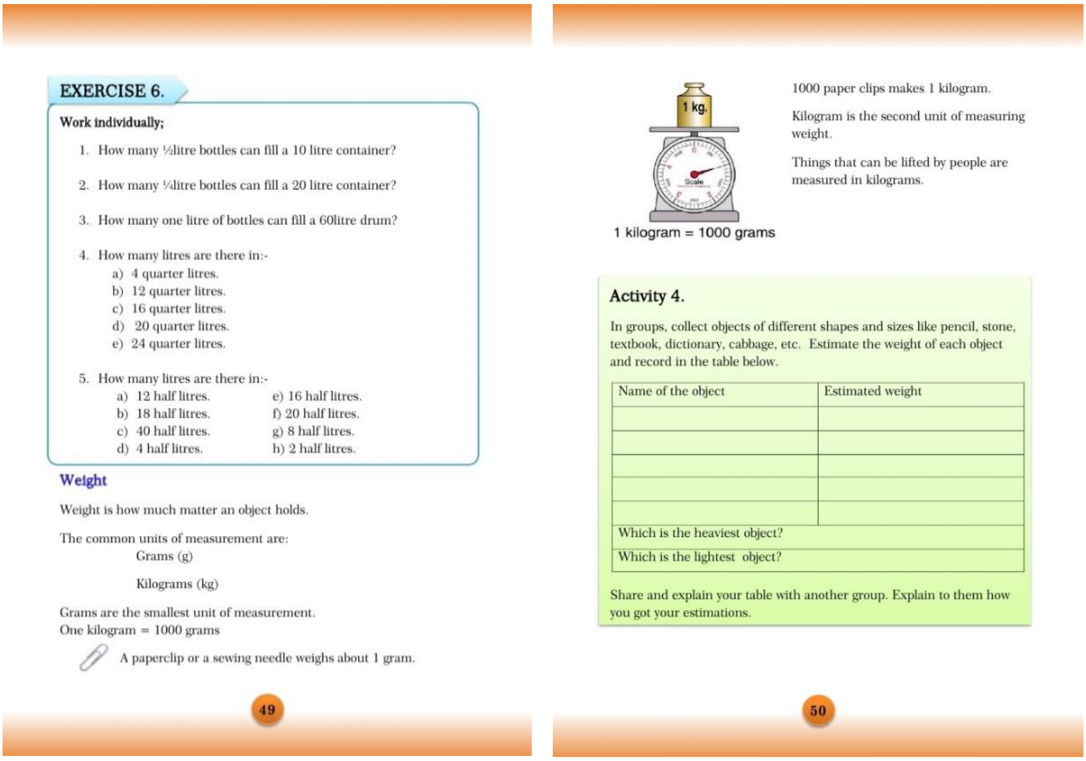
In groups, look at the picture below.

Do you have water tanks at school or at home?

Weight

Explain to the learner, weight is how much matter an object holds. The common units of measurement are:

- Grams (g)
- Kilograms (kg)



EXERCISE 6.

Work individually;

1. How many ½litre bottles can fill a 10 litre container?
2. How many ¼litre bottles can fill a 20 litre container?
3. How many one litre of bottles can fill a 60litre drum?
4. How many litres are there in:-
   a) 4 quarter litres.
   b) 12 quarter litres.
   c) 16 quarter litres.
   d) 20 quarter litres.
   e) 24 quarter litres.
5. How many litres are there in:-
   a) 12 half litres.
   b) 18 half litres.
   c) 40 half litres.
   d) 4 half litres.
   e) 16 half litres.
   f) 20 half litres.
   g) 8 half litres.
   h) 2 half litres.

Weight

Weight is how much matter an object holds.

The common units of measurement are:
Grams (g)
Kilograms (kg)

Grams are the smallest unit of measurement.
One kilogram = 1000 grams

A paperclip or a sewing needle weighs about 1 gram.

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1 kilogram = 1000 grams

1000 paper clips makes 1 kilogram.

Kilogram is the second unit of measuring weight.

Things that can be lifted by people are measured in kilograms.

Activity 4.

In groups, collect objects of different shapes and sizes like pencil, stone, textbook, dictionary, cabbage, etc. Estimate the weight of each object and record in the table below.

Name of the object	Estimated weight
Which is the heaviest object?	
Which is the lightest object?	

Share and explain your table with another group. Explain to them how you got your estimations.

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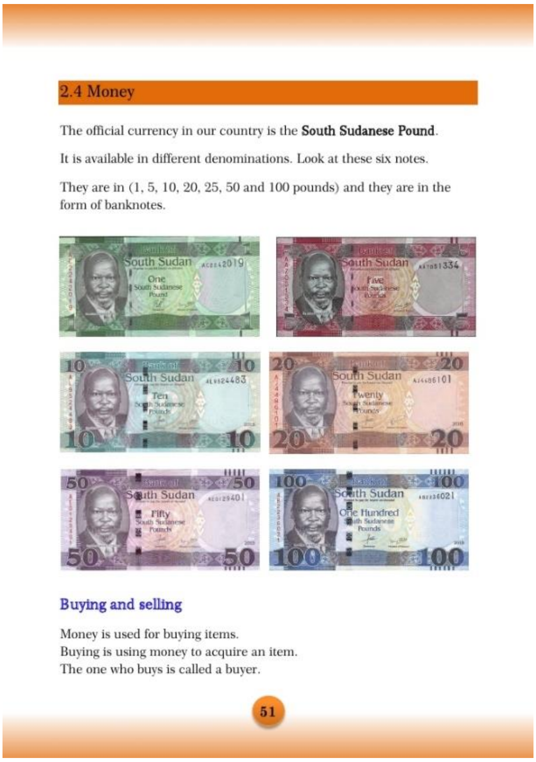
Activity 4

- ☑ Let learners to estimate the masses of different objects or guide learners on how to make an estimation.
- ☑ The teacher to guide learners on how to estimate and how to make readings in grams, kilograms and the conversion of the units.

2.4 Money



2.4 Money

The official currency in our country is the **South Sudanese Pound**.

It is available in different denominations. Look at these six notes.

They are in (1, 5, 10, 20, 25, 50 and 100 pounds) and they are in the form of banknotes.

Buying and selling

Money is used for buying items.
Buying is using money to acquire an item.
The one who buys is called a buyer.

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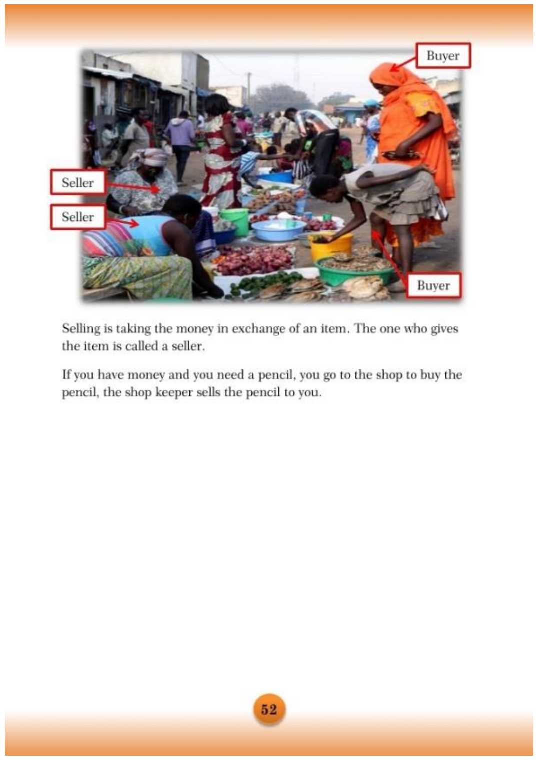

Selling is taking the money in exchange of an item. The one who gives the item is called a seller.

If you have money and you need a pencil, you go to the shop to buy the pencil, the shop keeper sells the pencil to you.

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When covering this subtopic present the notes to the learners and let them identify them.
Let the learners say what they can do with the money.

Buying and selling

Explain to the learner;

Money is used for buying items.

Buying is using money to acquire an item.

The one who buys is called a buyer.

EXERCISE 7.

Work individually; Show you working out

1. Makur had SSP 100. If he wanted a change of SSP 10 notes, how many such notes did he get?
2. Emma had SSP 50 note. She required SSP 20 notes, how many notes did she get?
3. John had 2 –100 notes. If he wanted SSP 25 notes, how many such notes did he get?
4. Douglas had 5-one hundred South Sudanese Pound notes. How many 20 south Sudanese pound notes did he get?
5. Mary had 150 South Sudanese Pounds how many five South Sudanese Pounds would she get?
6. How many 40 shilling coins can one get from a 500 shilling note?
7. How many 10 South Sudanese Pound notes can one get from a 200 South Sudanese Pounds?
8. Teresia had 5- one hundred South Sudanese Pounds notes, how many fifty notes did she get from getting change?
9. How many 50 notes can you get from 1000 South Sudanese Pounds?
10. Samson was sent by his mother to get change of 50 South Sudanese Pound note. How many five South Sudanese Pound notes did he get?

