

Primary Mathematics 5

Primary Mathematics has been written and developed by Ministry of General Education and Instruction, Government of South Sudan in conjunction with Subjects experts. This course book provides a fun and practical approach to the subject of mathematics, and at the same time imparting life long skills to the pupils.

The book comprehensively covers the Primary 5 syllabus as developed by **Ministry of General Education and Instruction.**

Each year comprises of a Pupil's Book and teacher's Guide.

The Pupil's Books provide:

- Full coverage of the national syllabus.
- A strong grounding in the basics of mathematics.
- Clear presentation and explanation of learning points.
- A wide variety of practice exercises, often showing how mathematics can be applied to real-life situations.
- It provides opportunities for collaboration through group work activities.
- Stimulating illustrations.



All the courses in this primary series were developed by the Ministry of General Education and Instruction, Republic of South Sudan. The books have been designed to meet the primary school syllabus, and at the same time equipping the pupils with skills to fit in the modern day global society.

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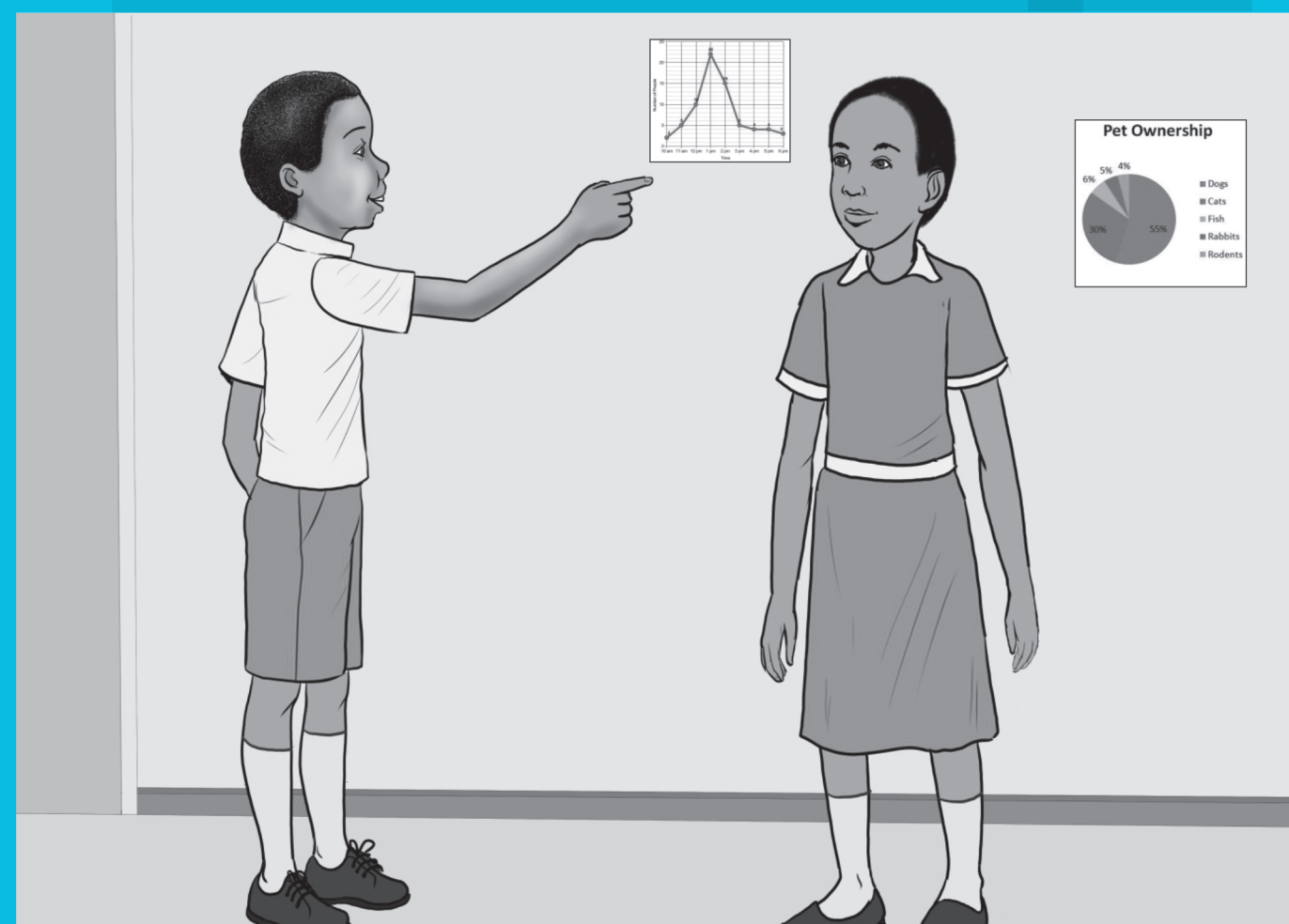
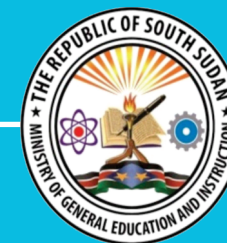
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Primary Mathematics 5

Teacher's Guide



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Mathematics

Teacher's Guide 5

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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 is a new P5 Mathematics series book and the teacher's guide is used alongside the learner's book. The course is practical. 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 is a primary five mathematics book, which contains 5 different units which have different sub topics. Each topic is strategically integrated with discussion sessions with activities that will help further the learners understanding.

The units are as outlined below.

Primary 5 Mathematics	
Unit	Title
1	Numbers: Operations
2	Measurement: profit and loss
3	Geometry: simple geometric constructions
4	Algebra: simple equations
5	Statistics: representation and interpretation of data

This primary mathematics book is based on the new curriculum review. The content of this book is mainly responsive to the needs of learners and aims to change from knowledge-based learning to competency-based learning.

An effort has been made to develop skills and competences of the learner; and this has been achieved through widening and inspiring certain attitudes during teaching and learning processes that would help the learner to think critically through various activities given in the learner's book.

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.

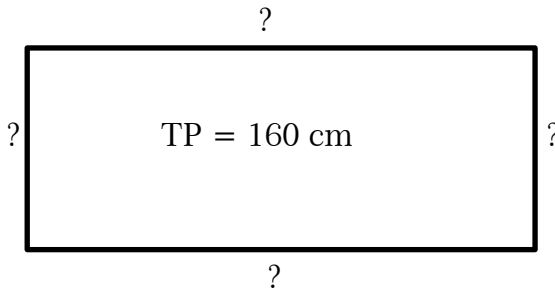
To make the learning explicit, it is important that you create a summary of what has been learnt from solving the problem.

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 **50 cm × 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.

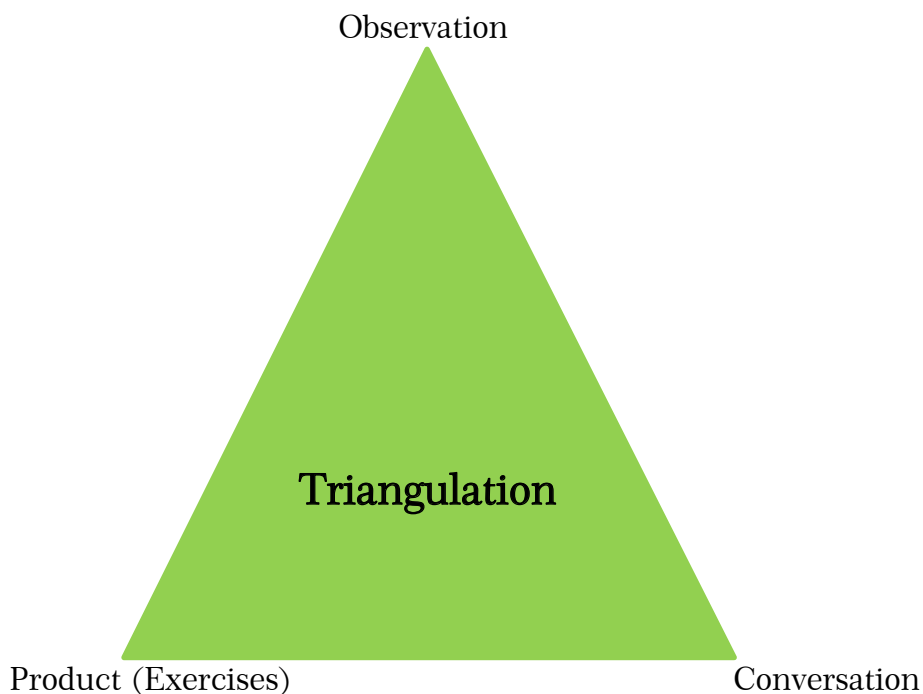
d) Peer teaching and learning

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

The concept of the four operations (addition, subtraction, multiplication and division) is dealt with in a practical way.

Learn about	Key inquiry questions
<p>✍ Learners should build on prior learning to secure understanding of place value and order numbers according to their size and position up to six digits, carry out basic operations, and cross check the answers using calculators.</p> <p>✍ They should investigate divisibility tests of 3, 4, 6 and 9 by single digits and identify prime numbers.</p> <p>✍ They should investigate factors and multiples of numbers and be introduced to the idea of least common multiple (LCM) and highest common factor (HCF).</p> <p>✍ They should investigate how to add and subtract fractions using LCM and reduce fractions using cancellation and investigate how to convert fractions to decimals and vice versa.</p> <p>✍ Learners should represent Roman numbers up to 50 with numerals and the equivalent Hindu – Arabic notations.</p>	<ul style="list-style-type: none">• How can learners read, write, order and compare numbers up to six digits and find their uses in daily life?• How can we identify numbers divisible by 3, 4, 6 and 9?• How can we obtain prime numbers?• Why do we use Roman representation of numbers of numerals and their equivalent Arabic notations?• Why do we determine factors numbers and their multiples of numbers?• How do we deduce the HCF and the LCM of given numbers?• Why do we convert fractions to decimals and vice versa?• How can we perform basic operations in addition and subtraction of fractions?

Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> • Read, write, compare and order numbers up to 6 digits • Divisibility tests of 3, 4, 6 and 9. • Prime numbers. • HCF and LCM. • Roman numerals up to 50. • Simplification of fractions by cancelling. • Conversion of fractions to decimals and vice versa. 	<ul style="list-style-type: none"> • Add and subtract fractions using LCM • Carry out investigations and problems involving divisibility tests • Practically use fractions and decimals in daily life such as dividing portions of food, money and mass • Represent numerals by Roman numbers and the equivalent Hindu – Arabic notations 	<ul style="list-style-type: none"> • Appreciate the importance of fractions and decimals
<p>Contribution to the competencies: <u>Critical thinking:</u> in investigation <u>Communication:</u> group work <u>Co-operation:</u> reading, writing and operating with numbers</p>		
<p>Links to other subjects: Numbers are linked to all subjects</p>		

1.1 Reading, writing, ordering and comparing numbers up to six digits.

The learner should be able to read numbers in both the local and formal language used in mathematics, write, put the numbers in order and compare the numbers up to six digits.

As the learners were taught in primary four they should be able to know differentiate the numbers that is the whole numbers, fractions and decimal numbers.

The learner should identify the place values up to six digits.

An example

In this example the learner should identify where to start from. Direct the learner to start from the right side to the left as instructed in the learners book.

1 ones

10 tens

100 hundreds

1000 thousands

10000 tens of thousands

100000 hundreds of thousands

This example will make the learners understand more about the example given in learner's book.

You are expected to guide the learners to walk to places near the school and observe numbers and identify.

**UNIT
1**

NUMBERS

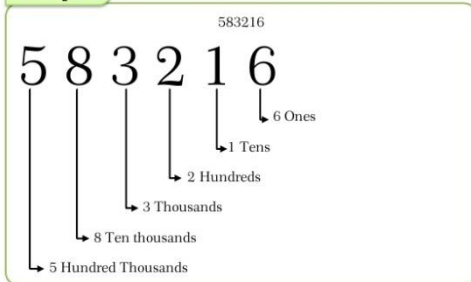
1.1 Reading, writing, ordering and comparing numbers up six digits

With the help of the teacher,
Tell your partner the biggest number you know.
Tell your partner the smallest number you saw.
Write them down in figures and in numbers.

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

To identify this, start from the first digit from the right hand side.

Example 1.



1

Thus the number **583216** = Five hundred and eighty three thousand, two hundred and sixteen.

Activity 1 :

In groups of 4, make a pack of 10 flash digit cards. Shuffle the cards and take in turns to draw 3 digits at a time. Place the cards in the middle of your group and then read aloud the number that you have made together. Now place the cards back into the pile, shuffle and repeat the activity. Once you are confident at making 3 digit numbers, move on to shuffle and make 4 digit numbers, then 5 digit number and finally 6 digit numbers. Now go back to 3 digit numbers. Pull out 3 numbers to make one number, then make two more 3 digit numbers from the remaining cards. Read aloud the three numbers that you have made and then order them from smallest to largest number. Repeat this. Now move into pulling out 2, 4 digit numbers. Say them aloud and order them so that you have a small and larger number.



Individually.

- In your books, write these groups of numbers in ascending order.
- a) 345, 628,951,729
 - b) 388,991,137,839
 - c) 441, 369,888,936
 - d) 4128, 5289, 3819, 0728
 - e) 4829, 4829,1893, 2893
 - f) 4782,7382, 9182, 6279
 - g) 27893, 28194, 27289, 99925
 - h) 38299, 93389, 37778, 38389
 - i) 345678, 123877, 378467, 444682
 - j) 1345,278,27819, 381926
 - k) 2671, 2678, 189267, 25711
 - l) 31111, 281290, 3677, 271

2

Activity 1

Group learners considering gender equity and provide them with the required materials (pieces of paper with written numbers) and ensure each learner understands the instruction in their text book

The discussion should involve each learners so as the help him or her practice both writing and reading the numbers.

In the map the learner should be able to use his eyes well enough to see which the largest state is. This will help him or her to understand the aspect of comparing numbers.

Exercise 1.

1. Look at the table below. What do the numbers tell you about the population in South Sudan and in each state?



STATE	POPULATION	AREA
Northern Bahr el Ghazal	820 834	30 543.30
Western Bahr el Ghazal	358 692	91 075.95
Lakes	782 504	43 595.08
Warrap	1 044 217	45 567.24
Western Equatoria	658 863	79 342.66
Central Equatoria	1 193 130	43 033.00
Eastern Equatoria	962,719	73 472.01
Jonglei	1 443 500	122 580.83
Unity	645 465	37 836.39
Upper Nile	1 013 629	77 283.42
TOTAL	8 923 553	644 329.37

Answer these questions together and then prepare some other questions to ask other pairs of learners in your class.

- Which state has the largest population? Which state has the smallest population?
- Which state is almost half the size of Western Bahr el Ghazal?
- Which state has an area of about 43 000

3

Exercise 1

The learners are required to do this individually to enable you to assess product.

Expected answers

1. The learner should be able to identify the area with the biggest population. This will be possible if he or she is able to read and compare the numbers up to six digits.

- Jonglei; Western Bahr el Ghazal
- Warrap
- Central Equatoria

2. Look at the table below showing the number of people affected in each disease.

Number	Disease	Number of Cases
1	Malaria	170 000
2	HIV Aids	75 000
3	Typhoid	150 000
4	Tuberculosis (TB)	1 575
5	Cholera	49 100

- What is the most common disease? Explain your answer.
- What is the least common disease? Explain your answer.
- Find the sum of the number of people affected by Malaria and Cholera. Show your working.
- What is the total number of cases affected by the diseases?
- Find the difference between the number of people affected by the most common and least common disease. What do you need to do first?
- Find the total number of people affected by Typhoid, Cholera and Tuberculosis. Explain how you worked this out.

Activity 2:

In pairs visit the local grocery or shops and find out the cost of each of the items listed below.

Number	Item	Price (SSP)
1	Sugar 50kg	
2	Rice 50kg	
3	Wheat flour 50Kg	
4	Beans 50Kg	
5	Maize 50Kg	

- What is the cost of the most expensive item? What is it?
- What is the cost of the least expensive item? What is it?
- What do you notice about the costs of items?

