

THE REPUBLIC OF UGANDA

Ministry of Education and Sports

HOME-STUDY LEARNING



MATHEMATICS

August 2020

NCDC
NATIONAL CURRICULUM DEVELOPMENT CENTRE

Save the Children



NCDC
NATIONAL CURRICULUM
DEVELOPMENT CENTRE

Published 2020

This material has been developed as a home-study intervention for schools during the lockdown caused by the COVID-19 pandemic to support continuity of learning.

Therefore, this material is restricted from being reproduced for any commercial gains.

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FOREWORD

Following the Outbreak of the CoVID-19 Pandemic, Government of Uganda closed all schools and other educational institutions to minimize the spread of the coronavirus. This has affected more than 36,314 primary schools, 3129 secondary schools, 430,778 teachers and 12,777,390 learners.

The COVID-19 outbreak and subsequent closure of all has had drastically impacted on learning especially curriculum coverage, loss of interest in education and learner readiness in case schools open. This could result in massive rates of learner dropouts due to unwanted pregnancies and lack of school fees among others.

To mitigate the impact of the pandemic on the education system in Uganda, the Ministry of Education and Sports (MoES) constituted a Sector Response Taskforce (SRT) to strengthen the sector's preparedness and response measures. The SRT and National Curriculum Development Centre developed print Home- Study Materials, radio and television scripts for some selected subjects for all learners from Pre-Primary to Advanced level. The materials will enhance continued learning and learning for progression during this period of the lockdown, and will still be relevant when schools resume.

The materials focused on critical competences in all subjects in the curricula to enable the learners to achieve without the teachers' guidance. Therefore effort should be made for all learners to access and use these materials during the lockdown. Similarly, teachers are advised to get these materials in order to plan appropriately for further learning when schools resume, while parents/guardians need to ensure that their children access copies of these materials and use them appropriately.

I recognise the effort of National Curriculum Development Centre in responding to this emergency through appropriate guidance and the timely development of these home study materials. I recommend them for use by all learners during the lockdown.



Alex Kakooza

Permanent Secretary

Ministry of EDUCATION AND SPORTS

ACKNOWLEDGEMENTS

National Curriculum Development Centre (NCDC) would like to express its appreciation to all those who worked tirelessly towards the production of home-study materials for Pre-Primary, Primary and Secondary Levels of Education during the COVID-19 lockdown in Uganda.

The Centre appreciates the contribution from all those who guided the development of these materials to make sure they are of quality; Development partners - SESIL, Save the Children and UNICEF; all the Panel members of the various subjects; sister institutions - UNEB and DES for their valuable contributions.

NCDC takes the responsibility for any shortcomings that might be identified in this publication and welcomes suggestions for improvement. The comments and suggestions may be communicated to NCDC through P.O. Box 7002 Kampala or email admin@ncdc.go.ug or by visiting our website at http://ncdc.go.ug/node/13.



Grace K. Baguma
Director,
National Curriculum Development Centre

ABOUT THIS BOOKLET

Dear learner, welcome to this home-study material which has been prepared for you. The material covers content for term 1, II and III.

The content covered has been carefully written covering the different topics in the syllabus. This is an addition to what you had learnt before schools were closed due to outbreak of COVID-19. The content is arranged using simple steps for your understanding. The activities provided in each topic are organised in such a way that they will enable you to relate with your local environment.

The content is organised into lessons. Each lesson has activities and summary notes that help you to understand the concepts. Some lessons have projects that you need to carry out at home during this period. You are encouraged to work individually as you do the practical and interactive activities.

Feel free to try out all the activities in this material.

Enjoy learning

SELF STUDY

TERM ONE

Topic: Operations on Whole Numbers

Lesson 1: Multiplication of 4 digit whole numbers by 3 digit numbers whose product is not more than 9,999,999

In this lesson, you will;

- Multiply whole numbers whose product is less than 9,999,999
- Solves word problems involving multiplication.

You will need;

- Multiplication tables normally at the back of your exercise book.
- A ruler, Pen, Note book, pencil

Introduction:

In this lesson, you are going to learn how to multiply whole numbers whose product is not more than 9,999,999. The Multiplication skills you will acquire will help you to do tasks both at school and home.

Phase 1:

Multiplication of large numbers is based on the principle that **multiplication is done in parts by** multiplying basing on place values done separately, and adding the products thereafter.

Study these examples;

Example 1: Multiply 2578 by 135?

$$\begin{array}{r} 2\ 5\ 7\ 8 \\ \times\quad 1\ 3\ 5 \\ \hline \end{array}$$

Step I:Multiply the ones

(a) $5 \times 8 = 40$; Write 0 regroup 4
(b) $5 \times 7 = 35 + 4 = 39$; Write 9 regroup 3
(c) $5 \times 5 = 25 + 3 = 28$; Write 8 regroup 2
(d) $5 \times 2 = 10 + 2 = 12$

$$\begin{array}{r} \quad\quad 2\ 3\ 4 \\ 2\ 5\ 7\ 8 \\ \times\quad\quad 1\ 3\ 5 \\ \hline \end{array}$$

1 2 8 9 0

Step II:Multiply the tens

(a) 3 × 8 = 24 ; Write 4 regroup 2
(b) 3 × 7 = 21 +2 = 23 ; Write 3 regroup 2
(c) 3 × 5 = 15 + 2 = 17 ; Write 7 regroup 1
(d) 3 × 2 = 6 + 1= 7

1 2 2
2 5 7 8

× 1 3 5

1 2 8 9 0
7 7 3 4

Step II:Multiply the tens

(a) 1 × 8 = 8
(b) 1 × 7 = 7
(c) 1 × 5 = 5
(d) 1 × 2 = 2

2 5 7 8

× 1 3 5

1 2 8 9 0

7 7 3 4

+2 5 7 8

3 4 8 0 3 0

Example 2: The Ministry of health bought 456 boxes of drugs for the COVID 19 patients. Each box contained 28 bottles. How many bottles of drugs were there in all the boxes?

4 5 6

× 2 8

3 6 4 8

+9 1 2

1 2 7 6 8

Exercise:

1. Multiply the following numbers;

(a) 1 3 5 7 × 1 5

(b) 6 3 5 2 × 24

(c) 2 4 6 8 × 13 4

(d) 4 5 67 × 315

2. A factory produces 255 bags of nails each day. If each bag contains 1645 nails, how many nails does the factory produce daily?

Lesson 2: Division of whole numbers by 2 digit numbers

In this lesson, you will;

- Divide whole numbers by 2 digit numbers with or without remainders.
- Solves word problems involving division.

You will need;

- Multiplication tables normally at the back of your exercise book.
- A ruler
- Pen
- Note book
- pencil

Introduction:

Before you divide large numbers by 2 digit numbers, you have to know multiplication tables. The division skills you will acquire will help you to do tasks both at school and home. For example, sharing money, food, books, and many others.

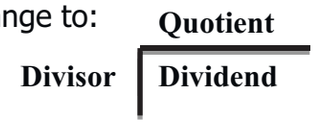
You are used to this kind of division: 12 ÷ 3; In such a case, you would ask yourself a question like how many times does 3 go into 12? 12 ÷ 3 = 4

12 is called the **dividend**,

3 is called the **divisor**, and

4 is called the **quotient**

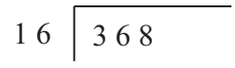
However, in primary six you are going to use long division and the sign is going to change to:



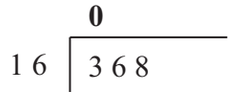
Phase 1:

Example I: Divide 368 by 16?

Step 1: Divide (Start your division with the larger place value in this case hundreds).



How many times will 16 go into 3? Remember, we cannot share 3 equally with 16 groups.



So, the answer is **0**. You put 0 on the quotient line above 3.

Step 2: **Multiply** your answer from step 1 by the divisor. 0 × 3 = 0

You write 0 under 3.

```
      0
16 | 368
     0
```

Step 3: **Subtract**. In this case, it will be 3 – 0 = 3

```
      0
16 | 368
   - 0
   ---
     3
```

Step 4: You bring down the next number from the dividend. In this case it is 6.

Write 6 next to the 3 from step 3 making the number 36.

```
      0
16 | 368
   - 0 ↓
   ----
     36
```

×	16
2	32
3	48
4	64

Start over again;

How many groups of 16 can we get from 36?

From the table on the right, the answer is 2. So put 2 on the quotient line.

```
      0 2
16 | 368
   - 0 ↓
   ----
     36
```

You multiply your answer by the divisor; 2 × 16 = 32 Write this under the 36 and subtract.

```
      0 2
16 | 368
   - 0 ↓
   ----
     36
   - 32
   ----
      4
```

Bring down the next number from the dividend which is 8. Write 8 next to 4 making it 48. Start over again.

```
      0 2
16 | 368
   - 0 ↓
   ----
     36 |
   - 32 ↓
   -----
      48
```

How many groups of 16 can we get from 48?

From the table on the right, the answer is 3. So put 3 on the quotient line.

×	16
2	32
3	48
4	64

```
     0 2 3
   ┌──────
16 │ 3 6 8
   - 0
     36
   - 32
      48
```

You multiply your answer by the divisor; 3 × 16 = 48 Write this under the 48 and subtract.

```
     0 2 3
   ┌──────
16 │ 3 6 8
   - 0
     36
   - 32
      48
    - 48
      00
```

So, 3 6 8 ÷ 1 6 = 2 3

Example II: **Work out:** 5325 divide by 25

Step 1: Divide

```
     0
   ┌──────
25 │ 5 3 2 5
```

Step 2:Multiply

```
     0
   ┌──────
25 │ 5 3 2 5
   0
0 × 25 =
```

×	25
2	50
3	75
4	100
5	125

Step 3:Subtract

```
     0
   ┌──────
25 │ 5 3 2 5
   - 0
     5
0 × 25 =
```

Step 4:Bring down the next number from the dividend

```
     0
   ┌──────
25 │ 5 3 2 5
   - 0
     5 3
0 × 25 =
```

Start over again:

```
          0  2  1  3
      ┌──────────────
25    │ 5  3  2  5
0 × 25 =  - 0
          ──
            5  3
2 × 25 =  - 5  0
          ──────
               3  2
2 × 25 =     -  2  5
             ──────
                7  5
2 × 25 =       - 2  5
               ──────
                0  0
```

So, 5 3 2 5 ÷ 2 5 = 2 1 3

Example III: A petrol station manager bought 18615 litres of motor oil. If she put equal amount of oil in 15 drums, how many litres of oil were in each drum?

```
          0  1  2  4  1
      ┌──────────────────
15    │ 1  8  6  1  5
0 × 15 =  - 0
          ──
            1  8
1 × 15 =  - 1  5
          ──────
               3  6
2 × 15 =     -  3  0
             ──────
                  6  1
4 × 15 =        -  6  0
                ──────
                     1  5
1 × 15 =           - 1  5
                   ──────
                     0  0
```

×	15
2	30
3	45
4	60

Exercise:

1. Divide the following numbers;

(a) 1 3 5 3 ÷ 1 1

(b) 1 9 0 4 0 ÷ 14

(c) 5424 ÷ 12

(d) 1 8 6 4 8 ÷ 18

2. A house is to be roofed using 1254 tiles. If a box contains 22 tiles, how many boxes will be required to complete the work?