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Profit

This is when a person sells an item at a higher price than he bought it.

Example 4.

A trader bought an exercise book at SSP20 and later sold it at SSP30. In this case SSP30 is the selling price while SSP20 is the buying price.

The trader has made a profit of SSP10 since the selling price is more than the buying price.

Profit = selling price (S.P) – buying price (B.P).
= SSP30 – SSP20 = SSP10

Loss

This is when a person sells a commodity at a value less than he bought the commodity at.

Example 5.

A saleswoman bought a radio at SSP1200 and later sold it at SSP1000. In this case she made a loss of SSP200 since the selling price is less than the buying price).

Loss = Buying Price (B.P) - selling price (S.P).
= SSP1200 - SSP1000 = SSP200

EXERCISE 8.

In pairs, determine whether the salesperson made a profit or a loss in each case. State how much loss or profit and explain your answer.

i) Bought a car at SSP 800,000 and sold at SSP 950,000.
ii) Bought a gas cooker at SSP 6000 and sold at SSP 5000.
iii) Bought a book at SSP 750 and sold at SSP 790.
iv) Bought a table at SSP 2400 and sold at 1800.

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Exercise 7

Learners should do the exercise individually, this will help learners understand money and notes. Check the working out to check for any misconceptions.

Profit and loss

Guide learners using example 4 and 5 on page 54 of learner's book. Develop more example to help learners understand profit and loss.

Exercise 8

Learners should do the exercise individually and also in groups.

Answers

i) Profit SSP 150,000
ii) Loss SSP 1,000
iii) Profit SSP 40
iv) Loss SSP 600

Exercise 9

Learners should do the exercise in pairs.

This exercise will help learners understand the prices of good.

Guide learners by allowing them to role play this exercise.

OUR SHOP

Set up a shop in class with the items or label different objects collected from the surrounding to answer exercise 10.

PRICE LIST

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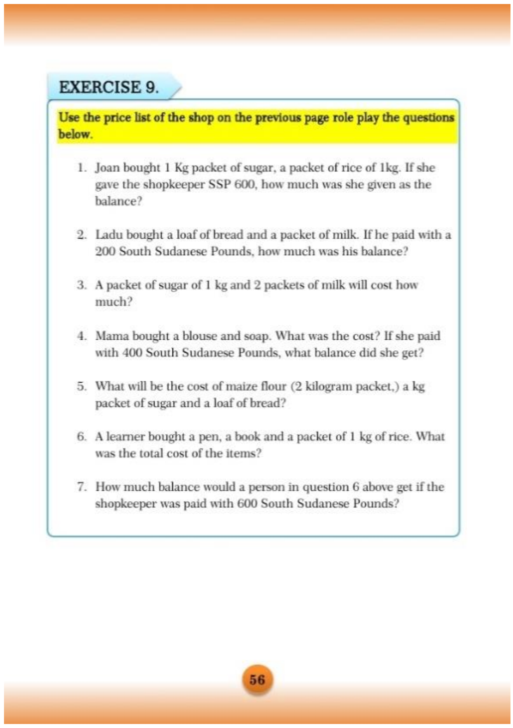

EXERCISE 9.

Use the price list of the shop on the previous page role play the questions below.

1. Joan bought 1 Kg packet of sugar, a packet of rice of 1kg. If she gave the shopkeeper SSP 600, how much was she given as the balance?
2. Ladu bought a loaf of bread and a packet of milk. If he paid with a 200 South Sudanese Pounds, how much was his balance?
3. A packet of sugar of 1 kg and 2 packets of milk will cost how much?
4. Mama bought a blouse and soap. What was the cost? If she paid with 400 South Sudanese Pounds, what balance did she get?
5. What will be the cost of maize flour (2 kilogram packet,) a kg packet of sugar and a loaf of bread?
6. A learner bought a pen, a book and a packet of 1 kg of rice. What was the total cost of the items?
7. How much balance would a person in question 6 above get if the shopkeeper was paid with 600 South Sudanese Pounds?

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2.5 Time

Guide learners to understand how the clock works.
This should be done using a clock.
We can tell if it is evening, but how do we know what the hour is?
The clock says 20 hours and 27 minutes. To change this time to the 12 hour clock take away 12 from the hours 20-12 = 8
So we know that it's something past 8 at night. The number after the colon (:) gives us the minutes. So it's 27 minutes past 8.
So 20.27 is the same as 8.27 pm.
In the 24 hour clock the hours keep on going up from 12 to 13. then 14 and so on.
In the 12 hour clock they go from 11 to 12 then start again back from 1, 2, 3 and soon.

Explain using the notes in the learner's book (page 55).

2.5 Time

A clock or watch is used to identify the duration of time that has passed.

A clock has three different types of hands: the hour hand, minute hand, and that of the seconds.

There are two main ways to show the time: "24 Hour Clock" or "AM/PM".

24 Hour Clock: the time is shown as how many hours and minutes since midnight.

AM/PM (or "12 Hour Clock"): the day is split into:

The 12 Hours running from Midnight to Noon (the **AM** hours), and

The other 12 Hours running from Noon to Midnight (the **PM** hours).

Converting 12 hour clock to 24 clock

Add 12 to any hour after Noon (and subtract 12 for the first hour of the day):

(12 Midnight to 12:59 AM), subtract 12 Hours

12 Midnight = 0:00, 12:35 AM = 0:35

From 1:00 AM to 12:59 PM, no change

11:20 AM = 11:20

From 1:00 PM to 11:59 PM, add 12 Hours

Examples: 4:45 PM = 16:45, 11:50 PM = 23:50

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Look at the picture below. What is she doing? Why is she doing so?

Converting 24 hour clock into 12 hour clock

For the first hour of the day (0:00 to 0:59), add 12 Hours, make it "AM"

0:10 = 12:10 AM

From 1:00 to 11:59, just make it "AM"

1:15 = 1:15 AM

From 12:00 to 12:59, just make it "PM"

12:10 = 12:10 PM

From 13:00 to 23:59, subtract 12 Hours, make it "PM"

14:55 = 2:55 PM.

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Exercise 10

Learners should do the exercise individually and also in groups.

Answers

i.
1. 1324h
2. 0256h
3. 1945h
4. 0516h
5. 1556h
6. 1225h
7. 2327h
8. 2013h
9. 0042h

ii.

1. 1:41pm
2. 5:50pm
3. 4:32 am
4. 12:36pm
5. 11:25pm
6. 8:53 am
7. 12:51am
8. 7:08pm
9. 3:39am

In groups, look at the picture below. What is happening?

At what time do you go for break, lunch and going home? (AM/PM)

EXERCISE 10.

Convert these am and pm times to 24 hour clock times:

1)	1:24pm =	2)	2:56am =	3)	7:45pm =
4)	5:16am =	5)	3:56pm =	6)	12:25pm =
7)	11:27pm =	8)	8:13pm =	9)	12:42am =

Convert these 24 hour clock times to am and pm times:

1)	13:41 =	2)	17:50 =	3)	04:32 =
4)	12:36 =	5)	23:25 =	6)	08:53 =
7)	00:51 =	8)	19:08 =	9)	15:39 =

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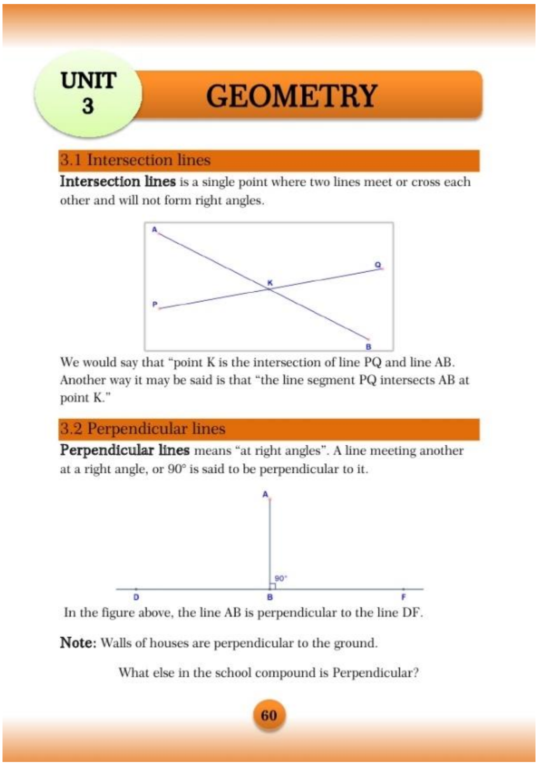
UNIT 3: GEOMETRY

In this unit, learners will learn the concepts and the language required to discuss shapes, angles and directions. They will learn about the properties of angles and to give and follow directions to move from one location to another.