4

- d. $170000 + 75000 + 150000 + 1575 + 49100 = 445675$
 e. $170000 - 1575 = 168425$
 f. $150000 + 49100 + 1575 = 200675$

Activity 2

Divide the learners into two and under your supervision lead the learners to do the activity. Give example if possible.

For learners in the rural areas guide them to a market place and collect prices for the items they can find in a shop.

Using activity 2, formulate prices and give the prices to the learners to use. You can give more examples related to that for more understanding.

1.2 Divisibility tests of numbers 3, 4, 6 and 8

1.2 Divisibility tests of numbers 3, 4, 6 and 8

Divisibility test of 3

A number is divisible by 3 if the sum of its digits is divisible by 3.

<div style="display: flex; align-items: center;"> <div style="text-align: center; margin-right: 10px;"> $\begin{array}{cccc} \downarrow & \downarrow & \downarrow & \downarrow \\ 2 & 0 & 7 & 9 \end{array}$ </div> <div style="background-color: #4CAF50; color: white; padding: 5px;"> <p style="margin: 0;">Add the digits</p> <p style="margin: 0;">$2 + 0 + 7 + 9 = 18$</p> <p style="margin: 0;">18 is a multiple of 3</p> <p style="margin: 0;">So 2079 is divisible by 3</p> </div> </div>		
Number	Divisible?	Why?
405	Yes	$4 + 0 + 5 = 9$ (9 is a multiple of 3)
381	Yes	$3 + 8 + 1 = 12$ (12 is a multiple of 3)
928	No	$9 + 2 + 8 = 19$ (19 is <i>not</i> a multiple of 3)
4,616	No	$4 + 6 + 1 + 6 = 17$ (17 is <i>not</i> a multiple of 3)

Example 2.

381 ($3+8+1=12$, and $12 \div 3 = 4$) Yes

217 ($2+1+7=10$, and $10 \div 3 = 3 \frac{1}{3}$) No

This rule can be repeated if needed.

99996 ($9+9+9+9+9+6 = 42$, then $4+2=6$) Yes

Activity 3:

In pairs:

- Identify which of the following numbers are divisible by three.
 a. 2916 b. 39 c. 1008 d. 927 e. 143,706
- You have got 96 questions for homework and you have three days to do them. You want to do the same number of questions on each day.



Use the divisibility test of 3 to check if you can divide equally.

Divisibility test of 3

A number is divisible by 3 if the sum of its digits is divisible by 3.

105 for instance is divisible by 3 since the sum of its digits ($1+0+5$) is 6. And 6 is divisible by 3.

Using the example 2, guide learners the divisibility test of 3.

You can develop more examples to help learners understand more.

Give more example to enable the learner to understand more.

Using activity 3 as a teacher assesses the understanding of the learners on the divisibility test and hence they can do the activity 3 in groups or as individuals.

Divisibility test of 4

If the last two digits are a multiple of 4 or are divisible by 4 (or if the last two digits are 00).

$4\ 6\ 2\ 4$

Look at the last two digits
 What number do you see? 24
 24 is a multiple of 4
 So 4624 is divisible by 4

Number	Divisible?	Why?
348	Yes	48 is a multiple of 4
27,616	Yes	16 is a multiple of 4
8,514	No	14 is <i>not</i> a multiple of 4
722	No	22 is <i>not</i> a multiple of 4
1,200	Yes	The last two digits are 00 (200 is a multiple of 4)

Example 3.

1312 is ($12 \div 4 = 3$) Yes
 7019 is not ($19 \div 4 = 4 \frac{3}{4}$) No

Another way to identify if a number is divisible by 4 especially for small numbers.
 Halve the last two digits of a number twice and if the result is still a whole then the number is divisible by 4.

7

Divisibility test of 4

A number is divisible by 4 if the last two digits of a whole number are divisible by 4.

For instance 1824 is divisible by 4 since the last two digits i.e. 24 is divided evenly by 4.

Using example 3 and activity 4 guide the learners to understand more about the divisibility test of 4.

Come up with more examples to enable the learner understand more.

$$\frac{12}{2} = 6, \quad \frac{6}{2} = 3, \text{ 3 is a whole number. Yes}$$

$$\frac{30}{2} = 15, \quad \frac{15}{2} = 7.5 \text{ which is not a whole number. No}$$

Activity 4:

- Working in pairs, write down some even numbers that are between 300 and 436.
- Four learners had 620 South Sudanese pounds. Use the divisibility test of 4 to check if they were able to divide equally.

Divisibility test of 6

A number is divisible by 6 if it is divisible by both 2 and 3

Example 4.

114 (it is even, and $1+1+4=6$ and $6\div3=2$) Yes

308 (it is even, but $3+0+8=11$ and $11\div3=3\frac{2}{3}$) No

$\begin{array}{cccc} \downarrow & \downarrow & \downarrow & \downarrow \\ 6 & 2 & 9 & 4 \end{array}$	<p>Is it a multiple of 2 and a multiple of 3? The last digit is 4 so it is a multiple of 2. What do the digits add up to? $6 + 2 + 9 + 4 = 21$ 21 is a multiple of 3 So 6294 is divisible by 6</p>	
Number	Divisible?	Why?
5,106	Yes	The last digit is a 2 (it is a multiple of 2) and... $5 + 1 + 0 + 6 = 12$ (12 is a multiple of 3)

8

636	Yes	The last digit is a 6 (it is a multiple of 2) and... $6 + 3 + 6 = 15$ (15 is a multiple of 3)
5,912	No	The last digit is a 2 (it is a multiple of 2) <i>but</i> ... $5 + 9 + 1 + 2 = 17$ (17 is <i>not</i> a multiple of 3)
508	No	The last digit is a 8 (it is a multiple of 2) <i>but</i> ... $5 + 0 + 8 = 13$ (13 is <i>not</i> a multiple of 3)

Activity 5:

- In pairs, identify which of the following numbers are divisible by six.
 - 408
 - 1364
 - 189,024
 - 103
 - 10230
- Our class teacher had 294 bottle tops and she wanted to share them equally to 6 learners. Use the divisibility test of 6 to check if she was able to share the bottle tops equally.
- You and five friends have 294 mangoes and you want to share them equally. Use the divisibility test of 6 to check if you can share equally.

Divisibility test of 9

A number is divisible by 9 if the sum of its digits is divisible by 9 or are a multiple of 9.

Just like in the divisibility test for three, this rule may be repeated if needed.

9

Divisibility test of 6

The prime factors of 6 are 2 and 3 therefore for a number to be divisible by 6 it must be also divisible by 2 and 3. Therefore check if a number is even and then check if the sum of the digits is divisible by 3.

Example: 68154

Step 1: this number is even and therefore is divisible by 2

Step 2: $6+8+1+5+4=24$

Step 3: 24 is divisible by 3

Step 4: because the number is divisible by 2 and 3 it's also divisible by 6.

Use also example 4 and activity 3 of the divisibility test of 6 to elaborate more to learners.

Divisibility test of 9

A number to be divisible by 9 the sum of the whole numbers must be divisible by 9.

Use example 5 and activity more for more elaboration and explanation to the learners.

Use the chart in activity 2 for illustration in class.

↓ ↓ ↓ ↓ ↓

4 6 9 2 6

Add the digits

$4 + 6 + 9 + 2 + 6 = 27$

27 is a multiple of 9

So 46926 is divisible by 9

Number	Divisible?	Why?
7,686	Yes	$7 + 6 + 8 + 6 = 27$ (27 is a multiple of 9)
252	Yes	$2 + 5 + 2 = 9$ (9 is a multiple of 9)
883	No	$8 + 8 + 3 = 19$ (19 is <i>not</i> a multiple of 9)
5,105	No	$5 + 1 + 0 + 5 = 11$ (11 is <i>not</i> a multiple of 9)

Example 5.

1629 ($1+6+2+9=18$, and again, $1+8=9$) Yes

2013 ($2+0+1+3=6$) No

Activity 6:

- In pairs, copy on a paper and check if they are divisible by 9 in your exercise book.

a. 729 b. 788 c. 913 680 d. 554 704
- A farmer had 636 kg of animal feed and 9 cows. Use the divisibility test of 9 to check if the farmer can divide the animal feed equally.
- What if you and 8 friends wanted to share 12 candies equally? Draw a picture showing how the candies can be shared.

10

2 A number is divisible by 2 if it ends in 0, 2, 4, 6 or 8.

3 A number is divisible by 3 if the sum of its digits is divisible by 3.

4 A number is divisible by 4 if its last two digits are divisible by 4.

5 A number is divisible by 5 if it ends in 0 or 5.

6 A number is divisible by 6 if it is divisible by both 2 and 3.

7 There is no simple test for divisibility by 7.

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

9 A number is divisible by 9 if the sum of its digits is divisible by 9.

10 A number is divisible by 10 if it ends in 0.

Exercise 2.

Work in pairs;

1. Use 'Divisibility Rules' to test whether 8,712 is divisible by:

- A 3 B 4 C 6 D 9

Can you explain your answer to your partner

2. Using divisibility test identify which number is divisible by 3. How will you work this out?

- A 5 994 B 5 996
C 5 992 D 5 990

11

3. Use 'Divisibility Rules' to determine which of the following numbers

- 1) 237 2) 833 3) 6 488 and 4) 3 528

is divisible by:

- A 3 B 4 C 6 D 9

4. Check whether the following are divisible by 3

- (a) 741 352 (b) 2 034 198 (c) 317 925 (d) 3 412 920

5. Check whether the following are divisible by 4

- (a) 4 137 156 (b) 135 764 (c) 34 560 (d) 167 435

6. Check whether the following are divisible by 6

- (a) 4 234 156 (b) 1 027 863 (c) 924 658 (d) 1 850 421

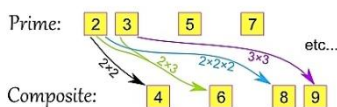
7. Check whether the following are divisible by 9

- (a) 739 602 (b) 2 034 198 (c) 674 132 (d) 7 413 552

Tell your partner what you have learnt about divisibility tests of numbers 3, 4, 6 and 9

1.3 Prime numbers

A prime number is any number that can be divided evenly by 1 or itself.



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Exercise 2

Guide learners to work in groups. Supervise as they work out the exercise and assess the learner's ability.

Expected answers

A. $8+7+1+2=18$; divisible by 3

B. 8712 divisible by 4 since the last two digits are divisible by 4

C. divisible by 6 since the number is an even number and is divisible by 3.

D. divisible by 9 since the sum of the numbers is divisible by 9

2. A. $5+9+9+4=27$ divisible by 3

B. $5+9+9+6=29$

C. $5+9+9+2=25$

D. $5+9+9+0=23$

3. B. 6915

C. 6921

4. A. Divisible by 3; 237, 3528

B. divisible by 4; 6488, 3528

C. divisible by 6; 3528

D. divisible by 9; 3528

5. D. 107

1.3 Prime numbers

What is a prime number? Ask the learners this question to see if they remember what they were taught in primary four let learners present what they can remember.

Listen to their answers and draw a simple definition which they will grasp easily and stick to it for easy understanding.

When giving the definitions draw examples which are not complicated. For instance 2, 3, 5, 7... these numbers can only be divided by one and itself therefore they are prime numbers.

A number that can be evenly divided by numbers other than 1 and itself is not a prime number but a composite number. For instance 15 can be evenly be divided by 1, 3, 5, 15

Use example 6 and 7 to further explain and illustrate to the learners on prime numbers.

Example 6.

5 can only be divided evenly by 1 or 5, so it is a prime number.

But 6 can be divided evenly by 1, 2, 3 and 6 so it is NOT a prime number (it is a composite number).

A composite is a whole number that can be divided evenly by numbers other than 1 or itself.



Example 7.

9 can be divided evenly by 3 (as well as 1 and 9), so 9 is a composite number.

But 7 cannot be divided evenly (except by 1 and 7), so is NOT a composite number (it is a prime number).

Whole numbers above 1 are either prime or composite.

Exercise 3.

- How many different prime factors does the number 252 have?
 A 2 B 3
 C 4 D 5
- Which of the following numbers is not a prime number?
 A 101 B 103
 C 105 D 107

3. Which one of the following numbers is prime number?

- A 18 B 19
 C 20 D 21

4. From the following which number is not a prime?

- A 67 B 69
 C 71 D 73

1.4 Roman numbers and Hindu numbers up to 50

Roman Numbers

Roman numerals are based on the following symbols

1	5	10	50
I	V	X	L

Basic combination of numeral numbers is.

1	2	3	4	5	6	7	8	9	10
I	II	III	IV	V	VI	VII	VIII	IX	X
11	12	13	14	15	16	17	18	19	20
XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
21	22	23	24	25	26	27	28	29	30
XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII	XXVIII	XXIX	XXX
31	32	33	34	35	36	37	38	39	40
XXXI	XXXII	XXXIII	XXXIV	XXXV	XXXVI	XXXVII	XXXVIII	XXXIX	XL
41	42	43	44	45	46	47	48	49	50
XLI	XLII	XLIII	XLIV	XLV	XLVI	XLVII	XLVIII	XLIX	L

Example 8.

$VI = V + I = 5 + 1 = 6$

When a symbol appears after a large symbol it is added

$IX = X - I = 10 - 1 = 9$

If the symbol appears before a larger symbol it is subtracted.

Exercise 3

Expected answers

- A. 2 2. C. 105
- B. 19 4. B. 69

1.4 Roman numbers and Hindu - Arabic numbers up to 50

Roman numbers

As a teacher find an easier way to explain to the learners about roman numbers with the help of the table showing the numbers in roman numbers in page 14 of the learner's book.

With the help of example 8, 9 and activity help the learner know to convert numbers into roman notations and vice versa.

At the end of the lesson the learners should be able to work out roman numbers individually or in groups.

Exercise 4

Expected answers

1. XXI
2. A. XXVI B. XXIV C. XXV D. XXVII
3. A. XXIV B. VI C. XLVII D. XLI

Activity 7:

In groups, identify the equivalent Roman numeral notations to the following.

- A 31 B 43
C 49 D 27

Converting numbers into roman notations.

Break the number according to its specific order of adjectives, thousands, hundred, ten and ones.

Example 9.

Covert 34 to roman numerals.

Break 34 into 10, 5 and 1, then do each conversion

$$10 = X \quad 10 \times 3 = 30 = XXX$$

$$5 = V$$

$$1 = I$$

$$5-1=4 \quad V-I=IV$$

$$34 = XXXIV$$

Exercise 4.

1. Convert 21 to roman numerals

2. Convert to roman numbers.

- (A) 26 (B) 24 (C) 25 (D) 27

3. Covert to roman numerals.

- (A) 24 (B) 6 (C) 47 (D) 41

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Hindu - Arabic notation

In pairs, count the numbers below. Write down a number and ask your partner to say it.

Numeral in English	
0	Zero
1	One
2	Two
3	Three
4	Four
5	Five
6	Six
7	Seven
8	Eight
9	Nine
10	Ten
11	Eleven
12	Twelve
13	Thirteen
14	Fourteen
15	Fifteen
16	Sixteen
17	Seventeen
18	Eighteen
19	Nineteen
20	Twenty
21	Twenty one
22	Twenty two
23	Twenty three
24	Twenty four
25	Twenty five
26	Twenty six
27	Twenty seven
28	Twenty eight
29	Twenty nine
30	Thirty
31	Thirty one
32	Thirty two

16

Hindu - Arabic numbers

Guide learners to count the Hindu - Arabic notation numbers by using the table provided in the learner's book.

You are encouraged to give some tests either in groups or individually to see if learners are able to read the numbers.

An example of a test:

Calculate the following and read the answers in Hindi- Arabic notation.

1. $23 + 15 = 38$

2. $18 + 16 = 34$

3. $32 + 8 = 40$

4. $15 + 5 = 20$

1.5 Factor numbers and their multiples

Factor numbers are numbers we multiply to get another whole number. The factors are usually whole numbers whether negative or positive.