Topic: Patterns and Sequences

Lesson 1: Forming Number patterns

In this lesson, you will;

- Describe types of numbers
- Form different number patterns

You will need;

- A ruler, Pen, Note book, pencil

Introduction:

In earlier classes, you developed your understanding of repeating, increasing patterns, and decreasing patterns by using objects, diagrams, and numbers. A number pattern is a sequence or list of numbers that is formed according to a rule. Number patterns can use any of the four operations (+, −, ×, ÷) or even a combination. In this lesson, we shall look at number patterns formed by even and old numbers.

Phase 1:

Activity

Look around you, identify the patterns you can see share with the people around you the different patterns and how they help people to be orderly.

Phase 2:Patterns and sequences formed by even and odd numbers

You looked at types of numbers in Primary 4 and 5. Look at the following numbers.

(a) 0, 2, 4, 6, 8, 10.

(b) 1, 3, 5, 7, 9, 11, 13.

What can you say about these numbers? Can you describe them?

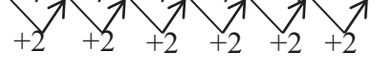
You will notice that all the numbers in (a) are even numbers. While

All the numbers in (b) are odd numbers

Let us try the examples below;

Patterns by addition:

(a) 12, 14, 16, 18, 20, ... , ...

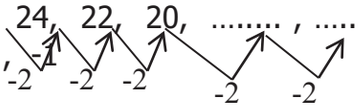


(b) 3, 7, 11, 15, ..., 23,

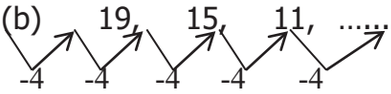


Patterns by subtraction:

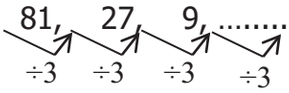
(a) 24, 22, 20, ... , ... , ...



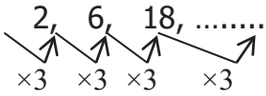
(b) 19, 15, 11, ... ,



Pattern by division: 81, 27, 9, ... , ...



Patterns by multiplication: 2, 6, 18, ... , ...



Exercise:

1. Find the next missing numbers in the following sequences;

(a) 0, 2, 4, 6, ... , ...

(b) 19, 16 , 13 , ... , ... , ...

(c) 64, 16, 8, ...

(d) 6, 12, 24, 48 , ...

2. List a set of the first 6 odd numbers.

3. Find the sum of all even numbers between 4 and 16.

Lesson 2: Tests for Divisibility of 2, 3 and 5

In this lesson, you will;

- Describe the steps for divisibility tests
- Find multiples of 2, 3 and 5
- Identify numbers divisible by 2, 3 and 5.

You will need;

- Multiplication tables normally at the back of your exercise book.
- Counters like sticks, straws, bottle tops etc.
- A ruler, pen, Note book, pencil

Introduction:

In this lesson, you are going to learn some special rules that will help you to identify numbers that are divisible by 2, 3 and 5. You will know some shortcuts that will make it easy for you to determine if numbers, even huge numbers like this, are divisible by other numbers like 2, 3, and 5. So, divisibility tests will help you to recognize numbers that are divisible by 2, 3 and 5 even without necessarily dividing.

Phase 1: Activity I:

Get 6 counters. If you want to share them equally with your friend, how do you know if each of you will get an equal number of counters? Knowing the divisibility rule for 2 will help you solve this dilemma without having to guess.

Divisibility rule for 2

The **divisibility rule for 2** is a short cut for knowing if a number is divisible by 2 without having to actually solve the division problem.

The rule says that any number that ends in a 0, 2, 4, 6, or 8 can be divided by 2 to produce a whole number. So, all **even numbers** (numbers that always end in 0, 2, 4, 6 or 8) are divisible by 2.

Divisibility rule for 5

The **divisibility rule for 5** is a short cut for knowing if a number is divisible by 5 without having to actually solve the division problem.

The rule says that any number that ends in a 0 or 5 can be divided by 5 to produce a whole number.

Divisibility rule for 3

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

Example I: State whether 93,025 is divisible by 3.

To check if 93,025 is divisible by 3, Add its digits.

9 + 3 + 0 + 2 + 5 = 19

Since 19 is not divisible by 3, neither is 93,025

Hint: *In adding the digits, you can totally omit any digits that are divisible by 3 (namely 3, 6 and 9)*

Example II: State without dividing if 993,768 is divisible by 3.

To check if 993,768 is divisible by 3, just add 7 + 8 = 15 and omit 9, 9, 3 and 6.

Since 15 is divisible by 3, so is 993,768

Exercise:

1. List the first 10 multiples of; (a) 2 (b) 3 (c) 5

2. Find the missing numbers;

(a) (b) 0, 6, 9, ……. , ……. , 18 (b) 0, 5, 20, ……. , ……. , …….

3. Given the numbers; 8, 15, 195, 894, 297, 87654, 7950, 240, 24

Without dividing, write the numbers which are divisible by;

(a) 2 (b) 3 (c) 5

Lesson 3: Square numbers and square roots

In this lesson, you will;

- Identify square numbers
- Find squares of numbers
- Prime factorize and find square roots

You will need;

- Multiplication tables normally at the back of your exercise book.
- A ruler, Pen, Note book, pencil

Introduction:

You were already introduced to square numbers in primary five. You learnt that the square of a number is the number times itself. For example the square of 3 is $3 \times 3 = 9$. In this lesson, you will review the square of whole numbers.

Phase 1

You can visualize the square of a number as an actual square. Here are some examples of squares of different numbers:

2^2

1	2
3	4

2 x 2 = 4

3^2

1	2	3
4	5	6
7	8	9

3 x 3 = 9

4^2

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

4 x 4 = 16

The square of a number is got by multiplying the number by itself.

Exercise I

Find the square of the following numbers;

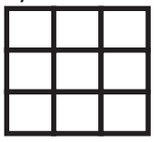
(a) 3 (b) 8 (c) 11 (d) 15 (e) 18 (f) 17 (g) 16

Square roots

Phase 2:

Modeling Squares

Do you know why we use the word *square*? If we construct a square with three tiles on each side, the total number of tiles would be nine.



This is why we say that the square of three is nine and the square root of 9 is 3.

A square root of a number is a value that can be **multiplied by itself** to give the original number. The symbol for square root is written like this;

$\sqrt{}$

$\sqrt{}$ This is read as the square root of 36

Phase 3:Look at these examples;

1. Find the square root of 36.

Solution

(a) Express the given number into prime factors

2	36
2	18
3	9
3	3
	1

$2 \times 2 \times 3 \times 3$

(b) Make pairs of similar factors.

$\sqrt{36} = (2 \times 2) \times (3 \times 3)$

(c) Choose one factor out of every pair. Take the product of the chosen factors.

$\sqrt{36} = 2 \times 3$

$= 6$

So, square root of 36 is 6

2. Work out the square root of 81

3	81
3	27
3	9
3	3
	1

Solution

$3 \times 3 \times 3 \times 3$

$\sqrt{81} = \sqrt{(3 \times 3) \times (3 \times 3)}$

$\sqrt{81} = 3 \times 3 = 9$

Exercise

Find the square root of each of the following;

(a) 64 (b) 144 (c) 36 (d) 225 (e) 81

TERM TWO

TOPIC: FRACTIONS

Lesson 1: Multiplying a fraction by a fraction

In this lesson you will;

-identify fractions.

-multiply fractions.

-read fractions.

You will need;

A pen, an exercise book, a ruler

Introduction

You are already introduced to fractions in primary five where you added and subtracted fractions.In this lesson you are going to look at multiplication of fractions by fractions.

Learning about multiplication helps you to tell what portion of a whole you need, have, or want.

Step 1

Here are some examples.

Example 1

Multiply: $\frac{4}{9} x \frac{5}{6}$

Here multiply the numerators alone

4 x 5 = 20

Then multiply denominators alone

9 x 6 = 54

Then reduce the numbers by 2 on both sides to the lowest term to simplify the answer.

$$= \frac{10}{27}$$

$$\frac{4}{9} \times \frac{5}{6} = \frac{10}{27}$$

Example 2

Multiply; $\frac{2}{3} \times \frac{3}{4}$

$$\frac{2}{3} \times \frac{3}{4} = \frac{6}{12}$$

Example 3:

Multiply: $2\frac{1}{3} \times 1\frac{1}{5}$

First $2\frac{1}{3}$ change it to improper fraction.

$3 \times 2 = 6$

$6+1=7$ out of the denominator 3which gives $\frac{7}{3}$

Then also change $1\frac{1}{5}$ to improper fraction.

$5 \times 1 = 5$, so get the $5+1$ the numerator,

$5+1=6$, out of 5 the denominator.

$\frac{7}{3} \times \frac{6}{5} = \frac{42}{15}$

then we divide 42 by 15 to get $2\frac{12}{15}$

Therefore, $2\frac{1}{3} \times 1\frac{1}{5} = 2\frac{12}{15}$

Exercise

1. $\frac{3}{4} \times \frac{1}{6}$
2. $\frac{12}{17} \times \frac{1}{2}$
3. $\frac{2}{9} \times \frac{4}{10}$
4. $1\frac{2}{5} \times 5\frac{1}{4}$
5. $2\frac{3}{5} \times 1\frac{1}{4}$
6. $3\frac{4}{7} \times 4\frac{3}{7}$

Lesson 2: Division of fractions

In this lesson you will,

-Divide fractions

-read factions

You will need;

-A book, pen, counters, fruits

Introduction

In this lesson we are going to look at division of fractions. Dividing fractions helps you to learn how to share in your daily life.

Step 1:

Example 1

$\frac{1}{3} \div \frac{5}{6}$ maintain the first fraction.

$\frac{1}{3} \div \frac{5}{6}$,get then reciprocal of the second fractionand multiply

$\frac{1}{3} \div \frac{5}{6} = \frac{1}{3} \times \frac{6}{5}$

$\frac{1}{3} \times \frac{6}{5}$, here you can reduce diagonally then multiply numerators alone denominators alone.

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

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

Example 2

Using LCD

Divide; $\frac{4}{5} \div \frac{2}{3}$

$\frac{4}{5} \div \frac{2}{3}$here first find the LCD of 5 and 3 which is 15.

After multiply each fraction with the LCD

$(\frac{4}{5} \times 15) \div (\frac{2}{3} \times 15)$

You reduce the LCD by the denominators in both fractions.

$$= (^{4}/_{\cancel{5}} \times \cancel{15}) \div (^{2}/_{\cancel{3}} \times \cancel{15})$$
$$\quad 1 \qquad\qquad 1$$

Then, multiply the numerators with the new LCD

$(4 \times 3) \div (2 \times 5)$

$12 \div 10$, write it in fraction form

$\frac{12}{10}$= you reduce to its simplest form.