Learn about	Key inquiry questions
✍ Learners should identify and draw intersecting, parallel and perpendicular lines using rulers and investigate their relationship. ✍ They should identify and compare angles and compare angles (right angle, acute and obtuse angle), using a right angle paper and draw right angles using corners of flat objects, and measure angles in degrees using a protractor accurately.	• How do we describe intersecting, perpendicular and parallel lines? • How many types of angles do we know and can see around us? • How do we measure angles?

Learning outcomes		
Knowledge and understanding	**Skills**	**Attitudes**
• Identify intersecting, parallel and perpendicular lines. • Comparing angles, drawing right angle. using corners • Measurement of angles using degrees.	• Draw intersecting, parallel, and perpendicular lines using ruler. • Draw a right angle using corner of plat objects and ruler. • Measure the angles using protractor.	• Appreciate the use of lines and angles in daily life. • Enjoy drawing angles using corners of objects. • Challenge children to explore and investigate and take responsibility for their own learning.
Contribution to the competencies: Critical thinking: applying the knowledge in drawing and measurement of lines and angles Communication: group work in different media Co-operation: team work		
Links to other subjects: • Population representation in SST • Seasons/Rotation/revolution of earth along axis/orbit • Art and design (lines and angles)		

3.1 Intersection lines


UNIT 3 GEOMETRY

3.1 Intersection lines

Intersection lines is a single point where two lines meet or cross each other and will not form right angles.

We would say that "point K is the intersection of line PQ and line AB. Another way it may be said is that "the line segment PQ intersects AB at point K."

3.2 Perpendicular lines

Perpendicular lines means "at right angles". A line meeting another at a right angle, or 90° is said to be perpendicular to it.

In the figure above, the line AB is perpendicular to the line DF.

Note: Walls of houses are perpendicular to the ground.

What else in the school compound is Perpendicular?

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Guide learners to understand intersecting lines.
Explain using the notes in the learner's book (Page 60)

Give practical examples using sticks, or guide learners to a place with intersecting roads.

3.2 Perpendicular lines

Guide learners to understand perpendicular lines.
Explain using the notes in the learner's book (Page 60)

Give practical examples using sticks, or guide learners using walls.

Learners should be able to give examples like flag post, door, windows etc.

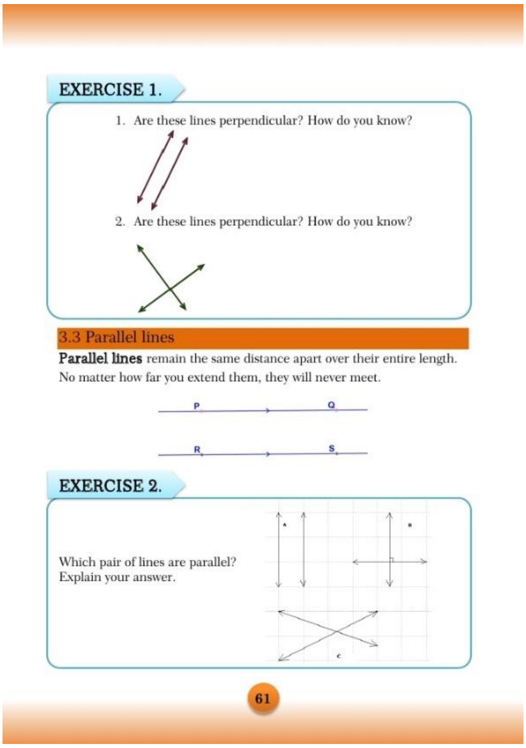
Exercise 1

Learners should be able to identify different lines.

Answers

1. No, they are parallel

3.3 Parallel lines


EXERCISE 1.

1. Are these lines perpendicular? How do you know?
2. Are these lines perpendicular? How do you know?

3.3 Parallel lines

Parallel lines remain the same distance apart over their entire length. No matter how far you extend them, they will never meet.

P Q

R S

EXERCISE 2.

Which pair of lines are parallel? Explain your answer.

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Guide learners to understand parallel lines.
Explain using the notes in the learner's book (Page 60).

Give practical examples using sticks, or guide learners using a ruler.

Exercise 2

Learners should be able to identify different lines.

Answers

A parallel.
B perpendicular.
C intersect.

3.4 Angles

Guide learners to understand how the clock works.
Explain using the notes in the learner's book (Page 62).

Activity 1

The teacher should guide learners to draw the angles and guide them in identifying the angles from the clocks.

Learners should note that;

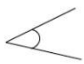
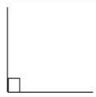
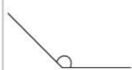
Acute angles are used.
Right angles are used.
Obtuse angles are used.

Application of angles

Explain different applications of angles example on house roofs. (learner's book page 63)

3.4 Angles

An angle is the space between two lines that meet each other. When two lines meet at a point, an angle is formed. The two lines are called the arms of the angle.

TYPE OF ANGLE	Diagram	DESCRIPTION
Acute Angle		is less than 90°
Right Angle		is 90° exactly
Obtuse Angle		is greater than 90° but less than 180°
Straight Angle		is 180° exactly

But the lines are the same, so when naming the angles make sure that you know **which angle is being asked for**.

Activity 1.

1. In groups, draw right angles using corners of flat objects.
2. Look at the clocks below, discuss the angles formed by each clock.

Application of angles

In construction we need to follow angles so that everything is stable and firm.

For example, the roof of a house has to be at least 39 degrees and at maximum 48 degrees to prevent rain water and make sure rain can slide off.

If the roof was a 180 degree angle or 0 degree angle, the water has no place but to start leaking inside a house.

People use angles to build chairs and tables.

Activity 2.

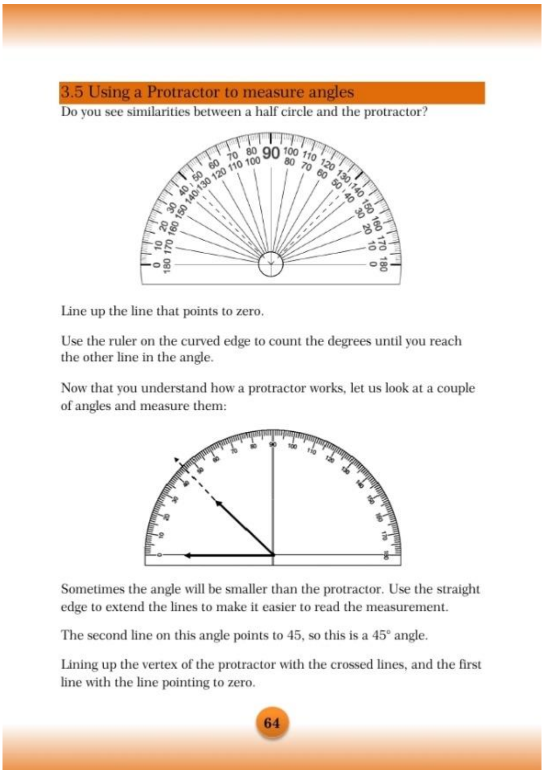
Visit a nearby carpenter, ask and observe how angles help them in their job.

Activity 2

Guide learners to a nearby carpenter and allow them to ask the carpenter about the tools they use.

Let the learners inquire about angles and how they are used.

3.5 Using a Protractor to measure angles



3.5 Using a Protractor to measure angles

Do you see similarities between a half circle and the protractor?

Line up the line that points to zero.

Use the ruler on the curved edge to count the degrees until you reach the other line in the angle.

Now that you understand how a protractor works, let us look at a couple of angles and measure them:

Sometimes the angle will be smaller than the protractor. Use the straight edge to extend the lines to make it easier to read the measurement.

The second line on this angle points to 45, so this is a 45° angle.

Lining up the vertex of the protractor with the crossed lines, and the first line with the line pointing to zero.

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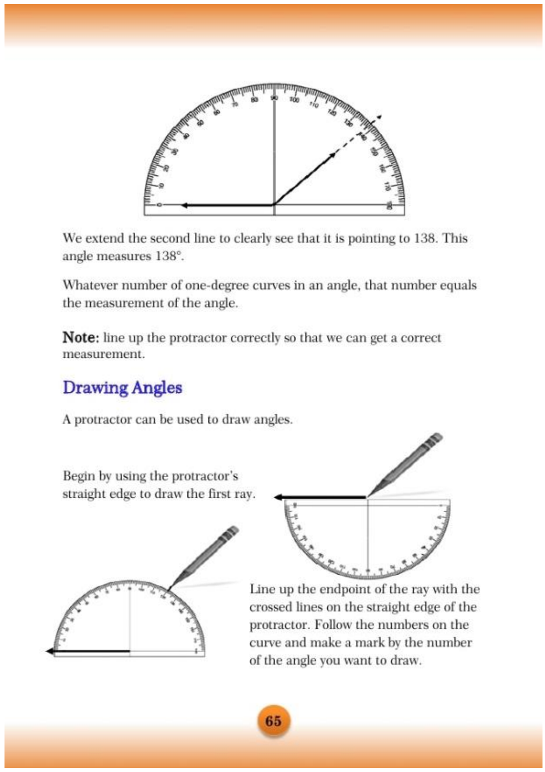

We extend the second line to clearly see that it is pointing to 138. This angle measures 138°.