For instance the factor numbers of 10 are 2 and 5 i.e. $2 \times 5 = 10$.

A number can have more than 2 factors. For instance 18 its factors are 2, 3, 6 and 9 as well as -2, -3, -6 and -9.

A common factor is that number that appears common after working out the factors of two or more different numbers.

When working out common factors as teacher come up with illustrations that occur in real life. This will help the learner understand better.

Also use the examples in the learner's book.

Use activity 10 of page 16 in the learner's book and give the learners to do in groups. Ensure the groups are balanced.

33	Thirty three
34	Thirty four
35	Thirty five
36	Thirty six
37	Thirty seven
38	Thirty eight
39	Thirty nine
40	Forty
41	Forty one
42	Forty two
43	Forty three
44	Forty four
45	Forty five
46	Forty six
47	Forty seven
48	Forty eight
49	Forty nine
50	Fifty

1.5 Factor numbers and their multiples

Factors are numbers we multiply together to get another number.

Example 10.

$2 \times 3 = 6$ In this case 2 and 3 are factors of six.

A number can have many factors.

Like for instance the factors of 12 are 1, 2, 3, 4, 6 and 12 as well as -1, -2, -3, -4, -6 and -12.

Factors are usually positive or negative whole numbers. (No fractions)

Common factors

This is acquired after working out the factors of two or more different numbers.

17

Example 11.

Factors of 12 and 30.

Factors of 12 are 1, 2, 3, 4, 6 and 12.

Factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30.

The numbers that appear in both lists are the common numbers.

So, the common factors of 12 and 30 are: 1, 2, 3 and 6

Activity 8:

In groups of three identify the factors of the following

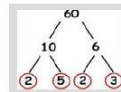
- (A) 15 (B) 24
(C) 36 (D) 22

Explain how you worked it out.

1.6 How to find the HCF and the LCM of numbers

HCF also commonly known as highest common factor refers to a set of two or more numbers that can be divided exactly or by a common number.

HCF is also called GCD greatest common divisor or greatest common measure.



LCM or least common multiple refers to the smallest quantity of a number that can be divisibly by two or more quantities of a given number without a remainder.

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1.6 How to find HCF and the LCM of numbers

HCF – highest common factor. It refers to a set of 2 or more numbers that can be divided exactly or by a common number.

HCF is also known as GCD the greatest common divisor.

Use the example 12 in the learner's book to guide the learners how to calculate HCF and how it is applied in real life.

LCM – Least common multiple. It refers to the smallest quantity of a number that can be divisibly by two or more quantities of a given number without a remainder.

Sometimes primary 5 learners encounter the ideas of highest common factor (HCF) and lowest common multiple (LCM) as procedures to follow to obtain answers, without much sense of what these quantities represent or why the procedures work.

This lesson builds up to having learners find numbers to fit a specified HCF and LCM, giving them an opportunity to explore what possibilities are allowed by these constraints.

Starter activity

Put these Questions to think about on the board as (or before, if possible) learners enter the room.

HCF and LCM are calculated by either factorization or method or division method.

Factorization method: Express each of the numbers as products of prime numbers.

The product of highest powers of all prime factors gives LCF.

Exercise 5.

In groups, calculate the following.
Before you begin, discuss how you will solve the problem.

1. Ben has collected 6 T-shirts and 16 buttons from his favorite band. He wants to combine them into identical sets to sell, with no pieces left over. What is the greatest number of sets Ben can make?
2. Kamal has 6 cans of regular soda and 15 cans of diet soda. He wants to create some identical refreshment tables that will operate during the football game. He also doesn't want to have any sodas left over. What is the greatest number of refreshment tables that Kamal can stock?
3. At a family reunion, each of Sana's aunts and uncles is getting photographed once. The aunts are taking pictures in groups of 5 and the uncles are taking pictures in groups of 10. If Sana has the same total number of aunts and uncles, what is the minimum number of aunts that Sana must have?
4. Sapphire and Abe are shelving books at a public library. Sapphire shelves 5 books at a time, whereas Abe shelves 6 at a time. If they end up shelving the same number of books, what is the smallest number of books each could have shelved? What do you need to calculate? What method would you use and why? Can you estimate or predict the answer?

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H.C.F.: We can use the H.C.F.

1. To split things into smaller sections?
2. To equally distribute 2 or more sets of items into their largest grouping?
3. To figure out how many people we can invite?
4. To arrange something into rows or groups?

Example 12.

Real life example:

Maya has two pieces of cloth. One piece is 36 inches wide and the other piece is 24 inches wide. She wants to cut both pieces into strips of equal width that are as wide as possible. How wide should she cut the strips?

Answer:

This problem can be solved using H.C.F. because we are cutting or "dividing" the strips of cloth into smaller pieces (Factor) of 36 and 24 (Common) and we are looking for the widest possible strips (Highest).

So
H.C.F. of 36 and 24 is 12
so we can say that Maya should cut each piece to be 12 inches wide.

L.C.M.: we can use the L.C.M.

1. To know an event that is or will be repeating over and over.
2. To purchase or get multiple items in order to have enough.
3. To figure out when something will happen again at the same time.

20

What is a factor? (For example, 2 is a factor of 6.) Does every number have factors? Can you think of a number that has... exactly 2 factors? ... exactly 3 factors?

When finding HCF and LCM it's either calculated by factorization or division method.

Exercise 4

Expected answers

1. 2

2. 3

3. 10

4. 30

At the end of the lesson, ask learners to give you all facts about HCF and LCM

1.7 Add and subtract fractions using LCM

Before you can add or subtract fractions with different denominators, you must first find equivalent fractions with the same denominator by;

Find the LCM of both numbers.

Rewrite the fractions as equivalent fractions with the LCM as the denominator.

Addition of fraction using LCM

An example

$$\frac{1}{3} + \frac{1}{6} =$$

Step 1: find the LCM. The LCM of 3 and 5 is 15

Step 2: rewrite the fraction making the LCM the denominator $\frac{1}{3} + \frac{1}{6} =$

Example 13.

Real life example:

Mika exercises every 12 days and Nanu every 8 days. Mika and Nanu both exercised today. How many days will it be until they exercise together again?

So,

This problem can be solved using Least Common Multiple because we are trying to figure out when the soonest (Least) time will be that as the event of exercising continues (Multiple), it will occur at the same time (Common).

Answer: L.C.M. of 12 and 8 is 24.

1.7 Add and subtract fractions using LCM

Addition of fraction using L.C.M

Example 14.

$$\text{Solve } \frac{1}{3} + \frac{1}{6} =$$

Find the L.C.M of denominators 3 and 6.

L.C.M of 2 and 3 is 6.

Divide each denominator by the L.C.M (i.e.) $6 \div 3 = 2$ multiply 2 numerator by 1 = $2 \times 1 = 2$.

Record 2 above L.C.M 6 then divide 6 by denominator 6.

$6 \div 6 = 1$.

Multiply 1 by numerator 1 = 1.

Record 1 above L.C.M 6 and then add.

$$\frac{2+1}{6} = \frac{3}{6} \text{ or } \frac{1}{2}$$

Step 3: divide each denominator by LCM then multiply by the numerator.

Step 4: add the numerators and the denominator remains constant

Step 5: simplify the answer if necessary.

Guide the learners with example 14 for more understanding.

Exercise 6.

- Use L.C.M to find the sum of the following fractions with different denominators. Show your working out.
 - $\frac{1}{6} + \frac{1}{7} =$
 - $\frac{2}{9} + \frac{1}{2} =$
 - $\frac{3}{7} + \frac{2}{6} =$
 - $\frac{2}{5} + \frac{1}{3} =$
 - $\frac{2}{4} + \frac{1}{3} =$
 - $\frac{1}{8} + \frac{1}{7} =$
 - $\frac{2}{11} + \frac{1}{3} =$
 - $\frac{1}{12} + \frac{1}{9} =$
 - $\frac{1}{4} + \frac{1}{2} =$
- Gachire did $\frac{1}{3}$ of his mathematics homework and $\frac{2}{5}$ of his homework in English. What was his total homework done in both English and Mathematics? Show your working out.
- Abdul had $\frac{3}{5}$ of his mathematics marked and $\frac{1}{4}$ of Science marked by the teacher. What fraction of his work in Mathematics and Science was marked? Show your working out.
- Amondo spent $\frac{1}{12}$ of her savings in one month and $\frac{1}{5}$ the following month. What fraction in her savings did she spend in the 2 months? Show your working out.

Subtraction of fractions using L.C.M

Example 15.

$$\frac{1}{2} - \frac{1}{3}$$

Find the L.C.M of 2 and 3

$$\left\{ \begin{array}{cc|c} 2 & 2 & 3 \\ -3 & 1 & 3 \\ \hline & 1 & 1 \end{array} \right.$$

- ⊗ L.C.M of 2 and 3 is $2 \times 3 = 6$.
- ⊗ Divide each denominator with the L.C.M $6 \div 2 = 3$ then multiply the result by the numerator so, 3×1 .
- ⊗ Record it above the denominator 6.
- ⊗ Repeat the same with denominator 3.

Exercise 7.

- Use L.C.M to work out the following: Show your working out.
 - $\frac{2}{5} - \frac{1}{4} =$
 - $\frac{3}{4} - \frac{1}{5} - \frac{1}{8} =$
 - $\frac{1}{3} - \frac{2}{9} =$
 - $\frac{2}{3} - \frac{3}{10} - \frac{1}{5} =$
 - $\frac{3}{4} - \frac{5}{7} =$
 - $\frac{2}{3} - \frac{1}{5} - \frac{1}{4} =$
 - $\frac{5}{6} - \frac{1}{7} - \frac{1}{3} =$
 - $\frac{2}{3} - \frac{2}{4} =$ or $=$
 - $\frac{2}{5} - \frac{2}{7} =$
 - $\frac{2}{4} - \frac{2}{9} =$
- Akiba saved $\frac{1}{4}$ of his salary in one month. He later spent $\frac{1}{9}$ of his saving in paying school fees for his son. What fraction of his saving did he remain with? Show your working out.
- A carpenter had a $\frac{3}{4}$ m piece of wood. He cut off $\frac{1}{5}$ m of it to support a granary. How long was the piece of wood that he remained with?
- Onjwere subtracted $\frac{3}{14}$ from $\frac{6}{7}$. What was the answer? Show your working out.

1.8 Fractions and decimals

Converting decimals into fractions.

- Write down the decimal divided by 1 $(\frac{0.5}{1})$
- Multiply both top and bottom by 10 for every digit after the decimal point. $(\frac{0.5 \times 10}{1 \times 10})$
- Simplify the fraction. $(\frac{5}{10} = \frac{1}{2})$

Exercise 6

Expected answers

- $\frac{13}{42}$
 - $\frac{13}{18}$
 - $\frac{32}{42}$ or $\frac{16}{21}$
 - $\frac{11}{15}$
 - $\frac{10}{12}$ or $\frac{5}{6}$
 - $\frac{15}{56}$
 - $\frac{17}{33}$
 - $\frac{7}{36}$
 - $\frac{3}{4}$
- $\frac{11}{15}$
 - $\frac{17}{20}$
 - $\frac{17}{60}$

Subtraction of fractions using LCM

The procedure is the same as that of addition of fractions

Use example 15 in the learner's book to guide the learners.

Exercise 7

Expected answers

1. a) $\frac{3}{20}$ b) $\frac{17}{40}$ c) $\frac{1}{9}$ d) $\frac{5}{30}$ or $\frac{1}{6}$

e) $\frac{1}{28}$ f) $\frac{13}{60}$ g) $\frac{15}{42}$ or $\frac{5}{14}$ h) $\frac{2}{12}$ or $\frac{1}{6}$

i) $\frac{4}{35}$ j) $\frac{10}{36}$ or $\frac{5}{18}$

2. $\frac{5}{36}$

3. $\frac{5}{12}$

4. $\frac{9}{14}$

1.8 Fractions and decimals

Converting decimals into fractions

Step 1: write down the decimal divided by 1

Step 2: multiply both top and bottom by 10 for every number after the decimal point for instance if there are two numbers after the decimal point then use 100, if there is three then use 1000 etc.

Step 3: simplify the fraction

Use the example 16 in the learner's book to put the theory into practice.

Activity 9: this will help the learners do more practice in group.

Converting fractions into decimals

Use the procedure in the learner's book to guide the learners to be able to convert fractions into decimals.

Emphasize on using example 17 in the learners book for the learners to get the concept of converting fractions into decimal.

Supervise the learners as they participate in doing activity 10.

There after give learners exercise 7 to attempt individually.

Example 16.

Convert 0.75 to a fraction.

$\frac{0.75}{1}$
 Multiply both top and bottom with a hundred because in this case there are two digits after the decimal point.

$$\begin{array}{ccc} \times 100 & & \div 5 \quad \div 5 \\ \frac{0.75}{1} = \frac{75}{100} & \text{Simplify the fraction} & \frac{75}{100} = \frac{15}{20} = \frac{3}{4} \\ \times 100 & & \div 5 \quad \div 5 \\ & \text{Answer} = \frac{3}{4} & \end{array}$$

Activity 9:

In pairs, convert the following to a fraction. Explain to your partner your working out.

1. 0.625 2. 2.35 3. 0.333

Exercise 8.

Convert the following decimals to fractions. How did you get your answer?

- a) 0.2 b) 0.04 c) 0.27 d) 1.25 e) 5.62
 f) 2.1 g) 0.75 h) 0.48 i) 1.7 j) 8.21

24

Convert fraction into a decimal

1. Find a number you can multiply by the bottom of the fraction to make it 10, 100 or 1,000.
2. Multiply both top and bottom by that number.
3. Then write down just the top number, putting the decimal point in the correct spot (one space from the right hand side for every zero in the bottom number).

Example 17.

Convert $\frac{3}{4}$ to a decimal

We can multiply 4 by 25 to become 100

Multiply top and bottom by 25:

$$\begin{array}{ccc} \times 25 & & \\ \frac{3}{4} = \frac{75}{100} & & \\ \times 25 & & \end{array}$$

Write down 75 with the decimal point 2 spaces from the right (because 100 has 2 zeros);

Answer = 0.75

Activity 10:

In pairs, convert the fractions to decimals. Explain to your partner your working out.

1. $\frac{3}{16}$ 2. $\frac{1}{3}$ 3. $\frac{5}{8}$

25

Unit Revision Exercise: Expected answers

1. 27, 105, 204, 580, 12547, 310000
2. a) 4769 b) 799 c) 6061
3. a) 3323 b) 8706 c) 4933
4. a) 1608 b) 162 c) 1020
5. a) nineteen thousand two hundred and forty one.
b) one hundred and two thousand, three hundred and forty.
c) two hundred and forty one thousand, one hundred and twenty four.
6. a) 21729 b) 110252 c) 900300
7. a) true b) false c) true d) true
8. 657

Exercise 9.

Convert the following fraction to decimals. How did you get your answer?

- a) $\frac{3}{10}$ b) $\frac{13}{20}$ c) $\frac{7}{10}$ d) $\frac{9}{40}$ e) $\frac{9}{25}$ f) $\frac{1}{5}$
g) $\frac{7}{8}$ h) $\frac{18}{52}$ i) $\frac{12}{33}$ j) $\frac{8}{22}$ k) $\frac{9}{74}$ l) $\frac{10}{36}$

Unit Revision Exercise

- 1) Arrange the following numbers in ascending order?
12547, 105, 204, 580, 27, 310,000
Which other method would you use to work it out.
- 2) Workout the following

a) $\begin{array}{r} 3456 \\ +1313 \\ \hline \end{array}$	b) $\begin{array}{r} 280 \\ + 519 \\ \hline \end{array}$	c) $\begin{array}{r} 5067 \\ +994 \\ \hline \end{array}$
---	--	--
- 3) Work out the following.

a) $\begin{array}{r} 6748 \\ -3425 \\ \hline \end{array}$	b) $\begin{array}{r} 8953 \\ - 247 \\ \hline \end{array}$	c) $\begin{array}{r} 9125 \\ - 4192 \\ \hline \end{array}$
---	---	--
- 4) Work out the following (— = divide)

a) $\frac{4824}{3}$	b) $\frac{1458}{9}$	c) $\frac{4080}{4}$
---------------------	---------------------	---------------------
- 5) Write the following numbers in words.
a) 19 241 b) 102 340 c) 241 124

26

- 6) Write the following in numbers.