$= \frac{12}{10} = \frac{6}{5}$

$\frac{6}{5} = 1\frac{1}{5}$

So, $\frac{4}{5} \div \frac{2}{3} = 1\frac{1}{5}$

Exercise

Try these out;

1. $\frac{1}{2} \div \frac{3}{4}$
2. $\frac{1}{4} \div \frac{2}{3}$
3. $\frac{5}{9} \div \frac{1}{2}$
4. $\frac{1}{3} \div \frac{2}{3}$
5. $\frac{7}{8} \div \frac{1}{2}$
6. $\frac{2}{3} \div \frac{1}{12}$

Lesson 3: mixed operations on fractions

In this lesson you will;

- State BODMAS in full,
- Apply BODMAS in mixed operation fractions,

You will need;

-A pen, book, counters, cards

Introduction

In this lesson, we are going to look at how to use BODMAS to workout mixed operations. Learning about mixed operations will help you to learn how to use the correct operations.

Step 1

BODMAS stands for Brackets (**B**), Of (**O**) , Division (**D**) Multiplication (**M**) , Addition (**A**) Subtraction(**S**).

Let us look at these examples

Workout:

$\frac{2}{3} \times \frac{3}{4} - \frac{1}{3} + \frac{1}{2}$

So, on our example:$\frac{2}{3} \times \frac{3}{4} - \frac{1}{3} + \frac{1}{2}$,

Here start with Multiplication (×) $\frac{2}{3} \times \frac{3}{4}$

$\frac{2}{3} \times \frac{3}{4}$reduce where applicable and it gives us$\frac{1}{2}$. So our new expression is; $\frac{1}{2} - \frac{1}{3} + \frac{1}{2}$

Find the lowest common denominator =6

$\frac{1}{2} - \frac{1}{3} + \frac{1}{2} = \frac{3 - 2 + 3}{6}$

$= \frac{6-2}{6}$

$= \frac{4}{6}$ or $\frac{2}{3}$

Example 2:

Work out:

$1\frac{1}{3} x \frac{3}{5} + \frac{1}{4} \div 1\frac{1}{2} - \frac{3}{4}$

Now here first change the mixed fractions to improper fractions.

$\frac{=(3\,x\,1)+1}{3} x \frac{3}{4} + \frac{1}{4} \div \frac{(2\,x\,1)+1}{3} - \frac{3}{4}$

$\frac{4}{3} x \frac{3}{5} + \frac{1}{4} \div \frac{3}{2} - \frac{3}{4}$

Work out the division first,

$\frac{4}{3} x \frac{3}{5} + \frac{1}{4} \times \frac{3}{2} - \frac{3}{4}$

$\frac{4}{3} x \frac{3}{5} + \frac{3}{8} - \frac{3}{4}$

Work out the multiplication;

$\frac{4}{3} x \frac{3}{5} + \frac{3}{8} - \frac{3}{4}$ get the LCM which is 40.

$\frac{4}{5} + \frac{3}{8} - \frac{3}{4}$

$\frac{(8x4) + (5x3) - (10x3)}{40} = \frac{32+15-30}{40}$

$\frac{47-30}{40} = \frac{17}{40}$

Exercise

Simplify;

1. $\frac{2}{5} \times \frac{3}{4} \div \frac{3}{5}$
2. $1\frac{1}{2} \times \frac{2}{3} + \frac{1}{4} \div \frac{3}{4}$
3. $\frac{1}{2} + \frac{1}{3} \times \frac{1}{4} - \frac{1}{5}$
4. $\frac{1}{3} \times (\frac{1}{2} + \frac{1}{4}) \times \frac{1}{5}$
5. $\frac{5}{6} \div (\frac{3}{4} \times \frac{1}{2})$
6. $\frac{2}{5} - \frac{1}{2} \times \frac{2}{7}$

Lesson 4: Rounding off decimals

In this lesson you will;

- Round off decimals
- Read decimals

You will need;

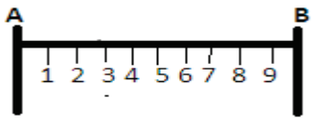
-A pen, book

Introduction

In primary four and five you looked at rounding off whole numbers. In this lesson you are going to look at rounding off decimals. Learning about rounding off decimals will help you to learn how to estimate in everyday life.

Step 1

Label first pole A and the second B then attach number tags for each marking.



List the numbers greater than 4.

You will realize that numbers greater than 4 are 5,6,7,8 and 9

Step 2

Example 1:

Round off 12.74 to the nearest whole number.

Whole number can also mean ones.

We round up when the number is greater than 5.

(a) 2 is in the required place.

(b) 7 is on the right of the required place value.

(c) So add 1 to the digit 2 and remove all digits to the right of the required place value.

12.74 = 1 2 . 7 4

+ 1 ↵

1 3 . 0 0

Example 2

Round off 67.954 to the nearest hundredths.(2 decimal places)

(a) 5 is in the required place.

(b) 4 is on the right of the required place value.

(c) So add 0 to the digit 5 and remove all digits to the right of the required place value.

67.954 = 6 7 . 9 5 4

+ 0 ↵

6 7 . 9 5

Exercise:

1. Round off to the nearest whole number (ones)
   a. 3.45 b. 8.29
2. Round off to the nearest tenths (1 decimal place)
   a. 9.83 b. 6.836
3. Round off to the nearest hundredths (2 decimal places)
   a. 12.23 b. 0.843

Lesson 5: Multiplication of decimal fractions

In this lesson you will;

-Multiply decimals
-Read decimals
-draw parts.

You will need;

-A pen, book, ruler.

Introduction

Decimal fraction is one where the denominator (bottom number) is a multiple of ten (such as 10,100,1000etc). In this lesson we are going to look at multiplication of decimals.

Step 1

Study the examples below;

Example: 1

Multiply: 2.4x4.2
First change the decimals to fractions.
2.4 becomes $\frac{24}{10}$and 4.2 becomes $\frac{42}{10}$
So, 2.4 x4.2 =$\frac{24}{10}$x $\frac{42}{10}$
Now multiply numerators alone and the denominators alone.

$\frac{24}{10}$x $\frac{42}{10}$=$\frac{24\ x\ 42}{10\ \text{x}\ 10}$

=$\frac{1008}{100}$

So, 2.4x 4.2 =10.08

Exercise

Now let us try out these numbers.

1. 0.4x 0.5
2. 1.5x1.6
3. 18.65x0.32
4. 2.3x 4. 35
5. 0.72x0.2
6. 2.4x0.54
7. 0.7x 0.6
8. 4.5x 1.6

Lesson 6: Division of Decimals

In this lesson you will;

- Divide fractions.

- multiply fractions

You will need;

-A pen, book, Counters

Introduction

In primary five you learnt about multiplying and dividing a fraction by a fraction. In this lesson you are going to divide and multiply decimals. Learning about decimals will help you to find how many items are in each group.

Step 1: Activity

Let us look at these examples.

Example 1

Divide: 6.0 ÷ 2.0

6.0 ÷2.0 you remove the decimal point and make a fraction

$$\frac{60}{10} \div \frac{20}{10}$$

After you maintain the first fraction and get a reciprocal of the second fraction which also changes the sign to multiplication because multiplication is the inverse of division

$$\frac{60}{10} \div \frac{20}{10}$$

$\frac{60}{10} \times \frac{10}{20}$ you reduce by cancelling.

3 × 1= 3

Example 2

Divide

0.036 ÷ 0.4

0.036 ÷ 0.4 first change to fractions

$\frac{36}{1000} \div \frac{4}{10}$ write the second fraction in reciprocal which also changes the sign.

$\frac{\cancel{36}\,9}{100\cancel{0}} \times \frac{\cancel{10}\,1}{\cancel{4}\,1}$ Cancel and reduce.

$\frac{9 \times 1}{100 \times 1} = \frac{9}{100}$ you write it in decimal form.

= 0.09

Exercise

Workout the following;

1. 0.2 ÷ 0.6
2. 1.8 ÷ 2.4
3. 0.25 ÷ 0.5
4. 0.144 ÷ 0.12
5. 3.2 ÷ 0.8

Lesson 7: Mixed operation of Multiplying and dividing of decimals

In this lesson you will;

- Multiply and divide decimals in the same numbers
- solve problems involving division and multiplication of decimals

You will need;

-A pen, book, Counters e.g sticks

Introduction

In primary five you learnt about multiplying of wholes by fractions. In this lesson you are going to learn about multiplying and dividing decimals in the same number.

Step 1

Example 1:

1. $\frac{0.6 \times 0.3}{0.9}$

First you change/ write the decimals as fractions.

$$\frac{6}{10} \times \frac{3}{10} \div \frac{9}{10}$$

Then multiply by the reciprocal of the divisor.

$$\frac{6}{10} \times \frac{3}{10} \times \frac{10}{9}$$

After you reduce and cancel diagonally.

$\frac{\cancel{6}\,2}{10} \times \frac{\cancel{3}\,1}{\cancel{10}\,1} \times \frac{\cancel{10}\,1}{\cancel{9}\cancel{3}\,1} = \frac{2 \times 1 \times 1}{10 \times 1 \times 1}$

$\frac{2}{10}$ = 0.2 (remember to change the fraction $\frac{2}{10}$ back to decimal)

Exercise

Try out these numbers.

1. $\frac{0.4 \times 0.2}{0.8}$

2. $\frac{1.2 \times 0.8}{0.4 \times 0.6}$

3. $\frac{0.24 \times 0.6}{0.2}$

4. $\frac{0.25 \times 0.4}{0.05}$

5. $\frac{1.5 \times 0.6}{0.9}$

RATIO AND PROPORTION

Lesson 1: Comparing quantities using ratios

In this lesson you will;

-Express ratios as fractions

- solve problems involving ratio.

You will need;

-A pen, book

Introduction

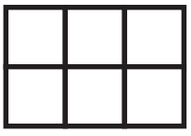
A ratio is a comparison of two quantities by division.Ratios help learners to compare values and tell us how much of one thing there is compared to another. In this lesson we are going to compare quantities using ratios.

Step 1: Activity

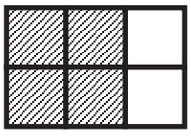
(a) Draw a rectangle in your book.



(b) Divide into 6 equal parts.



(c) Shade 4 parts



How many parts are not shaded?

You note that there are 2 parts which are not shaded.

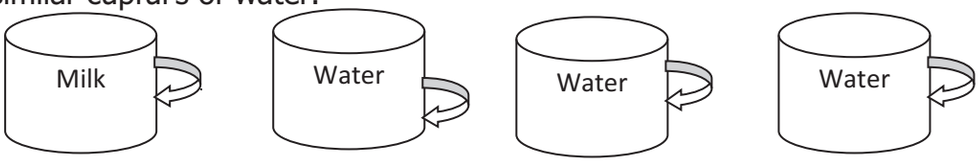
So the ratio of shaded to unshaded fraction is 4:2

Step 2

Let us look at examples

Example 1:

Tea is made by mixing milk and water so that for every cupful of milk, there are three similar cupful's of water.