Whatever number of one-degree curves in an angle, that number equals the measurement of the angle.

Note: line up the protractor correctly so that we can get a correct measurement.

Drawing Angles

A protractor can be used to draw angles.

Begin by using the protractor's straight edge to draw the first ray.

Line up the endpoint of the ray with the crossed lines on the straight edge of the protractor. Follow the numbers on the curve and make a mark by the number of the angle you want to draw.

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Ask learners if they have ever seen a protractor.

A protractor is an angle of measure. An angle is a measure of turn. Show the learners a protractor and guide them on how it is used. When measuring angles show them the intersection point.

Learners should have protractors. This will help them to practice measuring angles.

Exercise 3

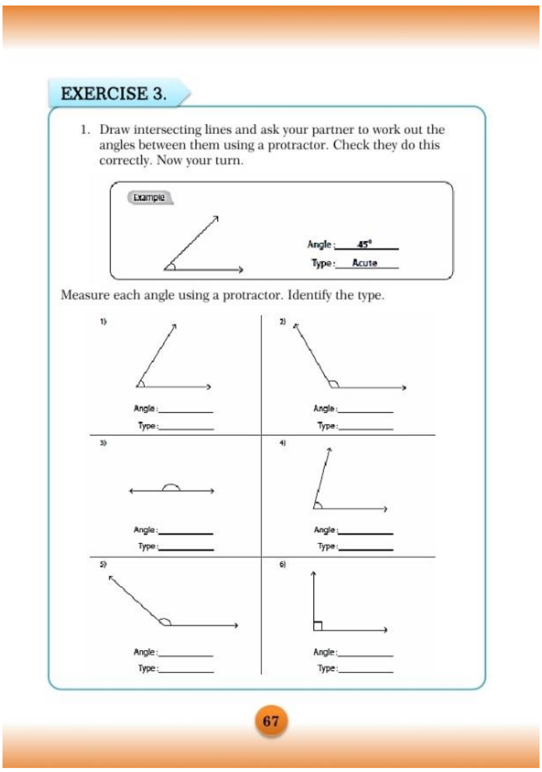
1. Check accuracy of the angle.
2. Check the value of the measurements the learner obtained.
3. i) check accuracy of the angle; acute.
   ii) Check accuracy; obtuse.

iii) 180^0, straight line.
iv) Check accuracy; acute.
v) Check accuracy; obtuse.
vi) 90^0; right angle.

Activity 3

This will help the learner to understand parallel lines, perpendicular lines and intersection lines.

1. Mary 1st Street and Mary 2nd Street, Ministries road and Buluk Avenue.
2. Perpendicular.
3. Thompiny Road, Gudele avenue and Terasa Road.
4. Ministries road, Bulik Avenue and John street.
5. No, they intersect.



EXERCISE 3.

1. Draw intersecting lines and ask your partner to work out the angles between them using a protractor. Check they do this correctly. Now your turn.

Example
Angle: 45°
Type: Acute

Measure each angle using a protractor. Identify the type.

1) Angle: ______ Type: ______
2) Angle: ______ Type: ______
3) Angle: ______ Type: ______
4) Angle: ______ Type: ______
5) Angle: ______ Type: ______
6) Angle: ______ Type: ______

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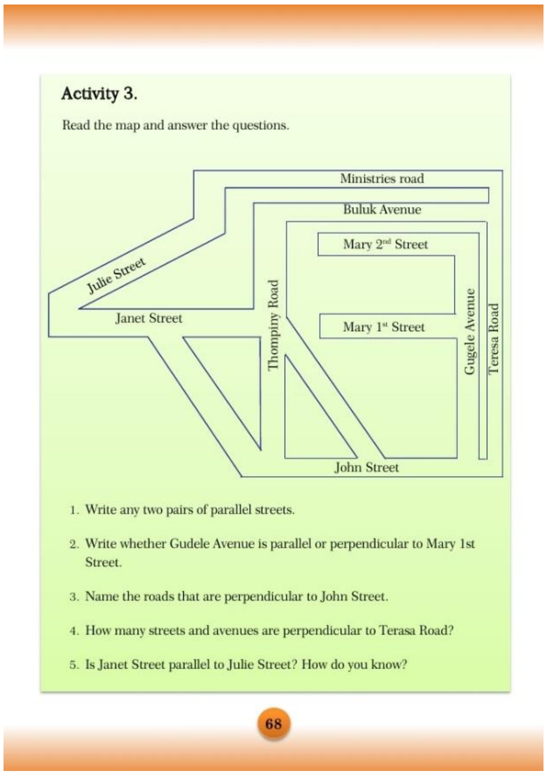

Activity 3.

Read the map and answer the questions.

1. Write any two pairs of parallel streets.
2. Write whether Gudele Avenue is parallel or perpendicular to Mary 1st Street.
3. Name the roads that are perpendicular to John Street.
4. How many streets and avenues are perpendicular to Terasa Road?
5. Is Janet Street parallel to Julie Street? How do you know?

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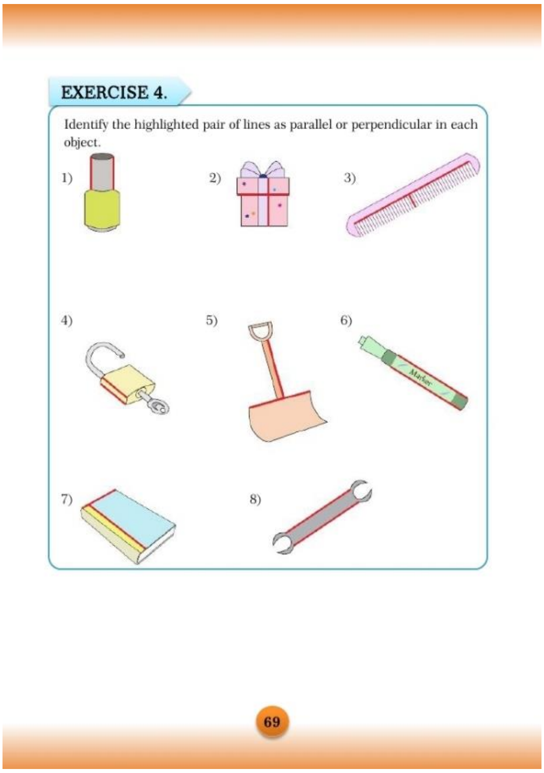
Exercise 4



EXERCISE 4.

Identify the highlighted pair of lines as parallel or perpendicular in each object.

1) 2) 3)

4) 5) 6)

7) 8)

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1) Parallel

2) Perpendicular

3) Perpendicular

4) Parallel

5) Perpendicular

6) Parallel

7) Perpendicular

6) Parallel

UNIT 4: ALGEBRA

Algebra is about using letters in place of numbers. Sometimes it's possible to work out what the letter represents.