- a) Twenty thousand seven hundred and twenty nine.
- b) One hundred and ten thousand two hundred and fifty two.
- c) Nine hundred thousand three hundred.

- 7) State the place value of the underlined digit in the following numbers.

- a) 110 720 b) 920 375 c) 201 730 d) 2 146

- 8) Qualify the statements below by writing true or false.

- a. 981 is divisible by 9
- b. 28 is divisible by 9
- c. 3716 is divisible by 4
- d. 429 is divisible by 6





- 9) Only one of the following numbers is divisible by 3. Which one?

- 326, 811, 179, 928, 657

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UNIT 2: MEASUREMENT

This unit focuses on ways of estimating, converting and measuring using local measurements as well as standard measurements. Measurement is finding a number that shows the size or amount of something.

Learn about	Key inquiry questions
<p> Learners should build on prior learning and investigate the conversion of units of length in metres to kilometres, the area of rectangles and squares, distinguish between length, height and width, and convert litres into millilitres.</p> <p> Learners should investigate cuboids as geometric solids and use the expression $V = lbh$ to calculate the volume of cuboids</p> <p> Learners should tell time, and investigate the relationships between seconds, minutes and hours. Over a day they should measure heat against time in degrees Celsius and Fahrenheit, and solve simple problems.</p> <p> Learners should understand the mathematical aspects of commerce and identify profit and loss. They should develop skills on these business concepts and learn how to identify different types of currencies and currency exchange.</p>	<ul style="list-style-type: none">• Why do we convert metres into kilometres and vice versa• How we calculate areas of rectangles and squares?• How can we practically estimate the area of a square and rectangle?• How would we obtain the formula for the volume of cubes and cuboids?• Why do we use hours, minutes and seconds in telling time?• How would we measure the temperature of different objects in Celsius/Fahrenheit?• How do we recognize profit and loss in business?• Why do we change currencies within a particular region?

Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> • Understand the relation between metric units of measure • Understand units of volume • Distinguish between rectangles and squares • Tell time in a.m. and p.m. 	<ul style="list-style-type: none"> • Convert metres into kilometres and vice-versa • Calculate areas of rectangles and squares • Apply formula for volume of cuboids ($V = lbh$) • Convert millilitres to litres and vice-versa • Solve problems involving money and temperature (in degrees Celsius and Fahrenheit) 	<ul style="list-style-type: none"> • Appreciate distinction between length, volume, time, temperature
<p>Contribution to the competencies: <u>Critical thinking</u>: handling measurement problems in real life situation <u>Communication and Co-operation</u>: team work; handling measurement assignments</p>		
<p>Links to other subjects: Science: measurements in Materials and properties of matter</p>		

As you introduce this topic to the learners. Try to remind learners on what they were taught in primary 4 about measurement.

Each learner’s contribution and participation is required. By doing this you will have a great starting point since measurement is a concept that is applicable in each and everyone’s like on daily basis.

There are two systems of measurements:

Metric system which includes meters, liters, kilograms etc.

US standard units includes feet, pounds etc.

2.1 How to convert meters into kilometers and vice versa

Meter (M) is the base length unit

UNIT 2

MEASUREMENT

2.1 Convert metres into kilometres and vice versa

Activity 1:

In groups, discuss the units we use to measure your desk, school compound and distance between towns.

Metres are usually smaller than kilometres, they are used to represent a certain length which is normally shorter compared to kilometres.

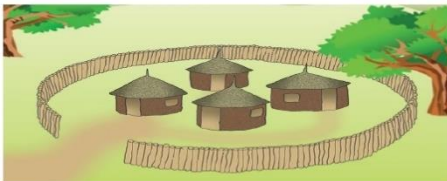


An example can be the 1 metre chalk board ruler.

The chalk board ruler consists of 100cm

Thus 1 metre= 100 cm

1Km = 1000metres



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The difference between the huts in this village can be measured in meters.

A km is longer than a meter and is mostly used to represent the distance of a place. The distance between two different towns is 40KM

Example 1.

Convert 750M to Km

$$1\text{Km} = 1000\text{M}$$

$$? = 750\text{m}$$

$$1 \times \frac{750}{1000} = 0.75$$

$$\text{Answer} = 0.75\text{Km}$$

1 millimeter [mm]	
1 centimeter [cm]	10 mm
1 meter [m]	100 cm
1 kilometer [km]	1000 m

The speed of a moving vehicle is also measured in terms of kilometers.



This school bus travels at a speed of 50KM per hour.

1 Kilometer = 1000M

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A kilometer equals to one thousand meters which is 0.001 km

Give real life examples of objects that are used to measure for an example a black board ruler a meter tape etc.

Guide the learners to use the primary 4 knowledge of converting centimeters to meters to enable convert the measurement of the objects they name to meters.

After reminding themselves it will be easier to introduce this subtopic.

$$1M = 100CM$$

$$1KM = 1000M$$

Example 2.

Convert 7.5 Km into metres
 $1\text{Km} = 1000\text{m}$
 $7.5\text{km} = ?$
 $7.5 \times 1000 = 7\ 500$
Answer = 7500metres.

Activity 1:

1. Approximately, what is the distance between your home and school in kilometres?
2. Convert the kilometres into metres.

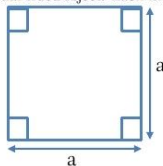
Exercise 1.

In groups, convert the following; Explain the method you used to work out.

1. Convert 6 Km to metres.
2. Convert 0.575Km to metres.
3. Convert 7.50Km to metres.

2.2 Calculating area of a rectangle and square

A square is a four equal sided object. Each internal angel is 90° .



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When giving examples it's advisable to use real examples because it's simpler and convenient for the learners.

You can engage them in measuring school Play grounds, distance of the class to the dining hall etc. the measurements collected guide them in converting to kilometers.

Use examples 1 and 2 to convert meters to kilometers and vice versa.

You can give activity 1 and exercise 1 to the learners to attempt in groups.

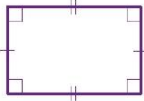
2.2 Calculating area of a rectangle and square

Using available materials like a sheet of paper guide the learners to make rectangles and squares.

Area of a square = side length squared.

$$= \text{Area} = a^2 = a \times a$$

A rectangle has four sides but two pairs of equal sides unlike a square that has all sides equal.



□ means "right angle"
| and || show equal sides

Each internal angle is 90° .

Opposite sides are parallel and equal in length.

Example 3.

What is the area of the rectangle?



$$\begin{aligned} \text{Area} &= w \times h \\ w &= \text{width} \\ h &= \text{height} \end{aligned}$$

We know Area = width multiplied by height:

$$\text{Area} = w \times h$$

The area is = 15 units square

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Activity 2:

In groups, calculate;

1. What is the area of the square?



2. Calculate the area of the rectangle below.



Exercise 2.

1. The area of a square is 16 cm^2 . What is the length and width? Discuss your answer.
2. The area of a rectangle is 45 cm^2 . If its length is 9 cm, then what is the width?
3. A rectangle with length 10m and width 4m are cut into squares. What is the maximum possible area of a square? Explain your answer?
4. The area of a square is 16 mm^2 . What is the measurement of one side?
5. The length of a rectangle is 12 cm and its width is 5 cm smaller. The area of the rectangle is? Explain your answer.
6. How many squares with the side of 2 cm cover the surface of a rectangle with a length of 24 cm and a width of 8 cm?

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Using Example 3 show the learners the length and width of the models made.

Using the notes in the learner's book (page 30 - 32) explain to the learner, what area means.

The examples given in the learner's book will help you give more examples and formulate a few exercises for the learner to attempt.

2.3 Calculating the volume of a cube and cuboid

Make a few models to present to the learners during this lesson. You can make the models together with the learners if you can.

Ask learners if they know what is a faces and edges. Model a cube to help in explaining a face and edge.

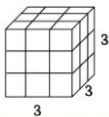
2.3 Calculate volume of a cube and cuboid

Facts about a cube

- It has 6 Faces
- Each face has 4 edges (and is a square)
- It has 12 Edges
- It has 8 Vertices (corner points) and at each vertex 3 edges meet

Finding the volume of cubes

Example 4.



Volume = base area x height

$$= (3 \times 3) \times 3$$

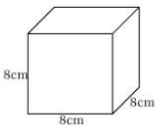
$$= 27 \text{ cubic units}$$

Volume = Length (L) ³

If the length is 4 then volume = (4) ³

This is also equivalent to 4x4x4=64

Example 5.



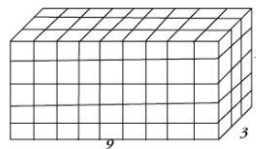
Volume = base area x height

$$= (8\text{cm} \times 8\text{cm}) \times 8\text{cm} = 512\text{cm}^3$$

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Finding the volume of cuboids

Example 6.



Volume = base area x height

$$= (9 \times 3) \times 5$$

$$= 27 \times 5 = 135 \text{ cubic units}$$

A cuboid is a box shaped object.

It has six flat sides and all angles are right angled.

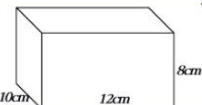
The volume of a cuboid is found using the formula:

$$\text{Volume} = \text{Length} \times \text{Width} \times \text{Height}$$

This can also be represented as:

$$V = l \times w \times h \text{ or } V = lwh$$

Example 7.

1. 

Volume = base area (L X W) x height

$$V = (12\text{cm} \times 10\text{cm}) \times 8\text{cm}$$

$$V = 120\text{cm}^2 \times 8\text{cm}$$

$$V = 960\text{cm}^3$$

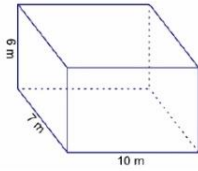
34

Provide learners with models to demonstrate volume and are of cube and a cuboid. Use the notes in the learner's book page 33 – 37 to explain to the learner how to find volume.

Elaborate the formula further to the learner.

The examples given (examples 4, 5, 6 and 7) will help you guide the learner accordingly.

2. What is the volume of the cuboid below?

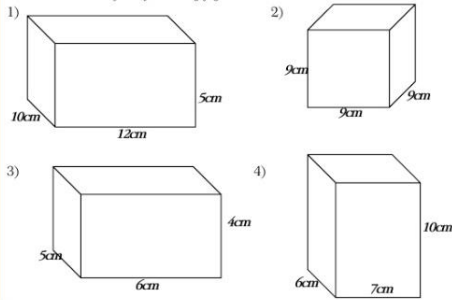


Formula = $l \times w \times h$

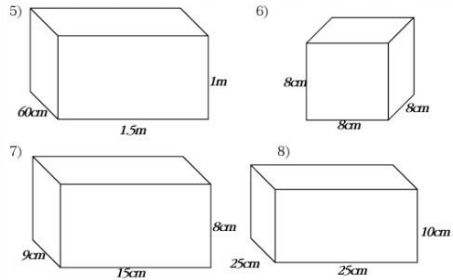
Thus in this case $10 \times 7 \times 6 = 420$

Exercise 2.

Find the volume of the following figures.



35



9. A rectangular tank measures 1.2m by 0.8m by 0.5m. What is the volume in cm^3 ?
10. The base area of a rectangular tank is 15m^2 and has a height of 1.5m. What is the volume of the tank in cubic metres?
11. One cube measures 8cm. Another cube measures 10cm. What is the sum in their volume in cubic centimetres?
12. A rectangular container with a base area of 150m^2 and a height of 12m. What is its volume in cubic metres?
13. A tank is a cube in shape. The height of the tank is 8.1metres. What is its volume in cubic metres?
14. A rectangular container is 80cm long, 50cm wide and 40cm. What is the volume in cm^3 ?
15. A cube shaped tank is 5.5m. What is its volume in cubic metres?

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Exercise 2

The exercise should be attempted individually.

Expected answers

- 1) 600cm^3 2) 729cm^3 3) 120cm^3 4) 420cm^3 5) 90cm^3
 6) 512cm^3 7) 1080cm^3 8) 6250cm^3 9) 480000cm^3 10) 22.5m^3
 11) 1512cm^3 12) 1800m^3 13) 531.441m^3 14) 160000cm^3
 15) 166.375m^3

2.4 Time

Time is the ongoing sequences of events taking place.

Time is measured in seconds, minutes, hours, days, weeks, months and years.

Provide different phases from a manually operating clock and let the learners identify the time and note the different time set.

Encourage the learners to have their own watch if they can because it will help them know more about time.

Thought the day encourage learners to tell you what time it is and how they know

Refer more notes from the learner's book (page 38 – 39).

2.4 Time

Time is the indefinite continued progress of existence and events.

Time can be expressed in hours, minutes or seconds.



A clock has three different hands, the hour hand, the minutes hand and the seconds' hand.

The hour hand indicates the number of hours; minute hand indicates the minutes and the second hand show the number of seconds.

Example 7.

What is the time?



The Time on the clock is 10:10 AM/PM

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The interval between a number and the other represent one hour but also represents five minutes and five seconds.

In the clock interface above the hour hand is at 10 which is also 10AM/PM.

The minute hand is at 2 which indicate its 10 minutes past 10.

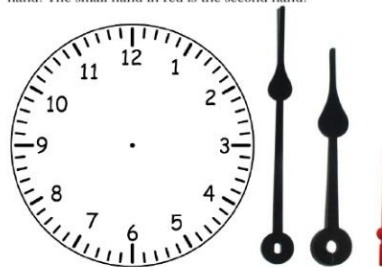
The second hand is usually the thinnest and usually at the top of the other two, in this case it is at 7 which is 35 seconds.

The second hand rotates first, when it makes a full rotation (60 seconds) = 1minute.

When the minute hand makes a full rotation (60 minutes) = 1 hour.

When the hour hand makes a full rotation (12 hours) = $\frac{1}{2}$ a day.

From the diagram below shows three different hands of a clock. The small Black Hand is the hour hand while the other black is the minute hand. The small hand in red is the second hand.



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Guide the learners to understand how many seconds are there in a minute, how many minutes are there in an hour etc.

$$1 \text{ hour} = 60 \text{ minutes}$$

$$1 \text{ minute} = 60 \text{ seconds}$$

$$1 \text{ day} = 24 \text{ hours}$$

Use the examples in the learners book (example 7 and 8) to explain more the concept of time more so the conversion of time.

Activity 3:

In groups, your teacher will provide different phases from the manually operating clock and you are to identify the time and note the different time set.

Example 8.

Conversion of hours into minutes and second

1. Convert 2 hours into minutes

$$\begin{aligned} 1 \text{ hour} &= 60 \text{ minutes or } 60 \text{ minutes} = 1 \text{ hour} \\ 1 \text{ minute} &= 60 \text{ seconds} \\ 1 \text{ hour} &= 60 \times 60 \text{ seconds} = 3600 \text{ seconds.} \\ \text{So, } 2 \text{ hours} &= 2 \times 60 \end{aligned}$$

$$= 120 \text{ minutes}$$

2. Convert 2 hours to minutes and seconds.

$$\begin{aligned} 2 \text{ hours} &= \text{--- minutes} = \text{--- seconds} \\ &= 2 \times 60 \text{ minutes} \\ &= 120 \text{ minutes} \\ 120 \text{ minutes} &\times 60 \text{ seconds} \end{aligned}$$

$$= 7200 \text{ seconds}$$

3. Convert 360 minutes to hours

$$60 \text{ min} = 1 \text{ hr}$$

$$360 \text{ min} = \frac{360 \text{ min}}{60 \text{ min}} = 6 \text{ hrs}$$

In time we use Seconds (sec), Minutes (min) and Hours (hrs) as units of telling time.