1 3

So the ratio of milk to water in the tea is one to three written as 1 : 3

The ratio is <u>1.3</u>

Example 2

Tom has 8 pens and Bob has 12 pens. What is the ratio of Tom's pens to Bob's pens?

Tom to Bob

8 : 12 here you can reduce

8 : 12 you divide each number in the ratio by 4.

$\frac{\cancel{8}\,2}{\cancel{4}\,1} \div \frac{\cancel{12}\,3}{\cancel{4}\,1}$

2 : 3 to the lowest terms.

.: <u>Ratio is 2 : 3</u>

Example 3

Express 20cm as a ratio of 1m.

Here you first change the units to make them uniform

20cm : 1m

You know that 1m = 100cm

20cm : 1m will change to 20cm : 100cm

20cm : 100cm

20 : 100

Then you reduce each number in the ratio by 100.

$$\frac{20}{100} : \frac{100}{100}$$

$\frac{\cancel{20}}{\cancel{100}} : \frac{\cancel{100}}{\cancel{100}} = 2 : 10$

Exercise

Find the ratio of the following;

a. 1 week to 14 days
b. 2m to 600cm
c. In a village 30 farmers grow maize and 15 grow carrots. What is the ratio of farmers who grow maize to farmers who grow carrots?
d. There were 16 girls and 20 boys in a meeting. Express this in ratio form.

Lesson 2: Expressing ratios as fractions

In this lesson you will;

- Express ratios as fractions.
- Read and write ratios

You will need;

A pen, book

Introduction

Ratios are also fractions. To write a ratio as a fraction, the first term is the numerator and the denominator the second term. Ratios are important because they help us to understand the idea of order when dealing with things.

Step 1

Examples

1. The ratio of boys to girls in a home is 3 : 5. Express this as a fraction.

   Boys : girls

   3 : 5 remember your first term is the numerator and second term is denominator.

   $3 : 5 = \frac{3}{5}$

2. 2 : 3 of a garden is planted with bananas. Express this as a fraction.
   2 : 3 = $\frac{2}{3}$

Exercise

Express the following ratios as fractions;

1. 3 : 7
2. 5 : 9
3. 15 : 12
4. The ratio of men to women in a home is 1 : 4. Express this as a fraction.
5. Ratio 8 : 12 of bread eaten in the morning. Write it in a fraction form.

Lesson 3: Increasing and decreasing quantities using ratios

In this lesson you will;

-Increase the given quantities using ratios.

-solve word problems involving ratios

You will need;

A pen, book

Introduction

To increase or decrease a given quantity in a given ratio, change the given ratio to a fraction then multiply by the given number.

Step 1

Study these examples

Example 1

Increase 400/= in the ratio 3 : 2

3 : 2

? : 400

2 parts represent 400/=

1 part $\rightarrow \frac{400}{2}$

3 parts $\rightarrow \frac{400}{2} \times 3$ here you divide then multiply

$$\frac{\cancel{400}\ 200}{\cancel{2}\ 1} \times 3$$

Shs (200 x 3)=Shs. 600

Example 2

The price of beans decreased in the ratio of 2 : 3. If the old price of the beans was 2,400/= a kg, find the new price of beans.

New : Old

2 : 3

? : 2400/=

3 parts → 2400

1 part $\rightarrow \frac{2400}{3}$

2 parts → $(\frac{\cancel{2400}\ 100}{\cancel{3}\ 1} \times 2)$

800 x 2=shs. 1600

Exercise

1. Increase shs. 600 in the ratio 5 : 4
2. Increase 800kg of beans in the ratio 5 : 8
3. Kalu's salary of shs. 140,000 increased in the ratio of 2 : 1. Find his new salary.
4. Decrease 120 in the ratio 2 : 3.
5. Decrease 700 in the ratio 7 : 10.
6. Sarah's salary of shs. 9000 was decreased in the ratio 5 : 6. Find her new salary.

Lesson 4: Applying inverse proportion to solve problems

In this lesson you will;

- Apply inverse proportion.
- Workout problems

You will need;

A pen, book, counters like sticks, stones.

Introduction

There are times when they tell you to do something at home like washing clothes. Other times your friends can help you to wash and you complete faster the work in

little time.In this lesson we are going to look at inverse proportion. Inverse proportion will help you to find the time needed by someone to do something.

Step 1

Let us look at these examples.

Example 1

4 women can dig a field in 6 days. How long will 8 women take to do the same piece of work at the same rate?

4 women take 6 days

1 woman takes (more days)

8 women take (less days than 1 woman)

$$\frac{24}{8}$$

$\frac{\cancel{24}\,3}{\cancel{8}\,1}$ divide

3 days

Example 2

5 people can do a piece of work in 6 days. How many days will 10 people take to do the same piece of work?

5 people take 6 days

1 person → (6 x 5)

10 people → $(\frac{6 \times 5}{10})$

$= \frac{6 \times 5}{10}$

$= \frac{\cancel{30}\,3}{\cancel{10}\,1}$

= 3 days

Exercise

1. Five men take 8 hours to build a hat. How long will 2 men take to build the same hat?
2. 6 people can dig a piece of land in 5 days. How many people can do the same piece of work in 10 days?
3. 12 men can repair a road in 5 days.
   a. How long would 10 men take to do the same work?

b. How many men would be required to finish the job in 3 days?

4. 12 girls can sow a garden of millet in 15 days. How many more girls will be required to do the same piece of work in 9 days?

PERCENTAGES

Lesson 1: Lesson 1: Expressing fractions as percentages

In this lesson you will;

- Define percentages
- Express fractions as percentages.

You will need;

A book, pen, ruler

Introduction

A percentage is a fraction whose denominator is 100.The symbol for percentage is %.For finding percentage we should have a number which is always out of 100. The fraction which is not out of 100 should be multiplied by 100 to make it a percentage.In this lesson you are going to express fractions as percentages.

Learning about percentage will help learners to understand the financial aspects of everyday life.

Step 1

Look at these examples.

Example 1

Write $\frac{3}{4}$ as a percentage.

$\frac{3}{4} \times 100$ multiply by 100

$\frac{3}{4} \times 100\%$reduce

$$\frac{3}{4\,1} \times \cancel{100}\%\ 25$$

3 x 25%=75%

Example 2

Express $1\frac{1}{2}$ as a percentage.

$= \frac{3}{2} \times 100\%$

$= \frac{3}{\cancel{2}\,1} \times \cancel{100}\%\ 50$

= (3 x 50%)

=150%

Exercise

Change the following to percentages;

1. $\frac{1}{5}$
2. $\frac{2}{8}$
3. $\frac{7}{25}$
4. $\frac{5}{10}$
5. $\frac{4}{5}$
6. $\frac{16}{20}$

Lesson 2: Expressing percentages as fractions

In this lesson you will;

- Express percentage as fractions.
- Read and write fractions

You will need;

A pen, book

Introduction

Expressing percentages as fraction we divide the percentage by 100. Learning about percentage as fractions will help you to learn how to convert your marks scored to fraction form.

Step 2

Look at the examples below;

Example 1

Change 35% as a fraction.

$35\% = \frac{35}{100}$

$= \frac{\cancel{35}\ 7}{\cancel{100}\ 20}$

$\therefore 35\% = \frac{7}{20}$

Example 2

Write $12\frac{1}{2}\%$ as a fraction.

$\frac{12 \times 2 \times 1}{2} = \frac{24+1}{2} = \frac{25}{2}$

$= \frac{25}{2} \div 100$

$= \frac{\cancel{25}\ 1}{2} \times \frac{1}{\cancel{100}\ 4}$

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

$= \frac{1}{8}$

Exercise

Change the following percentages as fractions.

1. 40%
2. 19%
3. 60%
4. $33\frac{1}{3}\%$
5. 95%
6. 170%
7. $16\frac{2}{3}\%$
8. 124%

Lesson 3: Expressing quantities as percentages

In this lesson you will;

- Express quantities as percentages
- Read and write quantities

You will need;

A pen, book

Introduction

To express one quantity as a percentage of another, make sure that both quantities are expressed in the same units. Learning about this will help you to compare values, the amount of change over time.

Step 1

Look at these examples.

Example 1

Express 15 as a percentage of 20.

Here you first write a fraction $\frac{15}{20}$

Then multiply by 100%

$= \frac{15}{\cancel{20}\ 1} \times \cancel{100}\ 5$

$= 15 \times 5\%$

$= 75\%$

Example 2

Express 40cm as a percentage of 1 metre.

You know that 1m = 100cm

The units have to be the same.

$\frac{40cm}{100cm} \times 100$

$\frac{40}{\cancel{100}\ 1} \times \cancel{100}\ 1 = 40\%$

Exercise

1. Express 35 as a percentage of 70.
2. What percentage of 25 is 10?
3. Express 250g as a percentage of 1kg
4. Out of 40 pupils who did a test, 12 passed. What percentage of the pupils passed?
5. Express 72 objects as percentage of 1 gross of objects.

Lesson 4: Increasing and decreasing quantities by percentages

In this lesson you will;

- Increase quantity
- Decrease quantity

You will need;

An exercise book, pen

Introduction

In this lesson we are going to look at how to increase or decrease a number by a certain percentage. Learning about increasing or decreasing quantities by percentage will help you to learn how to work out numbers using percentage increase and decrease.

Step 1

Look at these examples.

Example 1

Increase 800/= by 20%

New number = 100% + given %

100% + 20%= 120%

$\frac{120}{\cancel{100}\ 1} \times \cancel{800}$= 120×8

= 960/=

Example 2

Decrease 5,000/= by 40%

100% - 40% = 60%

60% of 5000/=

$$\frac{60}{\cancel{100}} \times 50\cancel{00}$$

60×50=<u>3,000/=</u>

Exercise

1. Increase 40 eggs by 40%
2. Increase 1,800/= by 20%
3. Increase 1000 by 20%
4. Increase 60,000 by $33\frac{1}{2}\%$
5. Decrease 400/= by 10%
6. Decrease 3600 by $12\frac{1}{2}\%$
7. Decrease 12,000/= by 10%.
8. Decrease 900 by 16%

Lesson 5: Finding percentage increase or decrease

In lesson you will;

- Find percentage increase or decrease.

You will need;

A pen, book

Introduction

In this lesson we are going to look at finding percentage increase or decrease of different numbers. Percentage increase or decrease helps us to learn how to compare numbers.

Step 1

Look at these examples

1. The number of pupils increased from 200 to 250 this year. Calculate the percentage increase.
   The increase = 250 – 200
   = 50
   % increase = $\frac{Increase}{Original\ number} \times 100\%$
   = $\frac{\cancel{50}\ 25}{\cancel{200}\ 1} \times 1\cancel{00}$
   = 25%
2. By what percentage was 800 decreased to 400?
   Decrease = 800 - 400
   = 400
   % decrease = $\frac{decrease}{Original\ number} \times 100\%$
   = $\frac{400}{\cancel{800}} \times 1\cancel{00}$
   = $\frac{\cancel{400}\ 50}{\cancel{8}\ 1}$
   = 50%

Exercise

1. By what percentage will 700 be increased to 770?
2. By what percentage will 1440 be decreased to 1152?
3. A worker's salary was increased from shs. 15,000 to shs. 18,000. What percentage was the salary increased?
4. When 800 is decreased it becomes 750. Calculate the percentage decrease.