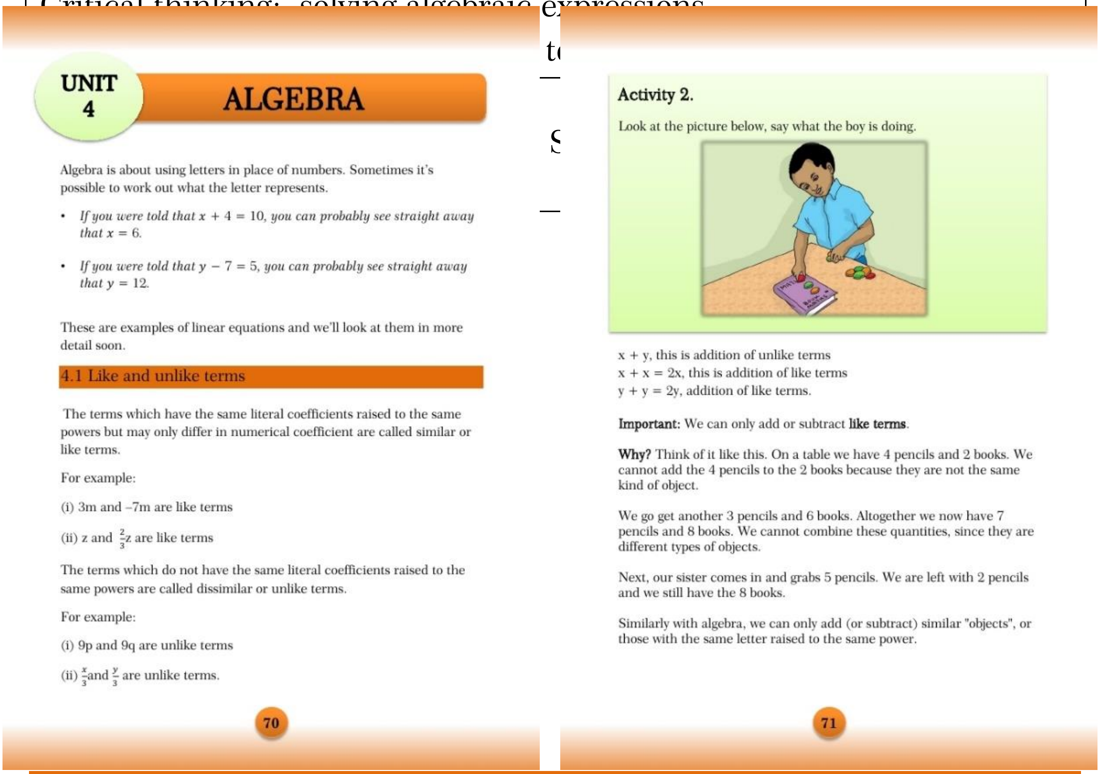
Learn about	Key inquiry questions
✍ Learners should use symbols e.g. letters to represent numbers, identify like and unlike terms, and perform simple addition and subtraction of simple algebraic expressions. They will explain the use of simple algebraic expression in daily life situation. ✍ In groups they should investigate simple algebraic expressions from word problems.	• What do we mean by 'like term' and 'unlike term' in algebra? • How can we express simple algebraic expressions? • Can we solve the following algebraic problems involving addition and subtraction? • How do we form simple algebraic expressions from word problems?

Learning outcomes

Knowledge and understanding	Skills	Attitudes
• Using symbols for numbers, like and unlike terms, addition and subtraction of simple algebraic expressions.	• Use letters for numbers –write simple algebraic expressions. • Solving from problems using algebraic expressions. • Write out simple algebraic expressions from word problems.	• Enjoy using letters to express daily expressions • Value like terms and unlike terms for knowing algebraic expressions of what takes place compound • Cooperation in sharing ideas.

Contribution to the competencies:

Critical thinking: solving algebraic expressions



UNIT 4

ALGEBRA

Algebra is about using letters in place of numbers. Sometimes it's possible to work out what the letter represents.

- *If you were told that $x + 4 = 10$, you can probably see straight away that $x = 6$.*
- *If you were told that $y - 7 = 5$, you can probably see straight away that $y = 12$.*

These are examples of linear equations and we'll look at them in more detail soon.

4.1 Like and unlike terms

The terms which have the same literal coefficients raised to the same powers but may only differ in numerical coefficient are called similar or like terms.

For example:

(i) 3m and –7m are like terms

(ii) z and $\frac{2}{3}z$ are like terms

The terms which do not have the same literal coefficients raised to the same powers are called dissimilar or unlike terms.

For example:

(i) 9p and 9q are unlike terms

(ii) $\frac{x}{3}$and $\frac{y}{3}$ are unlike terms.

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Activity 2.

Look at the picture below, say what the boy is doing.

x + y, this is addition of unlike terms
x + x = 2x, this is addition of like terms
y + y = 2y, addition of like terms.

Important: We can only add or subtract **like terms**.

Why? Think of it like this. On a table we have 4 pencils and 2 books. We cannot add the 4 pencils to the 2 books because they are not the same kind of object.

We go get another 3 pencils and 6 books. Altogether we now have 7 pencils and 8 books. We cannot combine these quantities, since they are different types of objects.

Next, our sister comes in and grabs 5 pencils. We are left with 2 pencils and we still have the 8 books.

Similarly with algebra, we can only add (or subtract) similar "objects", or those with the same letter raised to the same power.

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4.1 Like and unlike terms

Activity 1

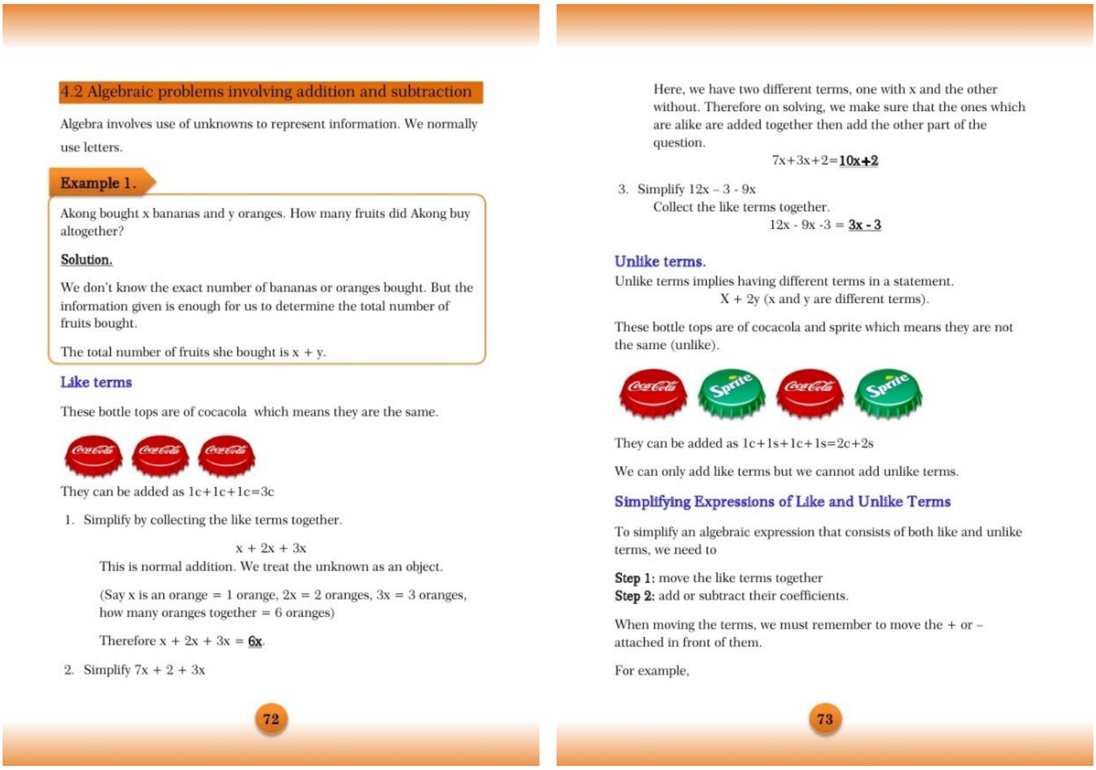
Guide learners in Collecting/grouping same objects together.

Others may say he is counting bottle tops.

- ☑ Use bottle tops or any safe objects to demonstrate to learners like and unlike terms

Emphasize using notes on page 70 of the learner's book.

4.2 Algebraic problems involving addition and subtraction



4.2 Algebraic problems involving addition and subtraction

Algebra involves use of unknowns to represent information. We normally use letters.

Example 1.

Akong bought x bananas and y oranges. How many fruits did Akong buy altogether?

Solution.

We don't know the exact number of bananas or oranges bought. But the information given is enough for us to determine the total number of fruits bought.

The total number of fruits she bought is x + y.

Like terms

These bottle tops are of cocacola which means they are the same.

They can be added as 1c+1c+1c=3c

1. Simplify by collecting the like terms together.

   x + 2x + 3x

   This is normal addition. We treat the unknown as an object.

   (Say x is an orange = 1 orange, 2x = 2 oranges, 3x = 3 oranges, how many oranges together = 6 oranges)

   Therefore x + 2x + 3x = **6x**.

2. Simplify 7x + 2 + 3x

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Here, we have two different terms, one with x and the other without. Therefore on solving, we make sure that the ones which are alike are added together then add the other part of the question.

7x+3x+2=**10x+2**

3. Simplify 12x – 3 - 9x

   Collect the like terms together.

   12x - 9x -3 = **3x - 3**

Unlike terms.

Unlike terms implies having different terms in a statement.

X + 2y (x and y are different terms).

These bottle tops are of cocacola and sprite which means they are not the same (unlike).

They can be added as 1c+1s+1c+1s=2c+2s

We can only add like terms but we cannot add unlike terms.

Simplifying Expressions of Like and Unlike Terms

To simplify an algebraic expression that consists of both like and unlike terms, we need to

Step 1: move the like terms together

Step 2: add or subtract their coefficients.

When moving the terms, we must remember to move the + or – attached in front of them.