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Exercise 3.

Change the following hours to minutes.

- | | | |
|-------------------------|-------------------------|-------------------------|
| 1) 4 hours | 2) $2\frac{1}{2}$ hours | 3) 5 hours |
| 4) 10 hours | 5) 7 hours | 6) 12 hours |
| 7) $5\frac{1}{4}$ hours | 8) $3\frac{3}{4}$ hours | 9) $4\frac{1}{4}$ hours |

Change the following minutes to hours.

- | | | |
|----------------|----------------|----------------|
| 1) 240 minutes | 2) 180 minutes | 3) 270 minutes |
| 4) 225 minutes | 5) 45 minutes | 6) 15 minutes |

Change the following to seconds.

- | | | |
|---------------|---------------|--------------|
| 1) 60 minutes | 2) 2 hours | 3) 6 minutes |
| 4) 6 hours | 5) 45 minutes | 6) 4 hours |

Change the following to minutes.

- | | | |
|------------|------------|------------|
| 1) 180 Sec | 2) 360 Sec | 3) 240 Sec |
| 4) 480 Sec | 5) 720 Sec | 6) 560 Sec |

Change the following into minutes and seconds.

- | | | |
|------------|------------|------------|
| 1) 90 Sec | 2) 75 Sec | 3) 300 Sec |
| 4) 150 Sec | 5) 435 Sec | 6) 100 Sec |

Musa travelled from town A to town B. If he took $4\frac{3}{4}$ hours. How many minutes did he spend on his journey?

A period in a class lasts 45mins. If there are 7 periods in a day, how many hours and minutes do pupils spend in the periods?

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The activity 3 should be done practically in groups or individually.

Exercise 4

Expected answers

Each learner to attempt in pairs

Hours to minutes

- | | | |
|----------------|----------------|----------------|
| 1) 240 minutes | 2) 150 minutes | 3) 300 minutes |
| 4) 600 minutes | 5) 420 minutes | 6) 720 minutes |
| 7) 315 minutes | 8) 225 minutes | 9) 255 minutes |

Minutes to hours

- | | | | |
|------------------------|------------------------|--------------------------|--------------------------|
| 1) 4hours | 2) 3hours | 3) 4 $\frac{1}{2}$ hours | 4) 3 $\frac{3}{4}$ hours |
| 5) $\frac{3}{4}$ hours | 6) $\frac{1}{4}$ hours | | |

Change to seconds

- | | | |
|------------------|-----------------|------------------|
| 1) 3600 seconds | 2) 7200 seconds | 3) 360 seconds |
| 4) 21600 seconds | 5) 2700 seconds | 6) 14400 seconds |

Change to minutes

- | | | |
|--------------|---------------|----------------------------|
| 1) 3 minutes | 2) 6 minutes | 3) 4 minutes |
| 4) 8 minutes | 5) 12 minutes | 6) 9 $\frac{1}{3}$ minutes |

Change into minutes and seconds

- | | | |
|-------------------------|-------------------------|--------------|
| 1) 1 minute 30 seconds | 2) 1 minute 15 seconds | 3) 5 minutes |
| 4) 2 minutes 30 seconds | 5) 7 minutes 15 seconds | |
| 6) 1 minute 40 seconds | | |

285 minutes

5 hours 15 minutes

2.5 Measure temperature of objects in Celsius or Fahrenheit.

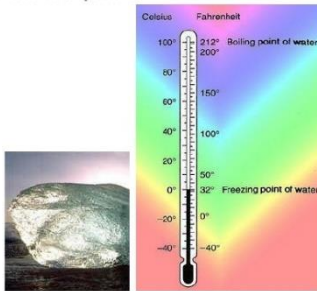
Temperature is measured in Celsius or Fahrenheit. These are both measurements in a thermometer.

2.5 Measure temperature of objects in Celsius or Fahrenheit

Temperature is how hot or cold something is.

Temperature can be measured in Celsius or Fahrenheit.

They both describe temperature.



Thermometer

This block of ice would measure 0° Celsius, or 32° Fahrenheit.

To convert Celsius into Fahrenheit or vice versa one can use either the interactive thermometer or the formula below:

°F to °C Subtract 32, then multiply by 5, then divide by 9.

$$^{\circ}\text{C} = \frac{(^{\circ}\text{F} - 32) \times 5}{9}$$

42

°C to °F Multiply by 9, then divide by 5, then add 32.

$$^{\circ}\text{F} = \frac{^{\circ}\text{C} \times 9}{5} + 32$$

Activity 4:

In groups of five use a thermometer to measure the temperatures water and record it in Celsius and Fahrenheit.

The temperature of a certain area was 12°C, 15°C, 17°C, 18°C, 20°C and 22°C to the left of zero. What was the total temperature in the 6 months?

Exercise 5.

- Convert the following Celsius to Fahrenheit. What operations are you going to use?
 - 24°
 - 19°
 - 46°
 - 37°
- Convert the following Fahrenheit to Celsius. What method will you use and why?
 - 168°
 - 72°
 - 143°
 - 200°

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Use the notes in the learner's book page 42 to guide the learners.

Provide a thermometer for the class and ensure the learners can read and measure the temperature of the room.

Using the thermometer guide them to attempt activity 4 in groups.

2.6 Money

Guide the learners by explaining the use of money in buying and selling in day to day setup.

Explain to the learner the difference between profit and loss. Also guide them on how to calculate the profit and loss with the help of example 9 and 10.

Refer more notes about currencies on the learner's book page 44.

2.6 Money

Profit and loss in business.

In business people do make profits but also make losses at times.

Profit

Profit is the extra money someone makes after deducting all the expenses.

Example 9.

A farmer harvested 80 sack of potatoes, each sack cost around SSP6000 from the cost of seeds and labor. If he sold each sack at SSP9500 he made a profit.

$$80 \times 6000 = \text{SSP}480,000$$

$$80 \times 9500 = \text{SSP}760,000$$

$$\text{Answer} = 760,000 - 480,000 = 280,000$$

Loss

Loss occurs when a product is sold less than the production cost.

Example 10.

From the example above, assume the farmer sold the sack of potatoes at SSP 5500 for each sack which cost SSP 6000.

$$5500 \times 80 = 440,000$$

$$6000 \times 80 = 480,000$$

$$\text{Answer} = 480,000 - 440,000 = \text{SSP}4,000$$

Exercise 5.

1. A TV was bought for SSP 18,950 and sold at a loss of SSP 4780. Find the selling price.
2. Mr. Smith buys pencils at SSP 450 per hundred and sells each at SSP 5. Find his loss or profit.
3. Davis bought a second hand cycle for SSP 500. He spent SSP 80 in repairs and SSP 175 in repainting. He then sold it to John for SSP 900. How much did he gain or lose?
4. A fruit vendor bought 600 apples for SSP 4800. He spent SSP 400 on transportation. How much should he sell each to get a profit of SSP 1000?
5. Tim bought a box of chocolates for SSP 650 and sold it to Tom at a profit of SSP 75. Find the selling price.

Currencies within particular regions

When traveling or moving around different regions it is advisable to change into the countries form of currencies.

Different countries use different types of currencies like Dollar, shilling and Pound. This makes it easier to buy goods and services in a country.

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Exercise 3

Expected answers

SSP 23730

SSP 50

SSP 145

SSP 10.20

SSP 725

UNIT 3: GEOMETRY

Geometry is that part of mathematics which explains the properties of points, lines, surfaces and solids

Learn about	Key inquiry questions
<p>Learners should broaden their understanding on lines and angles and construct parallel lines and angles using mathematical sets.</p> <p>Learners should identify different objects in terms of their sizes, shapes and length and record their observations and redraw them to a different scale.</p> <p>Learners should investigate angles to produce a variety of shapes using grids, and know that each point on a grid has two numbers to show its position.</p> <p>Based on their experiences of drawing right angles, learners should investigate and construct different types of angles (e.g. acute, obtuse and reflex angles) and be introduced to reflection as patterns of symmetry in a mirror line such that each point and its reflection are exactly the same distance from the mirror line.</p> <p>Learners should investigate vertical, horizontal and diagonal mirror lines.</p>	<ul style="list-style-type: none">• How can parallel lines be constructed using mathematical instruments?• Why do we use parallel lines?• How can shapes be represented in scale form? Or corners?• How can angles be practically constructed?• Do all regular and irregular polygons have a line of symmetry?• Do living things have mirror lines?

Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> • Identify and construct parallel lines using ruler and protractor and compasses. • Use linear scale and draw lines to a given scale. • Identify different sorts of angles (<i>acute, obtuse, reflex etc.</i>) and relate this to turns. 	<ul style="list-style-type: none"> • Construct and apply parallel lines in their daily life. • Use linear scales to represent size, space and positions of various objects under comparisons. 	<ul style="list-style-type: none"> • Appreciate the art of designing and drawing parallel lines and angles. • Confidence to investigate using mathematics and to take responsibility for their own learning.
<p>Contribution to the competencies:</p> <p><u>Critical thinking</u>: drawings and constructions of parallel lines and various angles and be able to differentiate these lines from other lines as well as differentiating these angles from other angles.</p> <p><u>Communication</u>: reporting of their observations in the school environment.</p> <p><u>Co-operation</u>: group work and discussions.</p>		
<p>Links to other subjects:</p> <p>Physics: geometrical optics, curved mirrors, lenses</p> <p>Social Studies: contour lines, lines of latitudes and longitudes.</p>		

It's important for the learner to know and understand some basic concepts of geometry.

There are two types of lines that are particularly useful in mathematics

1. Parallel line – lines that never meet or intersect
2. Perpendicular lines – intersect at a right angle.

See examples at learner's book page 45.

3.1 Constructing parallel lines

Ensure the learner has all the appropriate instruments used in construction. For example ruler, pencil, pair of compass.

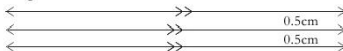
UNIT 3

GEOMETRY

Angles properties of parallel and perpendicular lines

- Lines that divide items into equal parts are called **parallel lines**
- Parallel lines throughout their distance will keep the same distance.

Example:

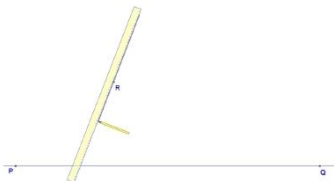


The distance or gaps between the lines will remain the same throughout.

3.1 Constructing parallel lines

We need a ruler and pair of compass.

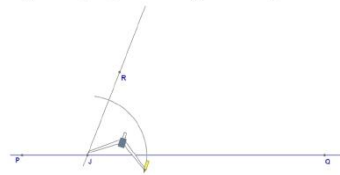
1. Using your ruler, draw a line through point R.



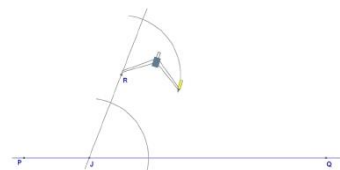
This is simply a straight line which passes through R and intersects with given line.

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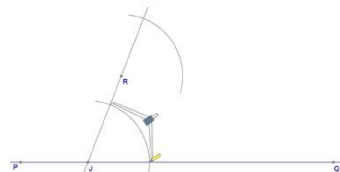
2. Using the compass, mark the angle formed by the transversal



3. Using the same distance on the compass, construct a copy of the angle formed by the transversal at point R

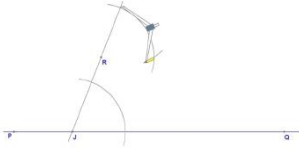


4. Measure the curve using a compass.

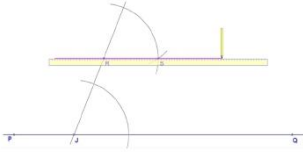


47

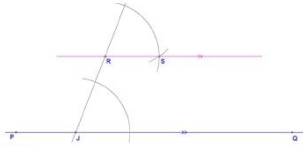
5. Using the same distance mark on the copied arc.



6. Join point R and S by drawing a line using a ruler.



7. Done. Line RS is parallel to line PQ



Activity 1:

In pairs, draw a straight line and follow the steps to construct a parallel line.

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Uses of parallel lines

We use parallel lines in construction of houses, carpentry like making a chair, farming when planting seedlings etc.

3.2 Construct angles.

Constructing a 60° Angle

We know that the angles in an equilateral triangle are all 60° in size.

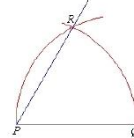
This suggests that to construct a 60° angle we need to construct an equilateral triangle as described below.

Step 1: Draw the arm PQ.

Step 2: Place the point of the compass at P and draw an arc that passes through Q.

Step 3: Place the point of the compass at Q and draw an arc that passes through P. Let this arc cut the arc drawn in Step 2 at R.

Step 4: Join P to R, the angle QPR is 60°



Activity 2:

In pairs, draw a 60° angle.

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Guide the learner to construct parallel line as shown in the learner's book.

Give practical examples to illustrate the concepts.

Guide the learners to follow the procedure accurately.

That activity in the learners should be done individually for accuracy and more understanding.

3.2 Construct angles

Ensure the learners remember or have a clue about angles as taught in primary 4.

Constructing a 30° Angle

We know that:

$$\frac{1}{2} \text{ of } 60^\circ = 30^\circ$$

So, to construct an angle of 30°, first construct a 60° angle and then bisect it. Often, we apply the following steps.

Step 1: Draw the arm PQ .

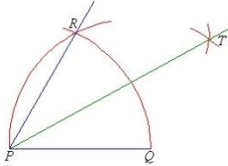
Step 2: Place the point of the compass at P and draw an arc that passes through Q .

Step 3: Place the point of the compass at Q and draw an arc that cuts the arc drawn in Step 2 at R .

Step 4: With the point of the compass still at Q , draw an arc near T as shown.

Step 5: With the point of the compass at R , draw an arc to cut the arc drawn in Step 4 at T .

Step 6: Join T to P . The angle QPT is 30°.



Activity 3:

In pairs, draw a 30° angle.

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Constructing an angle of 90°.

We can construct a 90° angle either by bisecting a straight angle or using the following steps.

Step 1: Draw the arm PA .

Step 2: Place the point of the compass at P and draw an arc that cuts the arm at Q .

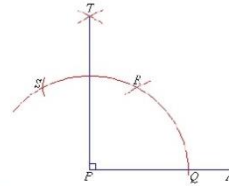
Step 3: Place the point of the compass at Q and draw an arc of radius PQ that cuts the arc drawn in Step 2 at R .

Step 4: With the point of the compass at R , draw an arc of radius PQ to cut the arc drawn in Step 2 at S .

Step 5: With the point of the compass still at R , draw another arc of radius PQ near T as shown.

Step 6: With the point of the compass at S , draw an arc of radius PQ to cut the arc drawn in step 5 at T .

Step 7: Join T to P . The angle APT is 90°.



Activity 4:

In pairs, draw a 90° angle.

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Guide the learners to construct a 60°, 30° and 90° angles.

Use the steps in the learner's book and lead them to construct the angles.

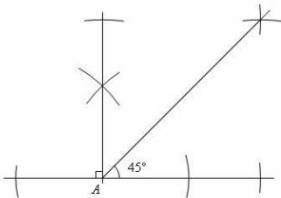
Also use the activities provide for further examples for practice.

3.3 Line of symmetry

Keywords: lines of symmetry; reflection; rotation; nature; open-ended questions; cross-curricular.

Constructing an angle of 45°

Bisect the angle of 90°



Measure angles

Activity 5:

In pairs, bisect a 90° angle.

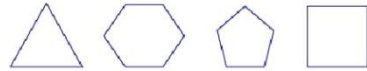
3.3 Line of Symmetry

Reflection Symmetry (sometimes called *Line Symmetry* or *Mirror Symmetry*) is easy to see, because one half is the reflection of the other half.

Regular polygons have sides that are all the same length and angles that are all the same size.

These polygons are regular:

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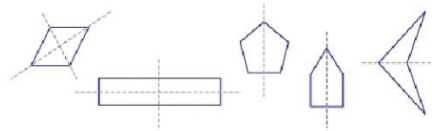
The polygons below are not regular.