Lesson 6: Finding percentage profit and loss

In this lesson you will;

- Define profit and loss.
- Find percentage profit and loss.

You will need;

A pen, book

Introduction

Profit is that extra money a trader gets after selling goods at a higher price than he bought.**Loss** is realized when a trader sells goods at a lower price than he/she bought them.In this lesson you are going to look at finding percentage profit and loss. Learning about percentage profit and loss will help you know how to bargain when buying items.

Step 1

Look at these examples.

Example 1:

A man bought a pair of shoes for shs. 5,000 and later sold it for shs. 6,500. Find his percentage profit,

Profit = selling price – buying price

6,500 – 5,000= Shs. 1,500

Percentage profit $= \frac{Profit}{Buying price} \times 100\%$

$= \frac{\cancel{1500}\,30}{\cancel{5000}\,1} \times 1\cancel{00}$

= 30%

Example 2

Zuma bought a jumper for shs. 20,000 and sold it for shs. 15,000. Calculate Zuma's percentage loss.

Loss = buying price – selling price

20,000 – 15,000= 5,000

Percentage loss = $\frac{loss}{Buying\ price} \times 100\%$

$= \frac{\cancel{5000}\,25}{\cancel{20000}\,1} \times 1\cancel{00}\,1$

= 25%

Exercise

1. A radio was bought at shs. 25,000 and sold it making a profit of shs. 5,000. Find the percentage profit.

2. Grace bought a skirt at shs. 15,000 and sold it shs. 12,000. Find Grace's percentage loss.
3. Calculate the percentage profit if an article was bought at shs. 1,000 and sold at shs. 1,300.
4. A cow was bought forshs. 440,000 and sold shs. 420,000. Calculate the percentage loss.

Lesson 7: Finding simple interest

In this lesson you will;

- Define principal, rate and time.
- Find interest

You will need;

A book, pen

Introduction

In the banking system, when one saves money in the bank, the bank pays an interest. If one borrows money from a bank, the bank charges an interest.

The amount of money saved or borrowed is the Principal (P).Rate is the percentage offered either yearly /per annum or monthly.Time can be in years, months, or weeks.

Learning about simple interest will help you to learn how to bank, save and borrow money.

Step 1

To get simple interest, we multiply the principle by rate and time.

Simple interest = Principal x Rate × Time

Here are some examples.

1. Calculate the simple interest on shs. 190,000 at a rate of 4% p.a for 2 years.
   Interest (I) = Principal x Time x Rate
   I = P X T X R
   = 190000 x 2 x $\frac{4}{100\ 1}$
   = 1900 x 8
   = 15,200/=
2. Find the simple interest on shs. 100,000 kept in the bank for 6months at 5% per annum.
   S I = P X T X R
   = 100,000 X $\frac{6}{12}$ X $\frac{5}{100}$ (You note that we divide the 6 months by 12 to get years)
   500 X 5= 2,500/=

Exercise

1. What interest is paid on a loan of shs. 80,000 at a rate of 10% p.a for 2 years?
2. Calculate the simple interest for shs. 50,000 at a rate of 15% for 2 years.
3. Brian borrowed shs. 3,000,000 from the bank for 2 years at a rate of 15% per annum. How much interest did she pay?
4. Calculate the interest for 6000 for 3 years and 8 months at a rate of $2\frac{1}{2}$% p.a.
5. Find the simple interest on shs. 50,000 for 5 years at 10% per year.

TOPIC: DATA HANDLING

Lesson 1: Finding range, mode and median

In this lesson you will;

-Find the range, mode, median.

-tally numbers

You will need;

-A pen, book

Introduction

In this pandemic of COVID-19 Mathematics has helped us to know the country with the highest number of corona virus patients in the world. Learning about data handling will help us to be more organized in life.

Step 1

The government of Uganda has produced and also distributed face masks to its citizens around Uganda in addition to food distribution.

Step 2

Now try out examples.

Akello asked her friends the number of people living in their home. she obtained the data below;

2	5	7	3	2	4	7	6	3	6
4	7	5	7	6	8	7	8	5	6

(a) Find the range

Here subtract the highest from the lowest number.

Range = highest – lowest

8 – 2 = 6

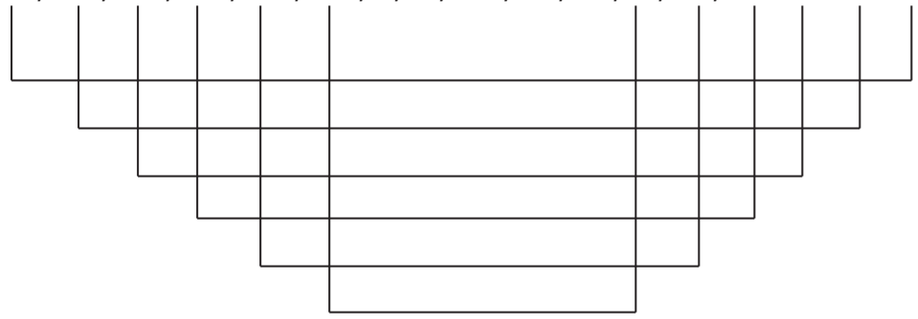
(b) Finding Mode

To find the mode, look at the number with the most common number of people or many people**. <u>Mode is 7</u>**

Finding Median

To find the median you arrange the number of people (data) in either ascending or descending order andpair from both sides until when you remain with the middle number.

2 , 3 , 3 , 4 , 4 , 5 , 5 ,6 ,6 , 7 , 7 , 7 , 7 , 7 , 8



You have remained with 2 numbers.

Here you add both numbers and divide them by 2.

Median = $\frac{6+6}{2}$

$\frac{12}{2}$= 6

Exercise

The following record shows the age in years of all your classmates.

12 14 12 16 15 13 14 18 19 12 14 15 16

a. Use tallies to organize the data.
b. Find the range.
c. Find the mode.
d. Find the median.

Lesson 2: Finding the frequency, range and average

In this lesson you will;

- Find frequency, range and average.
- Tally numbers

You will need;

-A book, pen, Counters, beans

Introduction

Frequency means a number of times a response occurs.**Average** is got by adding the numbers in a set and dividing their sum by the number of addends.In this lesson you are going to look at range, mean and frequency.

Step 1: Now these are examples.

1. The data below shows marks scored by pupils in an interview.

90	40	60	80	60
60	80	90	60	80

a. Find the frequency using tallies.

Marks	Tallies	Number of pupils (frequency)
40	*I*	1
60	*IIII*	4
80	*III*	3
90	*II*	*2*

b. Find range.

Range = highest – lowest

= 90 – 40

= 50

c. Find the average.

Average or mean = $\frac{total\ marks}{\text{Number of pupils}}$

$$\frac{(40 + 60 \text{ x } 4 + 80 \text{ x } 3 + 90 \text{ x} 2)}{1+4+3+2} = \frac{70\cancel{0}}{1\cancel{0}}$$

= 70

Exercise

1. The table below shows tourists who visited one of the game parks in a certain year.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No. of tourists	30	25	24	36	30	54	66	40	30	25	25	23

a. Use tallies to find the frequency.

b. Find the range.

c. Calculate the average number of tourists that visited Uganda that year.

Lesson 3: Interpreting line graphs

In this lesson you will;

- Interpret graphs.
- Read and answer questions.

You will need;

-A pen, pencil, book, ruler

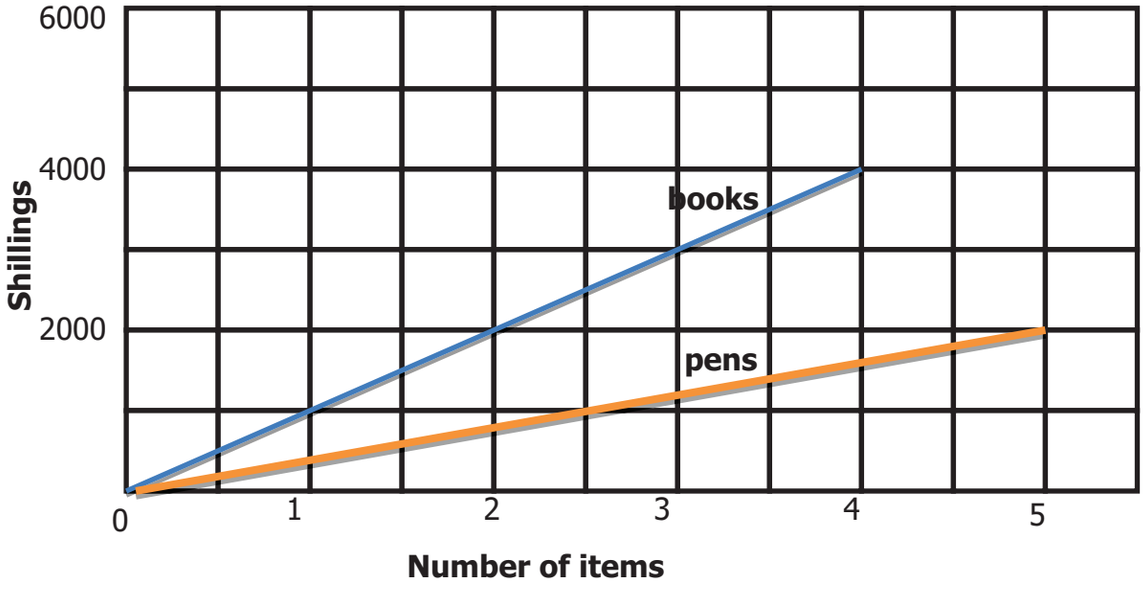
Introduction

Line graph is a graph that uses line segments to show changes in data.A graph should have a title, vertical and horizontal axes.In this lesson you are going to look at line graphs and how to interpret them.

Step 1

Example

The graph below shows the cost of exercise books and pens.