For example,

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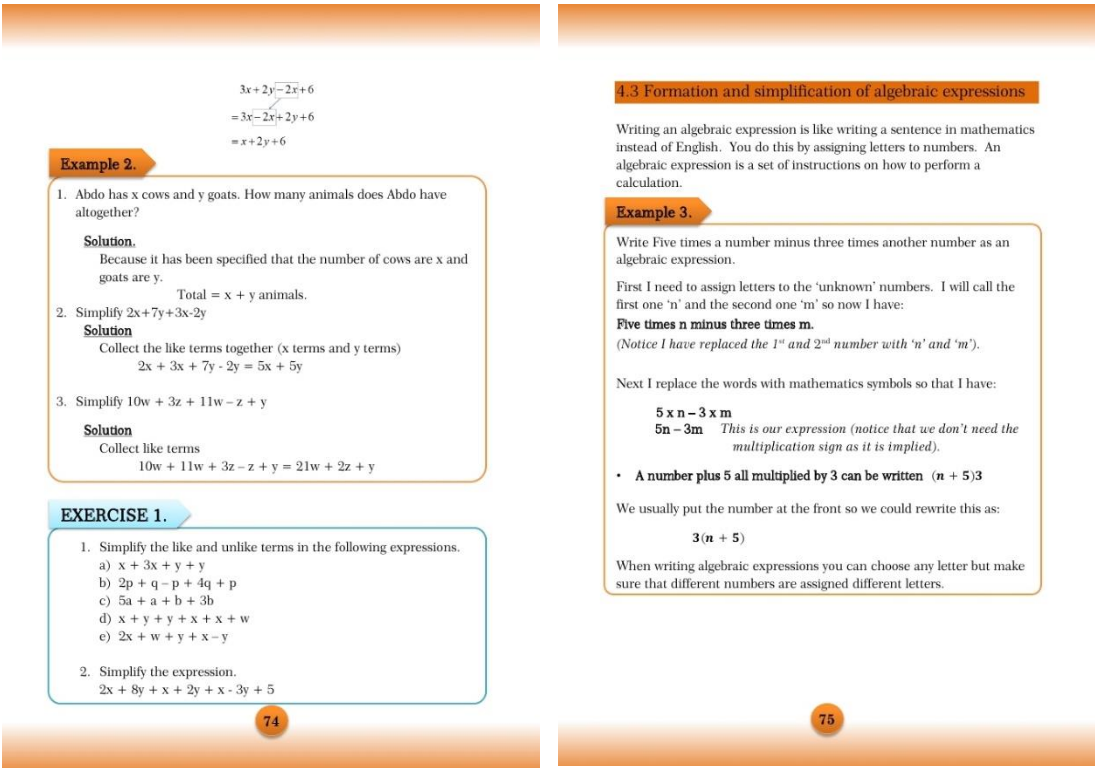
Demonstrate using example 1 on page 72 if the learners book on how to combine or add and subtract like and unlike terms.

Create more activities to emphasize the points
Also you can use the notes on page 73 of the learner's book.

Example 2 on page 74 of the learner's book also explains on how to add algebraic problem involving addition.

Exercise 1

1. a) 4x+2y   b) 2p+5q   c) 6a+4b   d)3x+2y+w
   e) 3x+w
2. 4x+7y+5



$$3x+2y-2x+6$$
$$=3x-2x+2y+6$$
$$=x+2y+6$$

Example 2.

1. Abdo has x cows and y goats. How many animals does Abdo have altogether?

   Solution.
   Because it has been specified that the number of cows are x and goats are y.
   Total = x + y animals.

2. Simplify 2x+7y+3x-2y
   Solution
   Collect the like terms together (x terms and y terms)
   2x + 3x + 7y - 2y = 5x + 5y

3. Simplify 10w + 3z + 11w – z + y

   Solution
   Collect like terms
   10w + 11w + 3z – z + y = 21w + 2z + y

EXERCISE 1.

1. Simplify the like and unlike terms in the following expressions.
   a) x + 3x + y + y
   b) 2p + q – p + 4q + p
   c) 5a + a + b + 3b
   d) x + y + y + x + x + w
   e) 2x + w + y + x – y

2. Simplify the expression.
   2x + 8y + x + 2y + x - 3y + 5

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4.3 Formation and simplification of algebraic expressions

Writing an algebraic expression is like writing a sentence in mathematics instead of English. You do this by assigning letters to numbers. An algebraic expression is a set of instructions on how to perform a calculation.

Example 3.

Write Five times a number minus three times another number as an algebraic expression.

First I need to assign letters to the 'unknown' numbers. I will call the first one 'n' and the second one 'm' so now I have:

Five times n minus three times m.

(Notice I have replaced the 1st and 2nd number with 'n' and 'm').

Next I replace the words with mathematics symbols so that I have:

5 x n – 3 x m
5n – 3m *This is our expression (notice that we don't need the multiplication sign as it is implied).*

- **A number plus 5 all multiplied by 3 can be written** $(n + 5)3$

We usually put the number at the front so we could rewrite this as:

$3(n + 5)$

When writing algebraic expressions you can choose any letter but make sure that different numbers are assigned different letters.

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4.3 Formation and simplification of algebraic expressions

Writing an algebraic expression is like writing a sentence in mathematics instead of English. You do this by assigning letters to numbers. An algebraic expression is a set of instructions on how to perform a calculation.

Use example 3 and example 4 on page 72 and page 73 respectively to emphasize on formation and simplification of algebraic expression.

Look at the picture below.

Deng has one apple and Taban has one dog. We can form an equation by saying an apple is represented by 'a' and a dog represented by 'd'.

If we add what they have all together = $1a + 1d$

Example 4.

1. Kamal is twice as old as his sister. Find an expression for the sum of their ages.

   Solution.
   Note: Sum means addition.
   Let the age of the sister be x
   Therefore Kamal = 2x (twice means two times)
   Therefore sum of their ages = x + 2x = 3x

2. A man is 2 years older than his wife. What is the sum of their ages?

   Solution.
   Let the wife's age be x
   Man = x + 2
   Sum of their ages = x + x + 2 = 2x + 2 years.

3. Our mathematics teacher is thrice as old as her daughter Debora. What is the difference in their ages?

   Solution
   Note: difference means subtraction.
   Let Debora's age be y
   Teacher = 3y
   Difference in their age = 3y – y = 2y

4. Kariem is 7cm taller than Rachael. What is the sum of their height?

   Solution
   Let Mary be h cm tall.
   Peter = (h + 7)cm
   Sum of their height = h + h + 7 = (2h + 7)cm

5. Hillary is twice as old as Abraham and their brother Amon is three years older than Abraham. Find an expression for the sum of their ages.

   Solution
   Let Abraham's age be x years.
   Hillary = 2x
   Amon = x + 3 years.
   Sum = x + 2x + x + 3 = 4x + 3 years.

EXERCISE 2.

Show your working out

1. Simplify, if possible.

   a. 13x + 7y – 8x + 20y
   b. 22x – 19 + 14x – 9x + 20
   c. 2x + 18y – y + 2x
   d. 2a + 5b + 19a
   e. 3q + 20s – 9q + 2s – 34q
   f. x + 7 + 6x + x – 3
   g. 10x + 14 + 9x + 3 – 8x + 6
   h. x + 4y – 10x + 7y – x

2. A farmer has y cows. The number of goats is 20 more than the number of cows. What is the total number of animals the farmer has?

3. The number of girls in a class is twice that of boys. What is the difference in the number of students?
4. A student scored 15 marks less in geography than mathematics. What was the total marks for the student?
   (**Hint**: less means minus, more means add)

5. Anne is 5 years older than Vivian. Find the sum of their ages four years ago?

6. Think of a number, square it and add 5. The result is 21. Find the number.(square means multiply the number by itself)

Exercise 1

1. a. $5x = 27y$ b. $27x+1$ c. $4x+17y$ d. $21a+5b$
   e. $-40q+22s$ f. $8x+4$ g. $11x+23$ h. $-10x+11y$

2. Cows; y
   Goats; $20+y$
   Total animals$=2y+20$

3. Let boys be y
   Therefore girls; $2y$
   Difference$=2y-y=y$

4. Let Mathematics be; x
   Therefore Geography; $x-15$
   Total$=x+x-15=2x-15$

5. Let Vivian age be x yrs
   Therefore Anne; $x+5$
   4 years ago; Vivian $x-4$, Anne; $x+5-4$
   Sum of ages 4 years ago$=x-4+x+1=2x-3$

6. Let the number be x
   $X^2+5=21$
   $X^2=21-5$ $X=4$

UNIT 5: STATISTICS

Learn about	Key inquiry questions
✍ Learners investigate the concept of data through practical activities involving the collection and recording of data. They should understand axes and draw bar and line graphs to represent data, interpret it, and explain their observations in terms of variables.	• How do we collect and record data? • How do we represent and interpret data on a bar or line graph? • What examples in daily life can you mention where bar and line graphs are used?