Such polygons are referred to as irregular.



A polygon has line symmetry, or reflection symmetry, if you can fold it in half along a line so the two halves match exactly. The "folding line" is called the line of symmetry.

These polygons have line symmetry. The lines of symmetry are shown as dashed lines. Notice that two of the polygons have more than one line of symmetry.



These polygons do not have line symmetry:



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Learning Outcomes

By the end of this section, you will have to:

Use group work to help develop learner's understanding of symmetry, including multiple lines of symmetry and orders of rotational symmetry;

Developed a range of strategies including using open-ended questions to develop thinking skills around symmetry;

Worked across curriculum areas to extend ideas about symmetry.

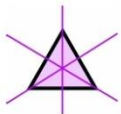
Introduction

If you fold a blank page in half and open it out again, each side of the fold looks like a reflection of the other. When folded, the two sides overlap and cover each other perfectly. This is reflection symmetry. The ‘mirror’ or ‘fold’ line that gives these two equal reflections is called the line of symmetry.

Not all shapes have lines of symmetry, or they may have several lines of symmetry.

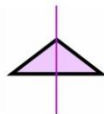
Example 1.

A Triangle can have 3, or 1 or no lines of symmetry:



Equilateral Triangle
(all sides equal,
all angles equal)

3 Lines of Symmetry



Isosceles Triangle
(two sides equal,
two angles equal)

1 Line of Symmetry



Scalene Triangle
(no sides equal,
no angles equal)

No Lines of Symmetry



In this picture the dog has her face made perfectly symmetrical with a bit of photo magic.

The white line down the center is the **Line of Symmetry** (also called the "Mirror Line").

The Line of Symmetry (also called the **Mirror Line**) can be in **any direction**.

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The reflection in this lake also has symmetry, but in this case:

- ✎ the **Line of Symmetry** runs left-to-right.
- ✎ It is not perfect symmetry, because the image is changed a little by the lake surface.



But there are four common directions, and they are named for the line they make on the standard XY graph.

Artists, professionals, designers of clothing or jewelry, car manufacturers, architects and many others make use of the idea of symmetry.

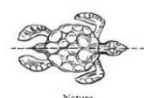
The beehives, the flowers, the tree-leaves, religious symbols, rugs, and handkerchiefs — everywhere you find symmetrical designs.



Architecture



Engineering



Nature

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Using group work to explore symmetry

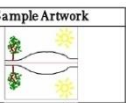
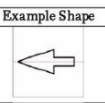
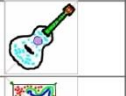
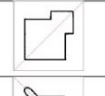


Introducing the concept of symmetry and reflection needs careful planning. Understanding that a shape is symmetrical if both sides are the same when a mirror line is drawn is best explored using practical activities. You need to think of ways to organize and group your learners so that they can participate fully.

One way to introduce this topic is by using drawings, photos and flat items like leaves. To see the line of symmetry you need to try:

Looking at a piece of paper held upright on the line of symmetry – look on one side, then the other;

Example 2.

See these examples (the artwork was made using Symmetry Artist):

Sample Artwork	Example Shape
	
	
	

Activity 6:

In groups, observe symmetry in the environment around you, especially animals, plants, leaves, flowers, crystals, etc.

Do you see any symmetrical observation? Share your thinking in class. Explain where and why there is symmetry.

Exercise 1.

1. Construct parallel lines of;

- a) 5cm b) 7cm c) 10cm d) 3cm

What method would you use and why?

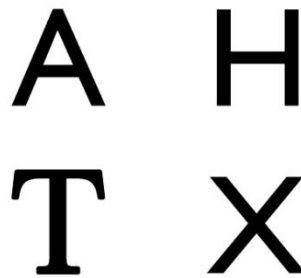
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2. Construct the following angles

- a) 60°
 b) Bisect 60°
 c) 90°
 d) Bisect 90°

How are you going to tackle it? How did you check your answers?

3. How many lines of symmetry are there?



What did you notice when checking your answers?

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putting a piece of paper over an item, along the line of symmetry, then turning the paper over to cover the other half;

The activity in the learner's book should be done by learners practically to ensure they apply their skill of observation with their surrounding environment. **Examples of symmetry found in nature.**

Teacher resource for planning or adapting to use with learners



Also use examples given in the learner's book (examples 1 and 2).

UNIT 4: ALGEBRA

Algebra is about using letters in place of numbers.

Learn about		Key inquiry questions
<p>✍ Learners should understand how to form and solve simple equations with one variable and solve problems.</p> <p>✍ They should analyse simple equations and use this understanding to solve practical problems.</p>		<ul style="list-style-type: none"> • Why do we form and solve simple equations? • How do we analyze solution of simple equations?
Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> • Solving simple equations 	<ul style="list-style-type: none"> • Construct and solve simple algebraic equations. • Apply simple equations in solving problems 	<ul style="list-style-type: none"> • Appreciate and value the importance of simple equations.
<p>Contribution to the competencies: <u>Critical thinking:</u> while comprehending mathematical expression as they develop algebraic statements and equations <u>Communication:</u> applying simple equations in their daily life <u>Co-operation:</u> group work</p>		
<p>Links to other subjects: Science</p>		

Remind learners what they learnt in primary 4.

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

$$x + 2 = 6$$

To find what x represents put like terms together that is $x = 6 - 4$ therefore the value of x is 4.

Always ensure unknowns are on one side while numbers on the opposite side.

Algebra has its purpose. Refer the notes in the learner's book page 57 and 58.

4.1 Purpose of algebraic equations

UNIT 4

ALGEBRA

What do you remember in algebra, that you learnt in primary 4?

In **book 4**, we studied simple algebraic expressions. We looked at how to **collect** like terms together. i.e.

Simplify the expression below;

$$x + 2y + x + y - 2$$

Solution

Collecting the like terms together, we have

$$\begin{aligned} x + x + 2y + y - 2 \\ = 2x + 3y - 2 \end{aligned}$$

4.1 Purpose of Algebraic equations

What do you think is the purpose of algebra?

The **purpose of Algebra** is to make it easy to state a mathematical relationship and its equation by using letters of the alphabet or other symbols to represent entities as a form of shorthand.

Algebra allows you to substitute values in order to solve the equations for the unknown quantities.

There are numerous mathematical relationships that have been established in science, finance and other areas. Examples include the relationship between force and acceleration, conversion of centimetres to inches, and determining the payments on a loan with a given interest rate. These relationships are stated as *equations*.

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Algebra allows you to use letters of the alphabet or other symbols to represent objects and numbers. This makes it more convenient

You can state a physical equation by using letters to represent the elements of the equation. For example, force equals mass times acceleration.

Solving Algebraic equations

In this sub unit, we shall discuss how to solve the simple algebraic equations.

Example 1.

Solve the equation below.

$$x - 4 = 0$$

Solution

Here, we are required to determine the value of x (unknown term)

In this case, we must ensure that the unknown x is on one side of the equal sign while the digit or number on the opposite side of the equal side.

$$\begin{aligned} x - 4 + 4 &= 0 + 4 \\ x &= 4. \end{aligned}$$

Because the value x is on the same side as x and it is negative, we add on both sides an equal value so that on the side where we have x , the sum of the digits is zero. If it was a positive, we would subtract on both sides i.e.

$$x + 5 = 0$$

Solution

$$\begin{aligned} x + 5 - 5 &= 0 - 5 \\ x &= -5 \end{aligned}$$

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The main purpose is to make it easy to state a mathematical relationship and its equation by using letters to represent entities thus creating an equation.

By the end of this subtopic the learners should be able to work addition and subtraction problems of algebra.

By the use of example 1, 2, 3 and 4 guide the learners in addition and subtraction problems.

Addition Problems

To solve equations, the general rule is to do the opposite. For example, consider the following example.

Example 2.

Solve the equation below.

$$x + 7 = -5$$

Solution

$x + 7 = -5$ The 7 is added to the x .
 $-7 \quad -7$ Subtract 7 from both sides to get rid of it.
 $x = -12$ Our solution
 Then we get our solution, $x = -12$.

The same process is used in each of the following examples.

$4 + x = 8$	$7 = x + 9$
$-4 \quad -4$	$-9 \quad -9$
<u>$x = 4$</u>	<u>$-2 = x$</u>

Activity 1:

Solve the following equation.

- a) $14 = b + 3$ b) $-1 + k = 5$ c) $n + 8 = 10$

How are you going to tackle this?

Subtraction Problems

In a subtraction problem, we get rid of negative numbers by adding them to both sides of the equation.

Example 3.

$$\begin{aligned} x - 5 &= 4 \\ +5 &+ 5 \\ x &= 9 \end{aligned}$$

The 5 is negative, or subtracted from x
 Add 5 to both sides
 Our Solution!

Then we get our solution $x = 9$.

The same process is used in each of the following examples. Notice that each time we are getting rid of a negative number by adding.

Example 4.

Solve the equations below.

$-6 + x = -2$	$-10 = x - 7$	$5 = -8 + x$
---------------	---------------	--------------

Solution

$-6 + x = -2$	$-10 = x - 7$	$5 = -8 + x$
$+6 \quad +6$	$+7 \quad +7$	$+8 \quad +8$
<u>$x = 4$</u>	<u>$-3 = x$</u>	<u>$13 = x$</u>

Activity 2:

Solve the following equation.

- a) $m - 4 = -13$ b) $-14 = x - 18$ c) $-13 - p = -19$

What do you think the answer or result will be?
 How will you check the answer?

Multiplication Problems

In multiplication problems, we get rid of the denominator by multiplying on both sides.

Multiplication problems

Guide the learners on how to find the value of letter represented using multiplication methods.

Example 1 in the learner's book has explained in a simple way therefore guide the learners using the example and formulate many more.

Always remind the learners to check the sign that is if a number is a positive or a negative. The same process is used in either. The learner should be keen when writing the answers.

For instance use the examples in the learner's book because they are well explained and easier for the learners to understand.

Example 5.

1. Solve $\frac{x}{5} = -3$
 $5 \times \frac{x}{5} = -3 \times 5$ Multiply both sides by 5
 $x = -15$ Our Solution

The same process is used in each of the following example.

Example 6.

1. Solve $\frac{x}{-7} = -2$
 $-7 \times \frac{x}{-7} = -2 \times -7$ Multiply both sides by -7
 $x = 14$

2. Solve $\frac{x}{8} = 5$
 $8 \times \frac{x}{8} = 5 \times 8$ Multiply both sides by 8
 $x = 40$

Activity 3:

Solve the following equation.

a) $\frac{5}{9} = \frac{b}{9}$ b) $\frac{1}{2} = \frac{a}{8}$ c) $\frac{k}{13} = -16$

What do you think the answer or result will be?
 How will you check the answer?

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Division Problems

With a division problem, we get rid of the number by dividing on both sides.

Example 7.

Solve $4x = 20$
 $\frac{4x}{4} = \frac{20}{4}$ Divide both sides by 4
 $x = 5$ Our solution
 We get our solution $x = 5$

With multiplication problems it is very important that care is taken with signs. If x is multiplied by a negative then we will divide by a negative.

Example 8.

Solve $-5x = 30$
 $\frac{-5x}{-5} = \frac{30}{-5}$ Divide both sides by -5
 $x = -6$ Our Solution

The same process is used in each of the following examples. Notice how negative and positive numbers are handled as each problem is solved.

Activity 4:

Solve the following equation.

a) $3n = 24$ b) $v - 16 = -30$ c) $-8k = 120$

What do you think the answer or result will be?
 How will you check the answer?

The process described above is fundamental to solving equations. This process should be mastered. These problems may seem different, but the process and patterns used will remain the same.

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Division problems

The value of the unknown number that is represented by a letter is calculated by multiplying the denominator in both sides. For instance $\frac{y}{2} = 6$

Step 1: Multiply both sides by 2

Step 2: $\frac{y}{2} \times 2 = 6 \times 2$ making the value of y to be 12

For more refer learner's book example 8 and 9

Copy example 10 on the chalk board and choose some learners from the class to take the rest though the example.

Let the learners attempt activity 1 and 2 as their homework, in groups or as individuals

Activity 1

Expected answers

- i) $y=1$ ii) $y=4$ iii) $x=0$ iv) $x=5$ v) $x=-3$

Activity 2

Expected answers

1. i) $x=2$ ii) $x=6$ iii) $y=4$ iv) $x=2$ v) $x=7$
2. i) $x=-2$ ii) $x=2$ iii) $y=5$ iv) $x=1$ v) $y=5$

Exercise 1

Expected answers

- 1) $v=7$ 2) $x=-5$ 3) $a=10$ 4) $x=-19$ 5) $n=18$
6) $x=-20$ 7) $n=108$ 8) $v=-8$ 9) $n=17$ 10) $x=20$
11) $n=3$ 12) $p=-13$ 13) $x=15$ 14) $b=-10$ 15) $r=5$
16) $a=-11$ 17) $x=14$ 18) $a=-11$ 19) $p=240$ 20) $m=-16$

Activity 5:

In pairs, obtain the values of the unknown in the equations below.

- i) $y + 3 = 4$
- ii) $y - 4 = 0$
- iii) $x + 2 = 2$
- iv) $x - 2 = 3$
- v) $x + 3 = 0$

Hint: ensure that the unknowns are on one side while numbers on the opposite side of the equal side.

Exercise 1.

Working in pair, Solve three equation each.
Tell your partner how you worked it out using mathematical steps.
How can you check your answer?

- 1) $v + 9 = 16$
- 2) $x - 11 = -16$
- 3) $30 = a + 20$
- 4) $x - 7 = -26$
- 5) $13 = n - 5$
- 6) $340 = -17x$
- 7) $-9 = \frac{n}{12}$
- 8) $20v = -160$
- 9) $340 = 20n$
- 10) $16x = 320$
- 11) $-16 + n = -13$
- 12) $p - 8 = -21$
- 13) $180 = 12x$
- 14) $20b = -200$
- 15) $\frac{r}{14} = \frac{5}{14}$
- 16) $-7 = a + 4$
- 17) $10 = x - 4$
- 18) $13a = -143$
- 19) $\frac{p}{20} = -12$
- 20) $9 + m = -7$

Make set of cards for each category. In groups learners organize their cars into the four categories. Teacher to check the learners understanding

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OPERATION	KEY WORD	EXAMPLE	TRANSLATIO
Addition (+)	plus	A number plus three	$x + 3$
	more than	Ten more than a number	$x + 10$
	the sum of	The sum of a number and five	$x + 5$
	the total of	The total of six and some number	$6 + x$
	increased by	A number increased by two	$x + 2$
	added to	Eleven added to a number	$x + 11$
Subtraction (-)	minus	A number minus seven	$x - 7$
	less than	Four less than a number	$x - 4$

	the difference of	The difference of a number and three	$x - 3$
	less	Nine less a number	$9 - x$
	decreased by	A number decreased by twelve	$x - 12$
	subtracted from	Six subtracted from a number	$x - 6$
Multiplication (\times)	times	Eight times a number	$8x$
	the product of	The product of fourteen and a number	$14x$
	twice; double	Twice a number; double a number	$2x$
	multiplied by	A number multiplied by negative six	$-6x$
	of	Three fourths of a number	$\frac{3}{4}x$
Division (\div)	the quotient of	The quotient of a number and seven	$\frac{x}{7}$
	divided by	Ten divided by a number	$\frac{10}{x}$
	the ratio of	The ratio of a number to fifteen	$\frac{x}{15}$
Equals (=)	equals	Seven less than a number equals ten.	$x - 7 = 10$
	is	Three times a number is negative six.	$3x = -6$
	is the same as	Eight is the same as twice a number.	$8 = 2x$
	amounts to	Nine less a number amounts to twenty.	$9 - x = 20$

4.2 Formation of algebraic equations and solving

To write the expressions always assign a variable to the unknown number.

4.2 Formation of algebraic equations and solving

The table below lists some key words and phrases that are used to describe common mathematical operations.