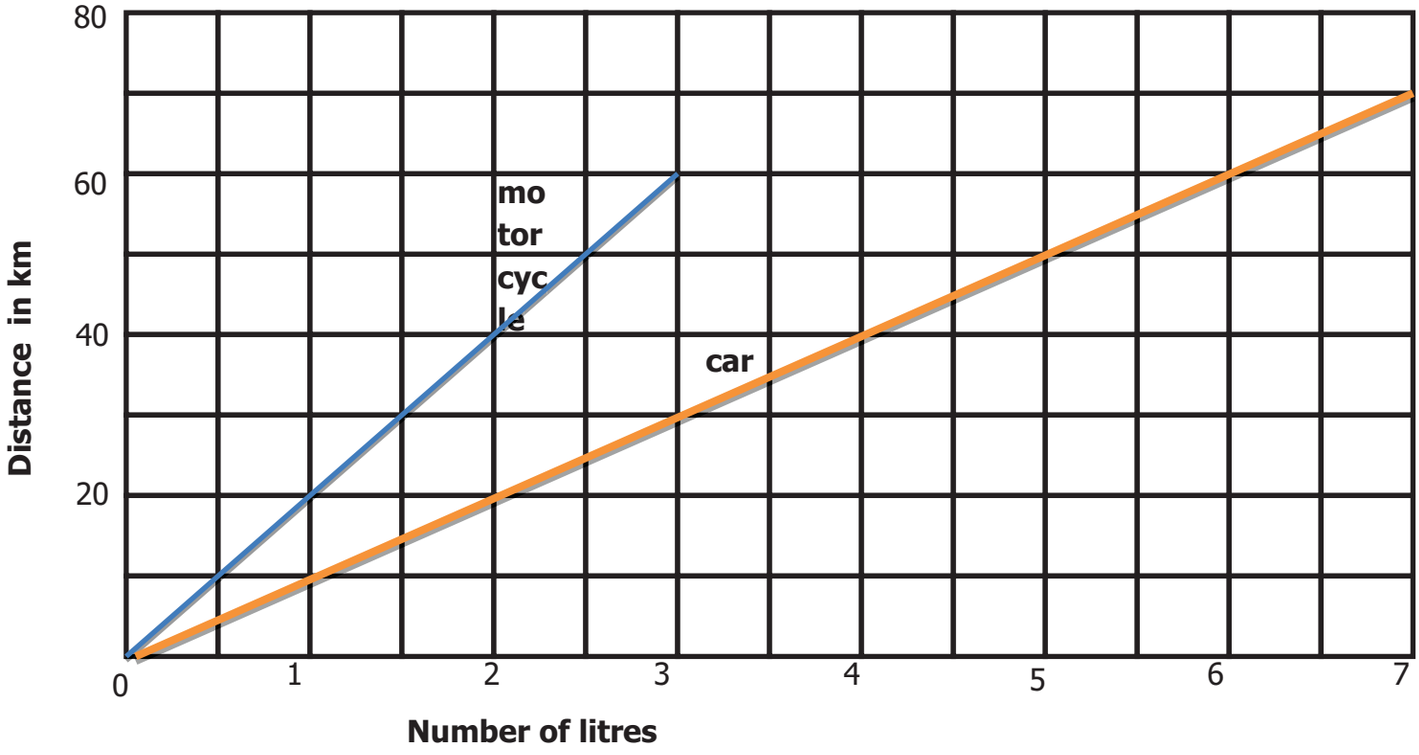


1. What is the cost of each book? **1 book costs 1000**.
2. How much is 1 pen? **1 pen costs Shs. 400**.
3. How many pens does one buy with 2,000 shillings?
   5 pens
4. How much will one spend on buying 2 exercise books?

   sh. 2,000

Exercise

The graph shows litres of fuel consumed by a motorcycle and a car through a certain distance.



a. How many km does the car travel on 1 litre of fuel?
b. What distance can the motor cycle cover on litre of fuel?
c. How many litres of fuel does the car need to cover 60 km?
d. What distance can the motorcycle cover on 3 litres of fuel?

Lesson 4: Drawing pie charts

In this lesson you will;

- Define pie chart
- Draw pie chart

You will need;

-A pen, pencil, book, ruler, protractor

Introduction

Pie chart is a graph that displays portions of data collection as part of a circular region. The graph represents 100%. Each section of the graph tells you what percent of the total is represented. Learning about pie charts will help you to see a data comparison at a glance to make an immediate analysis or to understand information quickly.

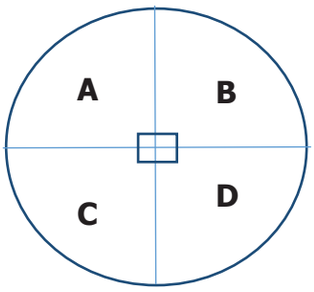
The parts are often labeled using fractions, percentages and degrees. In this lesson we are going to draw pie charts.

Step 1: Activity

- Using a pair of compasses draw a circle
- Draw two diameters in your circle bisecting (crossing) each other (remember a diameter goes through the centre.
- Measure each of the centre angles (angles formed by the crossing lines using a protractor.
- Work out the sum of all these angles measured. Note that if a pie chart is divided equally each portion is the same. Each portion in this measures 90 °
- You notice that the sum is 360°. Therefore, the angle sum of a circle graph is 360°
- This can also be represented as a percentage of the pie chart. All portions therefore will add up to 100%. Each portion in this case will be 25%

Solution

A+B+C+D = 90 °+90+ °90 °+90 °= 360⁰



Step 2:

Example 1

1. $\frac{1}{4}$of Peter's shirts are torn, $\frac{1}{3}$ of them are dirty and $\frac{5}{12}$ are clean.

a. Draw a pie chart showing the above information.(Use a radius of 4cm)
First you express the fractions to degrees by multiplying by 360°.

Shirt	Degrees
Torn shirts	$\frac{1}{\cancel{4}\,1} \times \cancel{360}\ 90$
	= 90°
Dirty shirts	$\frac{1}{\cancel{3}\,1} \times \cancel{360}\ 120$
	= 120°
Clean shirts	$\frac{5}{\cancel{12}\,1} \times \cancel{360}\ 30$
	= 150°

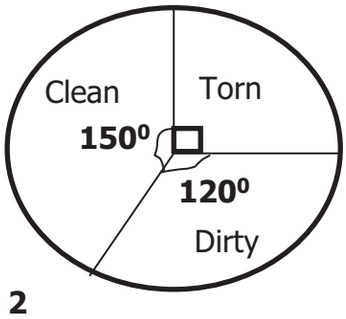
Remember the sum of all degrees should be 360°.

Now draw a circle and use a protractor to measure the angles.

(a) Measure 90°

(b) Measure 120°(Start from 90°, it is where you place zero mark)

(c) The remaining angle is 150°



Example 2

In Primary six class, there are 10 pupils who are twelve years old, 12 who are thirteen, 8 who are fourteen and 6 who are fifteen years old. Use the given data to draw a pie chart representing each age group.

First get the total number of all pupils.

10+12+8+6 = 36 pupils.

Twelve years = $\frac{10}{\cancel{36}\,1} \times \cancel{360}\ 10$

= 10x10 = 100°

Thirteen years = $\frac{12}{\cancel{36}\,1} \times \cancel{360}\ 10$

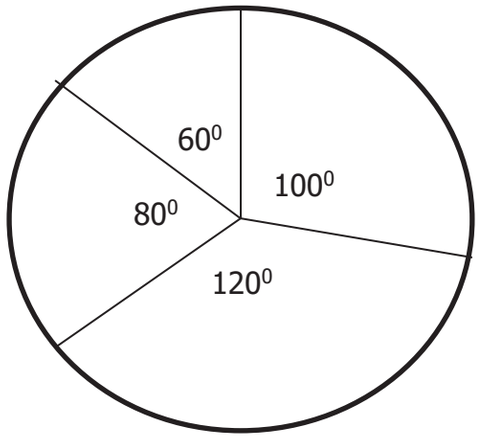
= 12x10 = 120°

Fourteen years = $\frac{8}{\cancel{36}\,1} \times \cancel{360}\ 10$

= 8x10 = 80°

Fifteen years = $\frac{6}{\cancel{36}\,1} \times \cancel{360}\ 10$

6x10 = 60°



Exercise

1. $\frac{6}{20}$of the exports of our country is cotton, $\frac{1}{2}$ is coffee and $\frac{1}{5}$ are flowers. Use the above information to draw a pie chart. (Use a radius of 3.5cm)
2. The following information was recorded by pupils.

Colour of car	Red	Blue	Green
Number of cars	18	9	3

Construct a pie chart for the data. (Use a radius of 5cm)

Lesson 5: Interpreting data on pie charts

In this lesson you will;

- Interpret data
- Work out problems

You will need;

A pen, pencil, book, ruler, protractor

Introduction

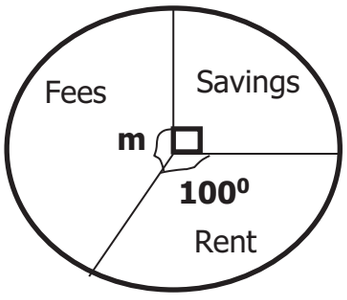
Pie charts can be constructed from given fractions, percentages or data. When interpreting data on pie charts we use the same knowledge as the one we learnt in drawing pie charts.

This will help you to learn how to organize data in order to see the size of components relative to the whole.

Step 1

Look at these examples.

1. The pie chart below shows how a man spends his monthly income of 72,000/=



a. How many degrees represent school fees?
$M+90^O+100^O = 360^O$ (sum of centre angles).
$M+190^O = 360^O$
$M+190^O-190^O = 360^O-190^O$
$M = 170^O$

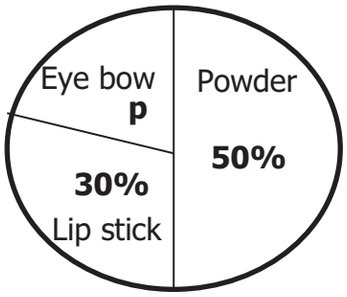
b. How much does he spend on rent?
Rent = $\frac{100}{\cancel{360}\ 1} \times \cancel{72000}\ 200$
= 100×200
= 20,000/=

c. How much more does he spend on rent than savings?

Rent	Savings	
$= \frac{100}{\cancel{360}\ 1} \times \cancel{72000}\ 200$	$= \frac{90}{\cancel{360}\ 1} \times \cancel{72000}\ 200$	.: 20,000
(subtract)		
= 100×200	= 90x200	- 18,000
= 20,000/=	= 18,000/=	02,000

He spends 2,000/= more on rent than savings.