Learning outcomes		
Knowledge and understanding	**Skills**	**Attitudes**
• Data collection and recording, graphs of data (bar & line graphs).	• Recording data accurately. • Drawing bar/line graphs.	• Develop positive attitudes towards data collection and representation online/bar graph. • Appreciate the use of bar/line graph to represent data.

Contribution to the competencies:
Critical thinking: data collection, representing data on a bar/line graphs can sharpens the reasoning ability of learners
Communication: through different media -information on the bar and line graphs
Co-operation: as they draw and interpret the graphs

Links to other subjects:
Links to a range of subjects such as Science and Social Studies where statistics are used

In this unit, learners use information to predict or make guesses about events that will happen, may happen or can never happen.

Activities and exercises in this unit have been designed to introduce important concepts and tools which are then revisited in later activities.

Learners also learn to use statistical information, graphs and tables in practical situations.

Define to learners the meaning of statistics.

Statistics is a process that involves the collection of data, recording of data, representation of data, analyzing and interpretation of data.

Data- information in terms of measurements.

Types of data.

i) **Primary data** – This is raw data collected at a source.

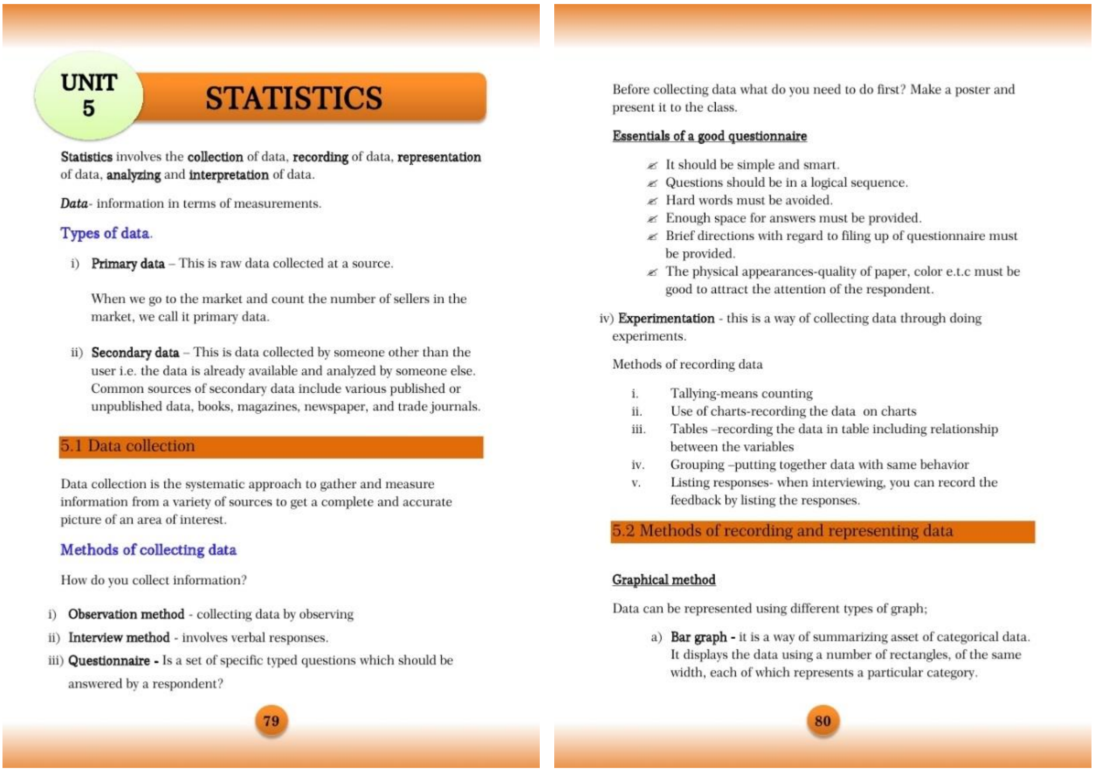
ii) **Secondary data** – This is data collected by someone other than the user i.e. the data is already available and analyzed by someone else. Common sources of secondary data include various published or unpublished data, books, magazines, newspaper, and trade journals.

5.1 Data collection

Define data collection using notes on page 79 of learner's book.

Explain methods of recording data and let them understand the different ways of recording data.

Emphasize using notes on page 79 and 80 of the learner's book.


UNIT 5 STATISTICS

Statistics involves the **collection** of data, **recording** of data, **representation** of data, **analyzing** and **interpretation** of data.

Data- information in terms of measurements.

Types of data.

i) **Primary data** – This is raw data collected at a source.

When we go to the market and count the number of sellers in the market, we call it primary data.

ii) **Secondary data** – This is data collected by someone other than the user i.e. the data is already available and analyzed by someone else. Common sources of secondary data include various published or unpublished data, books, magazines, newspaper, and trade journals.

5.1 Data collection

Data collection is the systematic approach to gather and measure information from a variety of sources to get a complete and accurate picture of an area of interest.

Methods of collecting data

How do you collect information?

i) **Observation method** - collecting data by observing

ii) **Interview method** - involves verbal responses.

iii) **Questionnaire -** Is a set of specific typed questions which should be answered by a respondent?

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Before collecting data what do you need to do first? Make a poster and present it to the class.

Essentials of a good questionnaire

- It should be simple and smart.
- Questions should be in a logical sequence.
- Hard words must be avoided.
- Enough space for answers must be provided.
- Brief directions with regard to filing up of questionnaire must be provided.
- The physical appearances-quality of paper, color e.t.c must be good to attract the attention of the respondent.

iv) **Experimentation** - this is a way of collecting data through doing experiments.

Methods of recording data

i. Tallying-means counting
ii. Use of charts-recording the data on charts
iii. Tables –recording the data in table including relationship between the variables
iv. Grouping –putting together data with same behavior
v. Listing responses- when interviewing, you can record the feedback by listing the responses.

5.2 Methods of recording and representing data

Graphical method

Data can be represented using different types of graph;

a) **Bar graph -** it is a way of summarizing asset of categorical data. It displays the data using a number of rectangles, of the same width, each of which represents a particular category.

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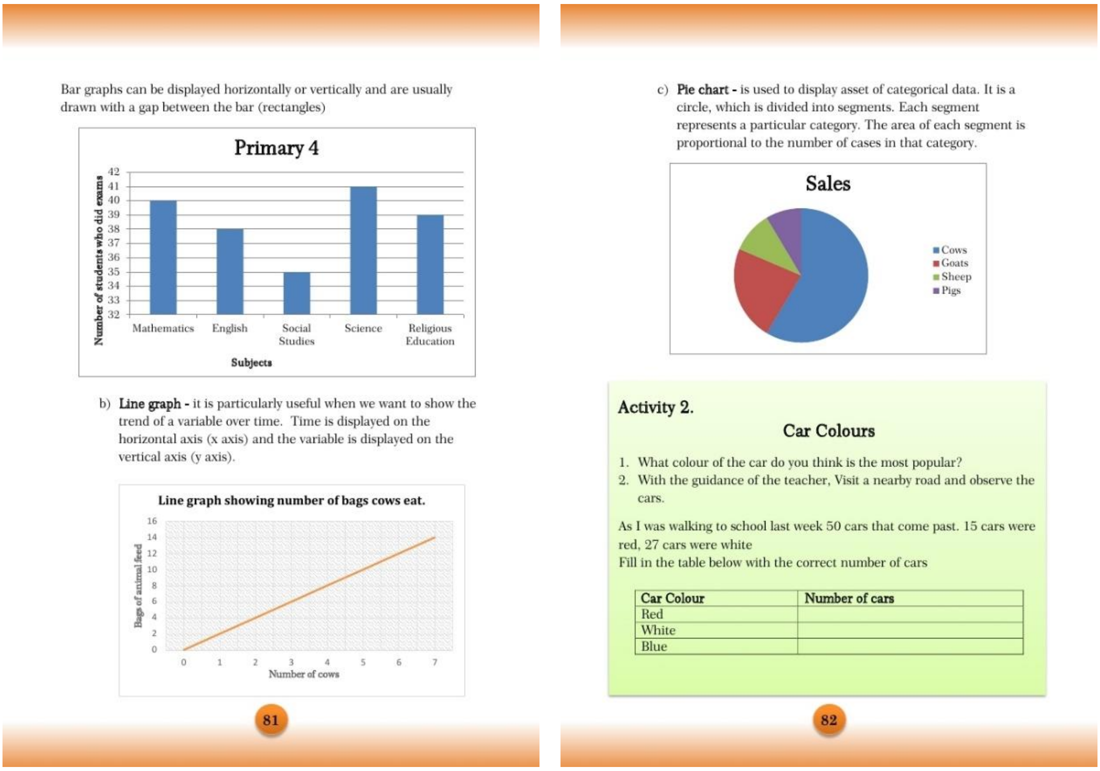
5.2 Methods of recording and representing data

Explain to the learner the different method of recording and presenting data that has been collected.