To write algebraic expressions and equations, assign a variable to represent the unknown number. In the table below, the letter "x" is used to represent the unknown.

In groups, Play the matching game.

OPERATION	KEY WORD	EXAMPLE	TRANSLATION
Addition (+)	plus	A number plus three	$x + 3$
	more than	Ten more than a number	$x + 10$
	the sum of	The sum of a number and five	$x + 5$
	the total of	The total of six and some number	$6 + x$
	increased by	A number increased by two	$x + 2$
	added to	Eleven added to a number	$x + 11$
Subtraction (-)	minus	A number minus seven	$x - 7$
	less than	Four less than a number	$x - 4$
	the difference of	The difference of a number and three	$x - 3$
	less	Nine less a number	$9 - x$
	decreased by	A number decreased by twelve	$x - 12$
	subtracted from	Six subtracted from a number	$x - 6$
	times	Eight times a number	$8x$

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Multiplication (×)	the product of	The product of fourteen and a number	$14x$
	twice; double	Twice a number; double a number	$2x$
	multiplied by	A number multiplied by negative six	$-6x$
Division (÷)	of	Three fourths of a number	$\frac{3}{4}x$
	the quotient of	The quotient of a number and seven	$\frac{x}{7}$
	divided by	Ten divided by a number	$\frac{10}{x}$
Equals (=)	the ratio of	The ratio of a number to fifteen	$\frac{x}{15}$
	equals	Seven less than a number equals ten.	$x - 7 = 10$
	is	Three times a number is negative six.	$3x = -6$
	is the same as	Eight is the same as twice a number.	$8 = 2x$
	amounts to	Nine less a number amounts to twenty.	$9 - x = 20$

Example 11.

1. A farmer has 40 animals in his farm. The number of goats is thrice the number of cows. How many cows does the farmer have?

Solution

Let the number of cows be x

Therefore, goats = $3x$

Total = 40 animals

$$3x + x = 40$$

$$4x = 40$$

$$x = 10$$

Therefore he has 10 cows

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By the end of this lesson the learners should be able to form a simple equation by him or herself.

Explain the key words to be used in this subtopic.

The key words are explained in the learner's book page 59 – 60.

Therefore your work is to give more examples. Advocate using real life examples.

For instance Musa has 6 children. The number of girls is twice the number of boys. How many boys does Musa have?

Let the number of boys be x

The number of girls will be $2x$

Total number of Musa's children will be $2x + x$ which is equals to 6

$$2x + x = 6; 3x = 6$$

Value of x is 2.

2. The length of a rectangle is 3cm more that the width. Given that the perimeter of the rectangle is 50cm, what are the dimensions of the length and width?

Solution

$$\begin{aligned} \text{Perimetre of a rectangle} &= 2L + 2W \\ &= 2(L + W) \end{aligned}$$

Let the width be w

Therefore length is $w + 3$

$$50 = 2(w + 3 + w)$$

$$50 = 2(2w + 3)$$

$$50 = 4w + 6$$

$$4w = 50 - 6$$

$$4W = 44$$

$$W = 11$$

$$\text{Therefore the length} = w + 3 = 11 + 3 = 14\text{cm}$$

$$\text{Width} = 11\text{cm}$$

Note; more means we add.

Less means we subtract.

3. Mary has SSP200 less than Tom. If they both have a total of SSP1000, how much does Tom have?

Solution

Tom has SSP x

Mary = $(x - 200)$

Total = SSP1000

$$x + x - 200 = 1000$$

$$2x - 200 = 1000$$

$$2x = 1200$$

$$x = \text{SSP}600$$

Therefore Tom has SSP600.

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Activity 7:

In groups form and solve the algebraic expressions. What operations are you going to use?

1. The number of mathematics text books in a school is 4 times the number of science text books. If the total number of the books in the school are 200, how many English text books are in the school?
2. Deng has SSP150 more than Paul. Paul has twice the amount Jane has. If the total amount they have altogether is SSP1200, how much does Paul have?

Exercise 2.

1. The length of a classroom is 8 m more than the width. Give that the area of the classroom is 80m, what is the length of the classroom?
2. Peter is 3 years younger than his dad. If the sum of their ages is 40 years, what is the age of peter? How old was the father 3 years ago?
3. The number of chairs at home is four times the number of tables. If the sum of the chairs and table is 10, how many tables are there?
4. In a class, the number of boys is three times the number of girls. If the difference between the number of boys and girls is 20, how many girls are there? (hint: difference means subtract)
5. A gardener is wanting to plant some trees. She plants p mangoes. She plants 5 more oranges than she does mangoes.
 - a. Find an expression for the number of oranges that the gardener had planted.

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Use examples in the learner's book to further elaborate this concept (sub topic 4.2).

Assign activity 3 to the learners to attempt in groups.

Exercise 2

Expected answers

1. 24 m

2. Age of peter now is 18 and half years; age of the father 3 years ago is 18 and half.

3. 2

4. 10

5. a) $p+5$ b) $p+ 5= 56$

c) $p= 51$

6. $9g$

7. SSP 6,700

8. a) $4a + l = 10$

- b. The gardener had actually planted 56 oranges. Form an equation, using this information.
c. Solve the equation that you found in part (b) to write down the number of tulips that were planted.

6. A large van can hold g parcels for delivery. Fast delivery Ltd. have 9 of these vans. How many parcels will they be able to deliver?

7. David hires a car. There is an initial standing charge of SSP 2500.00 and then the hire costs a further SSP700.00 per hour. How much will it cost for 6 hour hire?

8. A rectangle with a perimeter $4a$ has width 20cm. Find:
a. An expression for its length.
b. An expression for its area.

Summary

The primary purpose of Algebra is to allow you to substitute letters for the names of items, thus creating an equation. Then you can substitute in values to solve for an item. You can manipulate the equation to put it in terms of one of the unknown.

UNIT 5: STATISTICS

In this unit learners should be able to understand the process of data collection.

Learn about		Key inquiry questions
<p>✍ Learner should revise data collection and recording and their representation on bar and line graphs. They should collect data, represent the collected data, and give it simple meaning. They should be exposed to the techniques of collecting and how to recognize types of data.</p>		<ul style="list-style-type: none"> • Why do we collect data? • How do we carry out the process of data collection? • How can we represent and assign meanings to this statistical data?
Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> • Understand the representation and interpretation of collected data. 	<ul style="list-style-type: none"> • Able to collect and represent data in a given situation. • Distinguish different types of data. 	<ul style="list-style-type: none"> • Appreciate collection of data, representation, and interpretation of data. • Confidence to investigate using mathematics and to take responsibility for their own learning.
<p>Contribution to the competencies: <u>Critical thinking</u>: collecting and interpreting data. <u>Communication</u>: discussions and presentation of their results of the collected data. <u>Co-operation</u>: group work in the data collection.</p>		
<p>Links to other subjects: Linked to all subjects through research.</p>		

In this Unit learners participation is highly required.

Start by asking the learners what they learnt in primary 4 about primary 4 since it's also the last topic they learnt in that class.

Listen to the learners answers therefore derive a simple definition using real life examples and explain what statistics is.

Key words; statistics, data, data collection and data representation.

All these key words are clearly defined in the learner's book therefore guide the learner to come up with example of real life.

5.1 Why data is collected

UNIT
5

STATISTICS

Statistics involves collecting, organizing and analyzing data.

Data is a plural of datum (Latin word) meaning facts or things which are known and from which conclusions can be made. Data can be numerical figures, ratings, description, quotations, notes etc.

Quantitative data uses display numerical data to explore traits and situations. It can be continuous or discrete data.

5.1 Why data is collected

Activity 1:

In groups, discuss why do you think data collection is important to our country. Present your answers to the rest of the class.

Which methods are used in collecting data in our country?

- ✍ Teachers can use data to assess the learner's ability.
- ✍ Data collected can be used to assess the general progress of the school.
- ✍ Data collected can be used to understand the areas that needs improvement.
- ✍ Data collected can be used to predict about the future of our nation.

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Methods of collecting data

- i) **Observation method**-collecting data by observing.
- ii) **Interview method**-involves presentation of oral verbal stimuli and reply in terms of oral-verbal responses.
It can be structured or unstructured.
Structured involves use of pre-determined questions and of highly standard techniques of recording.
Unstructured do not follow a system of pre-determined questions and is characterized by flexibility of approach to questioning.
- iii) **Questionnaire**
This is a set of specific questions which should be answered by a respondent or the person giving data.
- iv) **Experimentation** - this is a way of collecting data through doing experiments.

Steps in collecting data

Step 1: Identify issues for collecting data.

Step 2: Select issues and set goals.

Step 3: Plan an approach and methods

- Who will the data be collected about?
- What locations or geographical areas will the data be gathered from?
- How should data be collected?
- Qualitative Data
- Quantitative Data.

What sources of data should be used to collect information?

- Pre-existing or official data.
- Survey data.

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Data collection is an important aspect in the day today's life.

Direct this to the learners and allow them give examples of why data is important in day today activities. Asses their answers accordingly hence understand their ability.

Use the learner's book to elaborate importance of data collection.

Methods of collecting data:

Observation; the use of eyes. For instance counting of reds cars and black cars at the main road.

Interview method; it's a one on one question and answer session. For instance interviewing the school nurse about the tendency of some diseases in the school. Refer more notes in the learner's book.





Questionnaire; questions formulated specifically for individuals to answer. Guide the learners to formulate simple questionnaire to their fellow learners.

Experiments; getting data through conducting of experiments.

Use the learner's book page 65 to explain the steps of collecting data.

Let the learners collect data within the school and assess to know their understanding on data collection.

How to formulate a questionnaire?

-  Know the kind of information needed. For example number of boys and girls in a neighboring school.
-  Use simple specific and short questions using a few words as possible.
-  Be selective.
-  Ask questions without bias. Questions that everyone will answer freely.

With this guidance let the learners attempt activity 2.

5.2 Representation of data

- ↳ Interviews and focus groups.
- ↳ Observed data.

Step 4: Collect data.

Step 5: Analyze and interpret data.

Step 6: Act on result.

Activity 2:

With the guide of the teacher, in pairs:

- Prepare a structured and an unstructured interview that will be presented to class 6 pupils on why learners perform well in Mathematics and what they think should be done to improve the performance in the subject.
- Prepare a questionnaire that will help you answer the question on the negative impact of internet on learners.

Exercise 1.

Collect data in class about age of your classmates, brothers and sisters for every learner. Present the data collected to the class.

5.2 Representation of data

The main purpose of representation of statistical data is to make collected data more easily understood. Methods commonly used are;

- Bar graphs
- Line graphs
- Pie charts

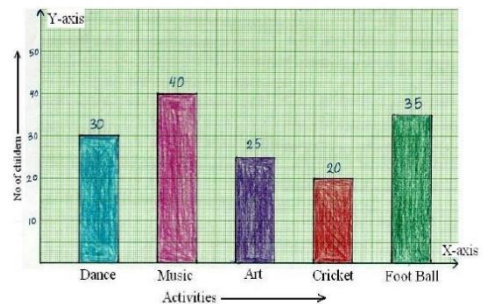
Bar graphs

A bar graph consists of a number of spaced rectangles which generally have major axes vertical. Bars are of uniform width. The axes must always be labeled and scales indicated.

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Steps in construction of bar graphs/column graph:

- ☑ On a graph book, draw two lines perpendicular to each other, intersecting at 0.
- ☑ The horizontal line is x-axis and vertical line is y-axis.
- ☑ Along the horizontal axis, choose the uniform width of bars and uniform gap between the bars and write the names of the data items whose values are to be marked.
- ☑ Along the vertical axis, choose a suitable scale in order to determine the heights of the bars for the given values. (Frequency is taken along y-axis).
- ☑ Calculate the heights of the bars according to the scale chosen and draw the bars.
- ☑ Bar graph gives the information of the number of children involved in different activities.



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The dos

1. Selection of a Suitable Method.
2. Selection of Suitable Scale.
3. Design e.g. the title.

Ask learners to gather information from each of the other learners in the class. They could find out how many family members each learner has.

Ask them to create a visual display of the information they have gathered. They may choose to display the data in any form other than in the form of numbers.

This activity requires quite a bit of time as learners need to gather information.

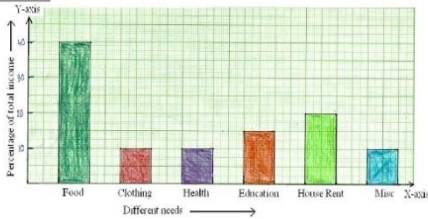
Example 1.

1. The percentage of total income spent under various heads by a family is given below.

Different Heads	Food	Clothing	Health	Education	House Rent	Miscellaneous
% Age of Total Number	40%	10%	10%	15%	20%	5%

Represent the above data in the form of bar graph.

Solution

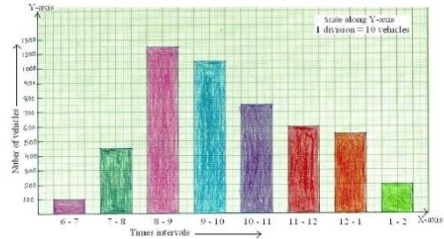


2. The vehicle traffic at a busy road crossing in a particular place was recorded on a particular day from 6am to 2 pm and the data was rounded off to the nearest tens.

Time in Hours	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2
Number of Vehicles	100	450	1250	1050	750	600	550	200

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Solution



This Bar graph gives the number of vehicles passing through the crossing during different intervals of time.

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Learning outcomes

By the end of this subunit, learners will be able to: Prepare a simple table of data collected and draw bar graphs of information collected locally.

Frequently asked questions; *what prior knowledge should the learner have?* A Learner should have a good working knowledge of whole numbers and be comfortable with the four basic arithmetic operations of addition, subtraction, multiplication and division.

Lesson focus

This lesson focuses on the interpretation and representation of data in bar graphs, line graphs and pie charts. Use the information the learners have collected during the starter activity and show learners how they can display their data using a tally table. Work through the examples 1, 2, 3 and 4 (67 – 84).

Bar graphs

The learner should observe the following when constructing a bar graph.

The width of the bars or columns should be similar.

All bars should be placed on equal distance.

Bars maybe shaded with colors to make the distinct and attractive.

Use the steps in the learners book to guide them learn how to draw bar graphs.

Guide them on how to find suitable scales for drawing bar graphs.

Ensure all learners have their worksheets for easy formulation of graphs.

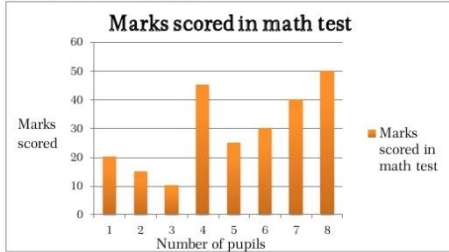
Exercise 2.

1. The data below shows the marks scored in a mathematics test done by primary 5 in a certain school. The test was marked out of 50. The data was: 30, 25, 50, 15, 25, 50, 25, 10, 50, 30, 15, 10, 25, 40, 35, 50, 45, 35, 30, 50, 40, 50, 45, 40, 45, 50, 30, 35, 50, 45, 40, 50, 40, 25, 40, 30, 50, 40, 10, 20, 35, and 30. The data was then recorded in a table as shown below.

Data recorded in a table

Mark scored	10	15	20	25	30	35	40	45	50
Number of pupils	3	2	1	5	6	9	7	4	8

Data represented in a bar graph.



From the graph:

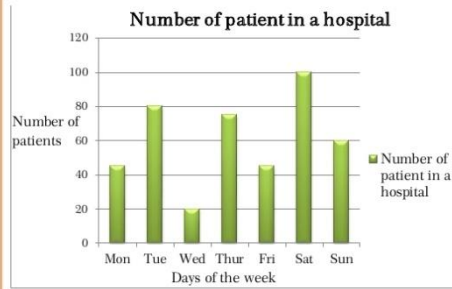
- How many pupils scored 40 marks?
- How many more pupils scored 30 marks than 20 marks?
- Which marks were scored by seven pupils?
- What was the difference between the highest score and the lowest score?
- How many pupils sat for the test altogether?