2. The circle graph below shows a woman's expenditure.



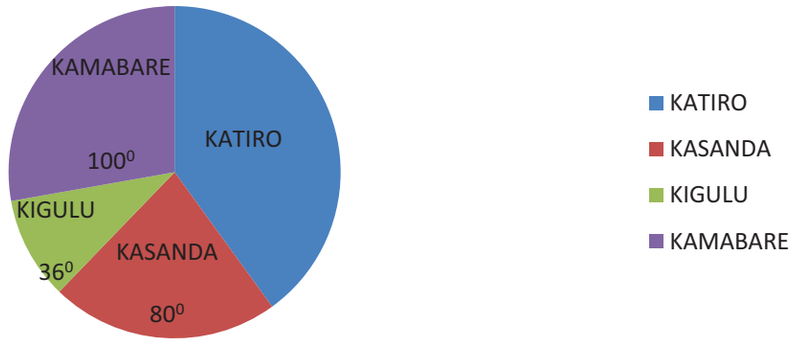
a. Find the value of P.
P+30%+50% = 100%
P+80% = 100%
P+80%-80% = 100%-80%
P = 20%

b. If she spends 36,000/= on lipstick, how much does she earn altogether?
30% represents 36,000/=
1% represents $\frac{36000}{30}$
(Whole salary) 100% represents $\frac{\cancel{36000}\ 12000}{\cancel{30}\ 1} \times 10\cancel{0}$
= 12000x10
= 120,000

c. How much more does she spend on powder than eye bow?
Find the difference in their percentage first.
= 50%-20%
= 30%
30% represents 36000
1% represents $\frac{\cancel{36000}\ 1200}{\cancel{30}\ 1}$
1% represents 1200
So 30% represents 1200x30
= 36,000/=

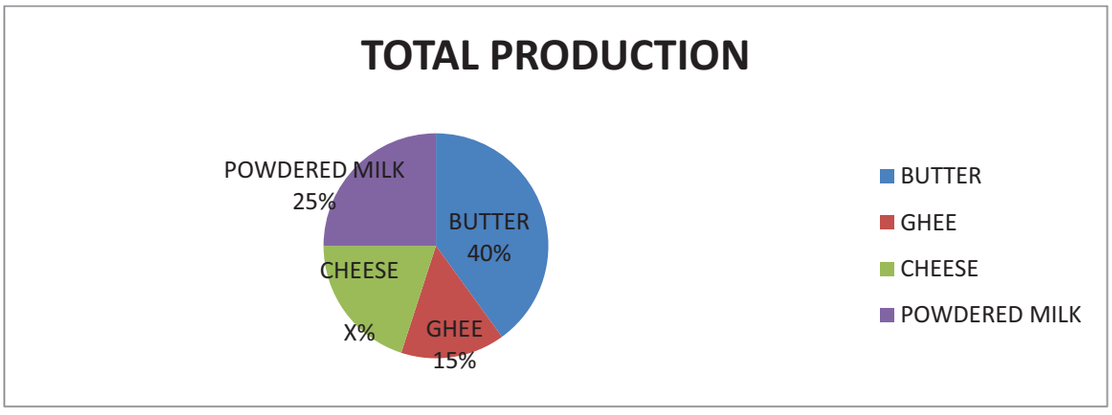
Exercise

1. The pie chart below shows the number of first grades obtained in four schools in P.L.E 2018. Use it to answer questions that follow;



a. Find the degrees that represent Katiro Primary School.
b. If 72 pupils got first grades in the four schools. How many first grades did each school get?

2. The pie chart shows the total production of dairy products in one of the factories. The total production is 18 tonnes in a month.



a. What is the value of X.
b. What fraction of the products was ghee?
c. Find the kilogrammes that were produced for;
(i) Butter (ii) Cheese (iii) Milk powder
d. Express the sector for butter in degrees.

Lesson 6: Finding probability

In this lesson you will;

- Find probability.
- Solve problems

You will need;

-A book, pen, bottle tops

Introduction

Probability is the chance that some event will happen. As you saw in P.5, the probability that anevent will happen is between 0 and 1.

- A probability of 0 means that the event is impossible to happen.
- A probability of 1 means that the event is certain to happen.
- The closer a probability is to 0, the less likely the event is to occur,
- The closer the probability is to 1, the more likely the event is to occur.

In this lesson you are going to look at probability.

Step 1

Example 1

Ann recorded the names of his group mates on cards using initials.

Below was his record;

M	K	N	A	M	A	A	O	M	N	S

a. What is the probability that the card with letter m is picked?

$$\text{Probability} = \frac{\text{Number of expected outcomes (3)}}{\text{Total number of possible outcomes (9)}}$$

$$= \frac{3}{11}$$

b. What is the probability that the card with letter O is picked?

c. $$\text{Probability} = \frac{\text{Number of expected outcomes}}{\text{Total number of possible outcomes}}$$

$$= \frac{1}{11}$$

Example 2

1. A bag contains 2 black balls, 4 red balls and 6 green balls.

   What is the probability of drawing a black ball at a random?

   Total outcomes (chance)

   2+4+6= 12 balls.

   $$P(b) = \frac{\text{Number of black balls}}{\text{Total number of balls}}$$

Probability (black) = $\frac{2}{12}$

Exercise

Study the following letter cards.

E	N	V	I	R	O	N	M	E	N	T

a. What is the probability of choosing letter V?

b. What is the probability of choosing letter E?

c. What is the chance that letter N is picked?

2. There are 8 girls and 7 boys in a group. If a teacher chooses a pupil at random to clean the blackboard, what is the probability of picking a girl?

3. A bag contains 4 red pens, 2 green pens and 3 black balls. What is the probability that;

(i) A red pen is picked (ii) A green pen is picked

(iii) A black pen is picked

TOPIC: MONEY

Lesson 1: Conversion of Currency

In this lesson you will;

- Name currencies for different countries
- Convert Uganda currency to another currency and vice versa

You will need;

- A pen, book

Introduction

Currency is money used by a certain country. Different countries use different currencies (money). We use our local currency to buy other countries currency. In this lesson you are going to convert from one currency to other currencies.

Learning about changing to other currencies will help you to understand exchange rates and how to determine prices in other countries.

Step 1

Look at these examples

1. Given that the exchange rate of United states dollars to Uganda shillings is 1 US dollar = Ugsh. 3650. How much money in Uganda shillings do I have if I have87 US dollars?

   1 US dollar costs 3650/=

   87 US dollars cost = 87 x 3650/=

   = 317,550/=

2. Convert 245000 Uganda shillings to Kenya shillings (Ksh.)if Ksh. 1 = UGX 35.

   Ksh. 1 = UGX 35

   ? = 245000

   Then divide $\frac{245000}{35}$ = Ksh. 7000

Exercise

1. Express Ug shs. 367000 to US dollars. If USD 1 = Ug.sh.3670
2. Find out how much Obbo has in pound sterling when£1 = Ug.sh.4800 if he has shs.240,000.
3. Aine has UGX 255,500. Find how much he has in US dollars if $ 1= Ug.sh.3650.
4. Change UGX 72,000 to Kenya shillings if Ksh. 1=Ug.sh.36

Lesson 2: Exchange Rates

In this lesson you will;

- Interpret exchange rate tables
- Calculate exchange rates

You will need;

-A book, pen

Introduction

In our previous lesson you looked at conversion of currency. In this lesson you are going to learn exchange rates.

Exchanging rates will help learners to know how the banks buy and sell different currencies.

The central bank and foreign exchange Bureaus (Forex Bureaus) are responsible for selling and buying of foreign currency in a given country.

So, when you have foreign currency and you need local currency, the bank buys the foreign currency from you and gives you local currency. This is common when you have returned on a trip from another country.

And when you have local currency and you need foreign currency, the bank sells to you foreign currency. This is common when you wish to travel to another country.

Step 1

Study the table of exchange rate below;

Currency	**Buying**	**selling**
US dollar (US $)	3620	3650
Pound sterling £	4800	4820
Kenya shilling (KSH)	32	35
1 Rwanda Franc (RF)	3.5	4

1. Sonko has 12US dollars how much money in Ugandan shillings does he have?

Since Sonkohas foreign currency, the forex bureau will buy from him

1 US dollar costs 3620/=

12 US dollars cost 12 x 3620/=

= ugsh. 43,440/=

2. Njunga has Ugandan shillings 87500, how much money in Kenya shillings does he have?

Since Njungahas local currency, the forex bureau will sell to him foreign currency

35 Ug sh. buys 1 Ksh.

Ugsh. 87500 Buys $\frac{87500}{35}$

= **Kshs. 2500**

Exercise

The table below sows the buying and selling prices of different currencies at a Ugandan Forex Bureau. Use it to answer questions that follow.

Currency	**Buying**	**selling**
US dollar (US $)	3620	3650
Pound sterling £	4800	4820
Kenya shilling (KSH)	32	35
1 Rwanda Franc (RF)	3.5	4

1. Nabasumba as 19 pounds. How much money does he have in Uganda shillings?
2. Abaayo converted ug.140,000 to Kenya shillings. How much money in Kenya shillings did he get?
3. Convert 7000 Rwanda Francs to Uganda shillings.
4. Adongo has Ug sh. 365,000. How many dollars can she buy?

TOPIC: DISTANCE, SPEED AND TIME

Lesson 1: Changing speed from m/s to km/hr and vice versa

In this lesson you will;

- Change speed
- workout problems

You will need;

-An exercise book, pen

Introduction

In our previous lessons we have already looked at speed. In this lesson we are going to look at changing from m/s to km/hr.

When changing from km/hr to m/s we multiply the distance by 1000 and divide by time which should be in hours.

Step 1

Example 1

Change 10m/s to km/hr.

Km HmDm m dm cm mm
1 0 0 0
1 km = 1000m
60 x 60 = 3600sec = 1 hour
1 sec = $\frac{1}{36000}\ hr$

Speed = $\frac{10}{1000} \div \frac{1}{3600}$

$$\frac{10}{1000} \times \frac{3600}{1}$$

$\frac{10}{5} \times 18$ = 2 × 18
= 36km/hr

Example 2

Express 180 km covered in 2 hours as metres per second.

Since 1 m = 1000 km
1 hr = 3600 sec
First change kilometres to metres,
Hours to seconds then divide distance by time.
To change from km/hr to m/s

$$\frac{Speed\ in\ km/hr}{3600} \text{x } 1000$$

180 km = (180 x 1000)m

2 hours = (2 x 3600)sec

$$\frac{180\ X\ 1000}{2\ X\ 3600} = 5 \text{ X } 5$$

Speed = 25 m/s

Exercise

1. A bus covered a distance at 5m/s. Calculate its speed in km/hr.
2. Express the speed 30m/s to km/hr.
3. Express 54 km/hr to m/s.
4. A cyclist covers a distance of 72 km in 2 hours. Calculate his speed in m/s.

Lesson 2: Drawing a distance – time graph

In this lesson you will;

- Draw and plot time and distance on the graph
- Interpret the graphs
- Solve problems involving time and distance

You will need;

- An exercise book, pen, Pencil, ruler

Introduction

In this lesson you are going to learn about how to draw a travel graph which is also a line graph. Learning about travel graphs will help you to improve on your decision making skills when planning a journey. A travel graph is used to display the distance covered in a given period of time.

Look at these examples;

Example I:

It took 10 minutes for Kato to walk 100m to a friend's house. He stayed for 5 minutes at the friend's house. He then took 5 minutes to walk 1000m to the shop. Use this information to show Kato's movement on a travel graph.

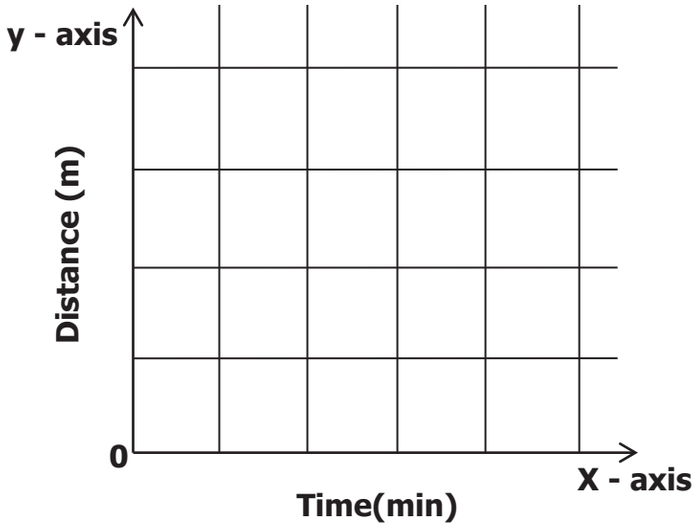
Step 1

Put the information above in a table like this one.