Activity 2.

'Car colours' introduces learners to simple data collection and addresses the following aspects:

- Making predictions about people's preferences and then commenting on these predictions in the light of results of the study.
- Considering the sample used in the study. Learners should note that results might differ from one learner to the other depending on the area they collected data from.



Bar graphs can be displayed horizontally or vertically and are usually drawn with a gap between the bar (rectangles)

b) **Line graph -** it is particularly useful when we want to show the trend of a variable over time. Time is displayed on the horizontal axis (x axis) and the variable is displayed on the vertical axis (y axis).

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c) **Pie chart -** is used to display asset of categorical data. It is a circle, which is divided into segments. Each segment represents a particular category. The area of each segment is proportional to the number of cases in that category.

Activity 2.

Car Colours

1. What colour of the car do you think is the most popular?
2. With the guidance of the teacher, Visit a nearby road and observe the cars.

As I was walking to school last week 50 cars that come past. 15 cars were red, 27 cars were white

Fill in the table below with the correct number of cars

Car Colour	Number of cars
Red	
White	
Blue	

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The data collected by each learner will not necessarily be the same.

The teacher will have to select a set of data on the basis of which to draw the pictogram, but the differences between learners' data should be discussed in the class.

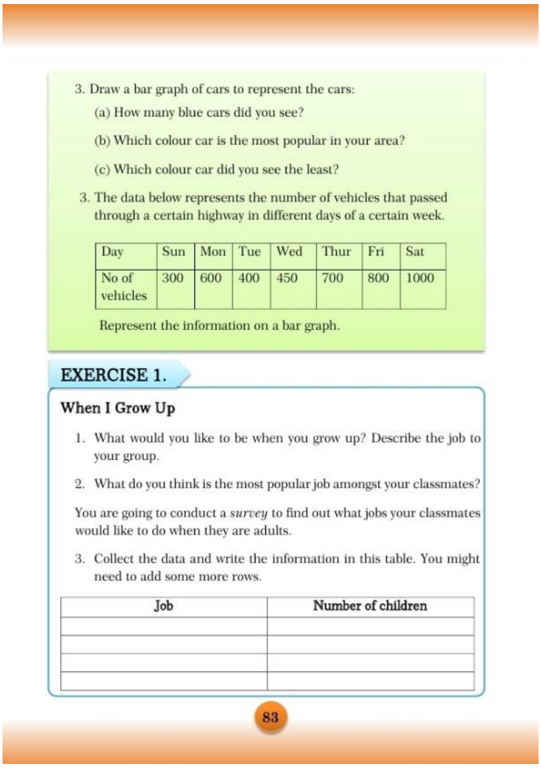
Learners should be encouraged to discuss possible reasons for discrepancies.

Some learners may include parked vehicles while others may only include moving vehicles.

- ☑ Counting the same vehicles more than once – learners must discuss whether this is valid.

All of these are important aspects of data collection and survey validity and could also account for differences between the learners' results.

Teachers should remember that the LEAST popular colours have a frequency of ZERO and may not appear on the list at all.



3. Draw a bar graph of cars to represent the cars:
   (a) How many blue cars did you see?
   (b) Which colour car is the most popular in your area?
   (c) Which colour car did you see the least?

3. The data below represents the number of vehicles that passed through a certain highway in different days of a certain week.

Day	Sun	Mon	Tue	Wed	Thur	Fri	Sat
No of vehicles	300	600	400	450	700	800	1000

Represent the information on a bar graph.

EXERCISE 1.

When I Grow Up

1. What would you like to be when you grow up? Describe the job to your group.
2. What do you think is the most popular job amongst your classmates?

You are going to conduct a *survey* to find out what jobs your classmates would like to do when they are adults.

3. Collect the data and write the information in this table. You might need to add some more rows.

Job	Number of children

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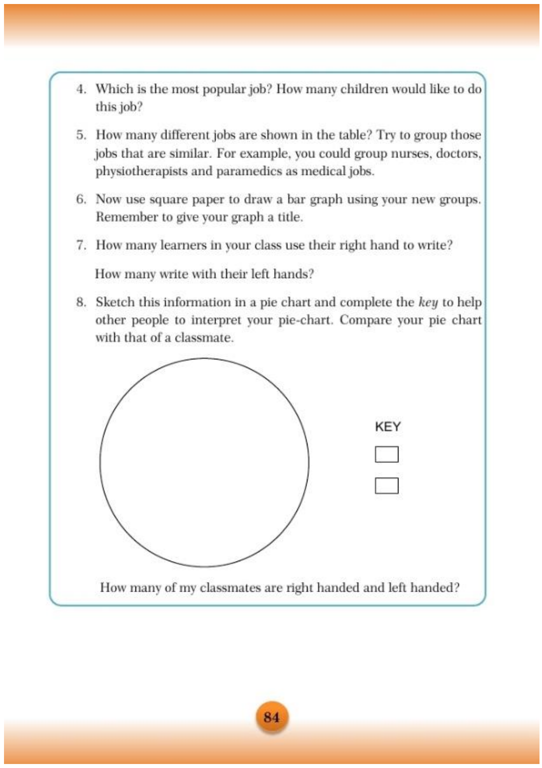

4. Which is the most popular job? How many children would like to do this job?
5. How many different jobs are shown in the table? Try to group those jobs that are similar. For example, you could group nurses, doctors, physiotherapists and paramedics as medical jobs.
6. Now use square paper to draw a bar graph using your new groups. Remember to give your graph a title.
7. How many learners in your class use their right hand to write?

   How many write with their left hands?
8. Sketch this information in a pie chart and complete the *key* to help other people to interpret your pie-chart. Compare your pie chart with that of a classmate.

KEY

How many of my classmates are right handed and left handed?

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Exercise 1

1. It requires that learners classify the data they have collected. It is possible that there will be a range of jobs chosen by learners and it will be of little use to draw a bar graph showing this information – it could be just as easily read off from the table.

The data can, however, be grouped so that more data falls into the categories. The teacher should provide assistance with the classifying where necessary.

This also provides learners with the opportunity to practice the collection of data, representation of the data in a table and the drawing of a bar graph.

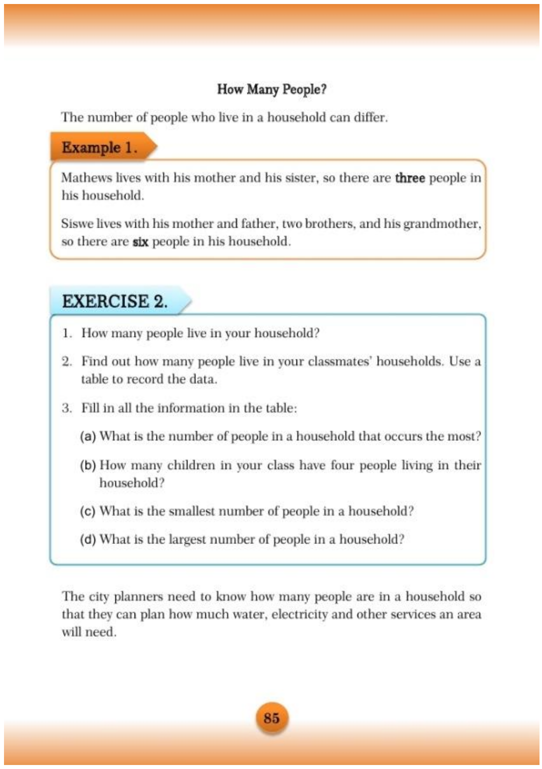
This requires that learners **sketch** their own pie chart.

The teacher may have to help learners to understand how the key should be completed, but should emphasize the importance of this key for understanding the pie chart.

Exercise 2

This exercise requires learners to firstly draw a table and fill it which might at first be confusing because there are numerical values in both columns.

You can also add additional questions, which is intended to help learners interpret the graphs.



How Many People?

The number of people who live in a household can differ.

Example 1.

Mathews lives with his mother and his sister, so there are **three** people in his household.

Siswe lives with his mother and father, two brothers, and his grandmother, so there are **six** people in his household.

EXERCISE 2.

1. How many people live in your household?
2. Find out how many people live in your classmates' households. Use a table to record the data.
3. Fill in all the information in the table:
   (a) What is the number of people in a household that occurs the most?
   (b) How many children in your class have four people living in their household?
   (c) What is the smallest number of people in a household?
   (d) What is the largest number of people in a household?

The city planners need to know how many people are in a household so that they can plan how much water, electricity and other services an area will need.

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Learners should be able to identify;

(a) The number of people in a household that occurs the most.
(b) Children in their class have four people living in their household.
(c) The smallest number of people in a household.
(d) The largest number of people in a household.