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2. The following data was collected in a certain hospital to show the number of patients who visited the hospital in a week.
45, 80, 20, 75, 45, 100, 60

Data recorded in a table

Days of the week	Mon	Tue	Wed	Thur	Fri	Sat	Sun
Number of patient	45	80	20	75	45	100	60



- How many patients visited the hospital on Thursday?
- How many less patients visited the hospital on Saturday than on Sunday?
- On which two days did the same number of patients visit the hospital?
- Which day did 60 patients visit the hospital?
- How many patients visited the hospital in the last 3 days of the week?
- On which day did the least number of patients visit the hospital?

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Exercise 2

Expected answers

1. a) 7 learners b) $6 - 1 = 5$ c) 40 marks d) $50 - 10 = 40$ marks

- e) 45 learners

2. a) 75 patients b) $100 - 60 = 40$ patients c) Monday and Friday

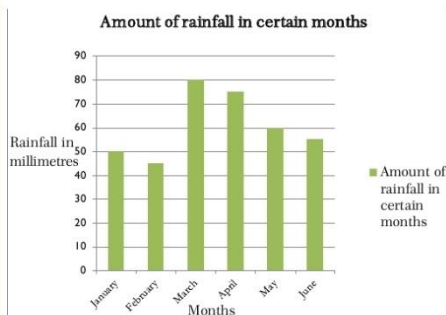
- d) Sunday e) $45 + 100 + 60 = 205$ patients f) Wednesday

3. The data below represents the amount of rainfall received in a certain district in the first 6 months of the year:

Jan 50mm, Feb 45mm, March 80mm, April 75mm, May 60mm and June 55mm.

Data is recorded in a table as shown below.

Months	Jan	Feb	Mar	Apr	May	June
Amount of rainfall in (mm)	50	45	80	75	60	55



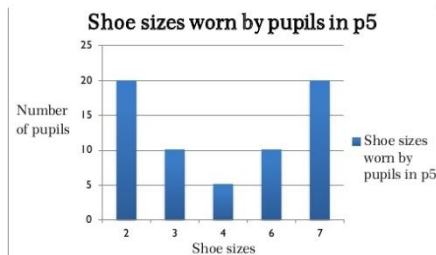
- Which month did the district receive 45mm of rainfall?
- Which month had the most amount of rainfall received?
- How much less in mm was the rainfall received in the month of June than the month of May?
- How much rainfall in mm was received in the first $\frac{1}{2}$ part of the year?

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4. The data below shows shoe sizes worn by pupils in primary 5 in a certain school. 2, 3, 4, 6, 7

The data was recorded in a table as shown below.

Shoe sizes	2	3	4	6	7
Number of pupils	20	10	5	10	20



- How many pupils chose shoe size 6?
- What shoe size number was chosen by 20 pupils?
- How many more pupils chose shoe size 6 than size 4?
- What shoe size numbers were chosen by the same number of pupils?
- Which is the least chosen shoe size?
- How many pupils altogether chose the shoe sizes?
- Collect data, record them in a table and represent them in a bar graph.

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3. a) February b) march c) $60-55= 5\text{mm}$ d) total of the rainfall in the six months 365 mm

4. a) 10 learners b) shoe size number 2 and 7 c) 5 learners

d) 2, 7 by 20 learners each; 3, 6 10 learners each e) size number 4

g) Find answers depending on the data collected by learners

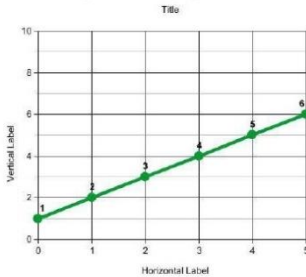
Line graphs

Line graphs

In line graphs, data is represented using lines.

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).

Let's define the various parts of a line graph.



Title - The title of the line graph tells us what the graph is about.

Labels - The horizontal label across the bottom and the vertical label along the side tells us what kinds of facts are listed.

Scales - The horizontal scale across the bottom and the vertical scale along the side tell us how much or how many.

Points - The points or dots on the graph show us the facts.

Lines - The lines connecting the points give estimates of the values between the points.

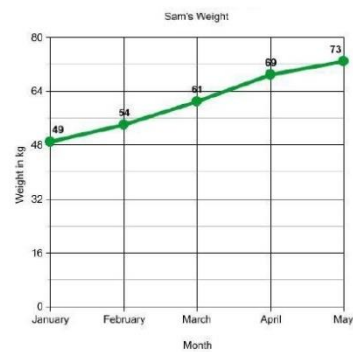
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Example 2.

The table below shows Sam's weight in kilograms for 5 months.

Sam's Weight	
Month	Weight in kg
January	49
February	54
March	61
April	69
May	73

The data from the table has been summarized in the line graph.



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

Use the notes in the learner's book to explain and guide the learners draw line graphs.

A **line graph** is useful for displaying data or information that changes continuously over time. Another name for a line graph is a line chart.

Exercise 3.

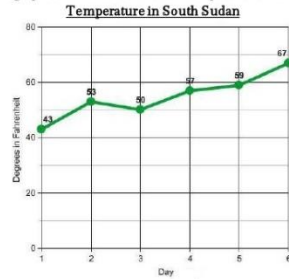
Look at the graph below and use it to answer questions that follow.



QUESTION

- What is the title of this line graph?
- What is the range of values on the horizontal scale?
- What is the range of values on the vertical scale?
- How many points are in the graph?
- What was the highest value recorded?
- What was the lowest value recorded?
- Did Sam's weight increase or decrease over time?

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



QUESTION

- What is the title of this line graph?
- What is the range of values on the horizontal scale?
- What is the range of values on the vertical scale?
- What was the lowest temperature recorded?
- What was the highest temperature recorded?
- At which day did the temperature go down?

The graph below shows people in a store at various times of the day.



QUESTION

- What is the line graph about?
- What is the busiest time of day at the store?
- At what time does business start to slow down?
- How many people are in the store when it opens?
- About how many people are in the store at 2:30 pm?
- What was the greatest number of people in the store?
- What was the least number of people in the store?

Summary:

A line graph is useful in displaying data or information that changes continuously over time. The points on a line graph are connected by a line. Another name for a line graph is a line chart.

The steps provided in the learner's book are simple and easier for the learners to understand. Elaborate more when necessary.

Give the exercise to the learners to attempt. They should attempt all questions if necessary.

Exercise 3

Expected answers

1. a) Sam's weights b) one month c) 16kgs d) 5 points
e) 73kgs f) 49 kgs g) Sam's weight increased
2. a) Temperature in South Sudan b) one day c) 20 degrees Fahrenheit
d) 43 degree Fahrenheit e) 67 degree Fahrenheit f) Day 3
3. a) People in the store b) 1pm c) 3pm d) 2 people
e) 9 people f) 22 people g) 2 people

Pie charts

Pie chart is another graphical method of the representation of data. It is drawn to depict the total value of the given attribute using a circle. Dividing the circle into corresponding degrees of angle then represent the sub- sets of the data. Hence, it is also called as Divided Circle Diagram.

The angle of each variable is calculated using the following formulae.

$$\frac{\text{Value of given State/Region} \times 360}{\text{Total Value of All States/Regions}}$$

If data is given in percentage form, the angles are calculated using the given Formulae.

$$\frac{\text{Percentage of } x \times 360}{100}$$

Use different shades of colors to differentiate portions.

Give the key for example 1 cm represents 5 learners

Pie charts

A pie chart is a circle divided into various sectors. Each sector represents a certain quantity of the item being considered. The size of the sector is proportional to the quantity it represents.

It is used to display a set 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.

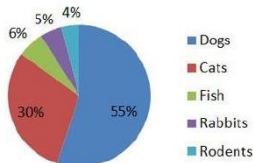
To obtain the size of the sector, we take a quantity out of the total then multiply by 360° .

Example 3.

The pie chart below represents the percentage of people who own various pets.

As you can see, the 'dog ownership' slice is by far the largest, which means that most people represented in this chart own a dog as opposed to a cat, fish, or other animal.

Pet Ownership



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Uses of a Pie Chart

The main use of a pie chart is to show comparison. When items are presented on a pie chart, you can easily see which item is the most popular and which is the least popular.

Various applications of pie charts can be found in business, school, and at home.

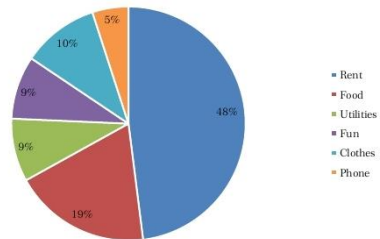
For business, pie charts can be used to show the success or failure of certain products or services.

They can also be used to show market reach of a business compared to similar businesses.

At school, pie chart applications include showing how much time is allotted to each subject.

It can also be used to show the number of girls to boys in various classes.

Accounting



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Use the notes in the learner's book and guide the learners to draw a pie chart. Example 3 and 4 will help the learner to know about drawing and reading of pie charts.

Assign exercise 3 to the learners to attempt.

How to Read Pie Charts

Reading a pie chart is as easy as figuring out which slice is the biggest.

You will see that some data have larger slices than others. So you can easily decipher which data is more important to your audience than others.

For the pet ownership pie chart, I can easily see that rodents make up the smallest number of pets. So, pet owners, when choosing pets, rodents are at the bottom of their list.

That is not to say that rodents make the worst pets, but the data shows that pet owners prefer dogs first and foremost, followed by cats, then fish, then rabbits, then rodents.

Create Your Own

Pie charts are created and used when the number of data is not too large. They are easy to make, both by hand or with computer software.

Example 4.

The total population of animals in a farm given as 1800. Out of these, 1200 are chicken, 200 cows, 300 goats, 100 ducks. Represent the data on a pie chart.

Solution

To represent on a pie chart, we must know the angle each animal will occupy;

Chicken

$$\begin{aligned} \text{Angle} &= \frac{\text{no of chicken}}{\text{total population}} \times 360 \\ &= \frac{1200}{1800} \times 360 \\ &= 240^\circ \end{aligned}$$

Cows

$$\begin{aligned} \text{Angle} &= \frac{200}{1800} \times 360 \\ &= 40^\circ \end{aligned}$$

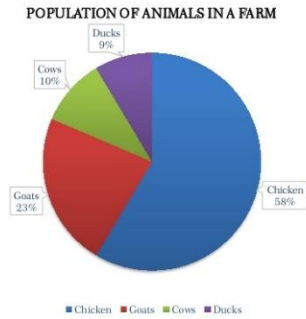
Goats

$$\begin{aligned} \text{Angle} &= \frac{300}{1800} \times 360 \\ &= 60^\circ \end{aligned}$$

Ducks

$$\begin{aligned} \text{Angle} &= \frac{100}{1800} \times 360 \\ &= 20^\circ \end{aligned}$$

NOTE: Having obtained the angle, we use a protractor to measure the angle.



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Exercise 4.

- Draw a pie chart to represent the information below for a 24 ha farm
Coffee farm-4ha
Grass-3ha
Maize-7ha
Bananas-5ha
Homestead-0.5ha
Vegetables-4.5ha

- Represent the information below on a bar graph for trees planted in a certain farm

Year	1998	1999	2000	2001	2002
No of trees	7400	11200	10700	5600	9800

- The table below represents the importation of vehicles for the year 1994 to 2002

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002
No of vehicles	15	24	29	42	50	48	45	43	38

Draw a line graph to represent the information.

- Draw a line graph to represent the variation of temperature with time

Time	8 am	9am	10 am	11 am	12noon	1 pm	2pm
Temp °c	35.6	36.4	37.0	37.2	36.8	35.9	37.1

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Exercise 4

Expected answers

Calculate the angles

Coffee 60

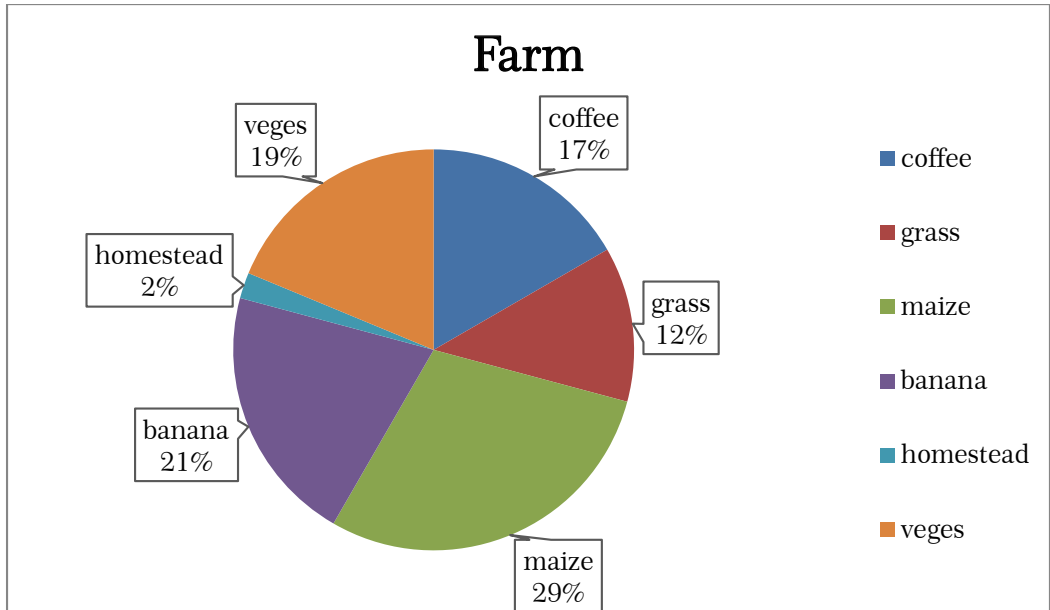
Grass 45

Maize 105

Homestead 7.5

Vegetables 67.5

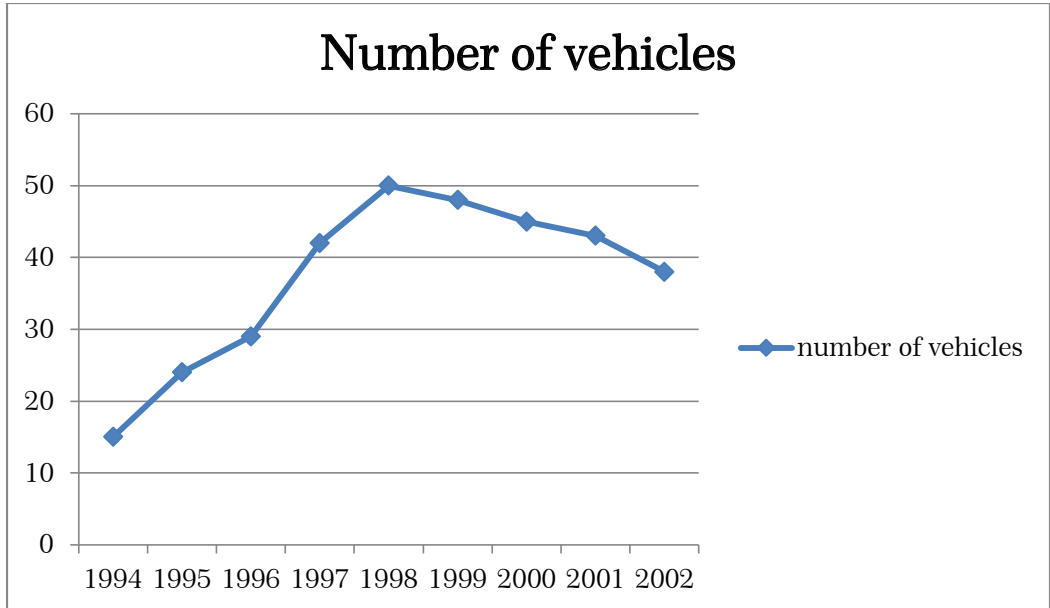
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Draw a bar graph



Draw a line graph



Draw a Line graph to represent variation of temperature with time.