Position	Time (minutes)	Distance(metres)
Home (H)	0	0
Walk to Friends house(F)	10	1000
Stay at friends house	15	1000
Walk to shop(S)	20	2000

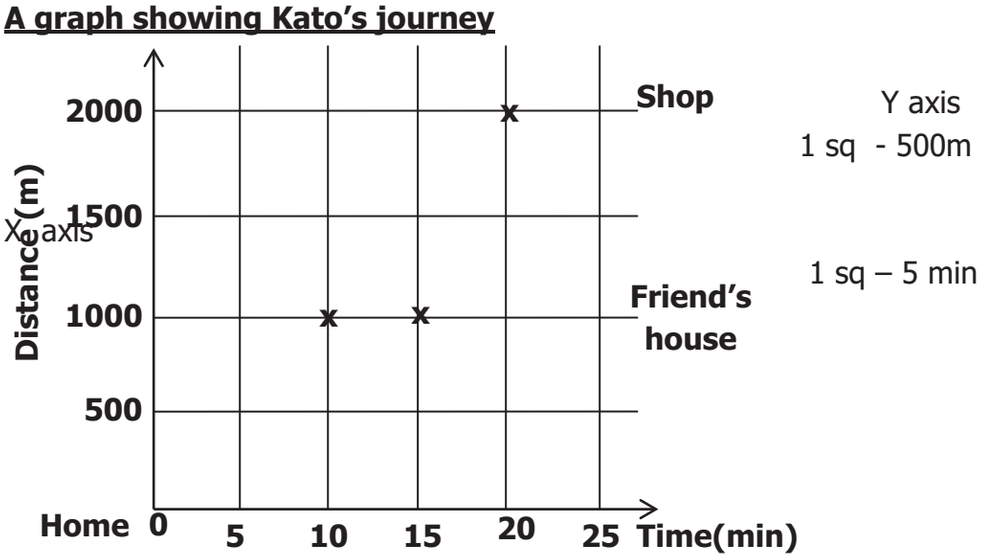
Step 2

Draw a graph with two axes: total time(x axis) and total distance(y axis). Label the axes



Step 3

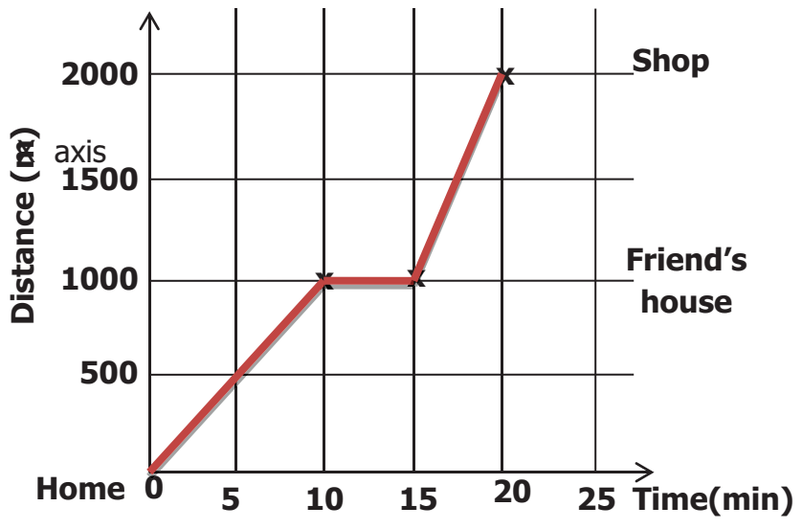
Plot the points from the table. For the walk to friends section of the journey plot a point at 10 on the x axis and 1000 on the y axis(10,1000), then(15,1000) and (20,2000)



Use a scale 1 square to represent 500 m on the vertical axis, and 1 square to represent 5 minutes on the horizontal axis)

Step 4: You now join the plotted points to form Kato's movement/journey

A graph showing Kato's journey



Y axis
1 sq - 500m

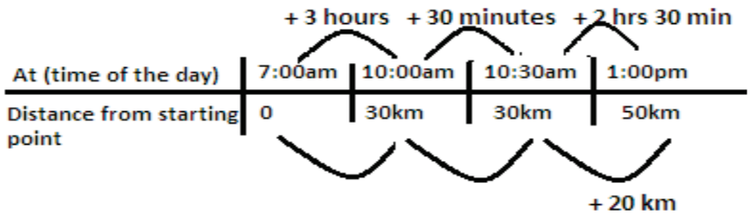
1 sq – 5 min

You notice that your distance time graph will look like the one drawn above.

Example II:

Bwire rode a motorcycle from town P to town R through town Q starting at 7:00am as follows:He rode from P to Q a distance of 30 km in 3 hours and then rested for 30minutes. From Q, he rode to R a distance of 20km in 2 hours and 30 minutes. Show Bwires movement on a travel graph.

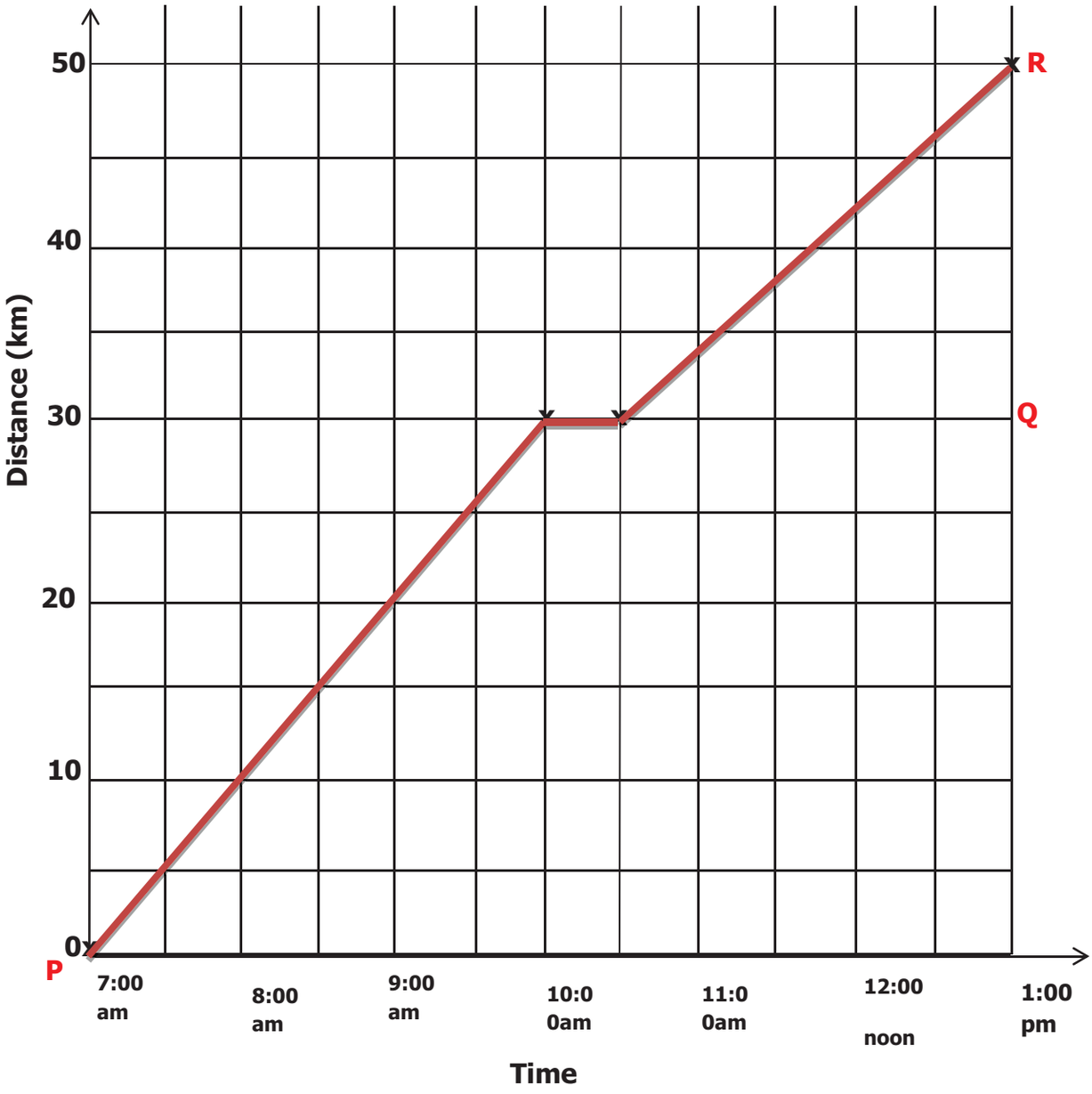
Step 1 Put the information above in a table.



Step 2

Draw a graph with two axes and Plot the points from the table. P (7:00am, 0km), Q (10:00am, 30km), Q (10:30am, 30km),R(1:00pm, 50km

Join the plotted points to form Bwire's movement/journey



You notice that your distance time graph will look like the one drawn above.

Exercise

1. A man left town A at 8:00am and drove at 40km for $1\frac{1}{2}$ hours to town B. He rested for 30 minutes at B. He then continued to C at 50km for 2 hours. Draw a travel graph to show his journey. Scale vertical axis 1 cm sq represents 20km. Horizontal axis 2cm sq rep 1 hour.
2. Nana left his home at 6:00am and walked a distance of 2 km in 1 hour. she rested for 1 hour after which she continued with her journey for 2 hours covering a distance of 3 km. Draw a travel graph to show her journey. (use a scale 2 squares to represent 1 km on the vertical axis, and 2 squares to represent 1 hour on the horizontal axis)

TERM THREE

TOPIC 1: Length, Mass and Capacity

Lesson 1:Circumference of a Circle

In this lesson, you will;

- Give the relationship between diameter and circumference
- Find the ratio of diameter to circumference of a circle.
- Identify Pi

You will need;

- Circular objects of different sizes such as plates, cups, jar lids, jerrycan lids, etc
- A string, ruler, Pen, Note book
- pencil

Introduction:

In this lesson, you will learn how to find perimeter of a circle.The perimeter of a circle is the total distance around a circlecalled**Circumference**.Learning about perimeter helps you to acquire the knowledge of fencing off a plot of land; since fences cost money, you need to know the perimeter of the land buying the materials.

Step 1:

- Trace the outline of a few circular objects of different sizes like a Jerrycan lid, a circular bottle lid, a round bowl or a CD and cut them along their circumference.
- Measure the diameter of each circle by folding it into half.
- To find the circumference, wrap a string around a circular face.
- The length of the string is the circumference of the circular face.
- Then take the string and lay it alongside a ruler to find its length.

Step 2:

- Draw a table in your notebook similar to the one below and write in all the information got in step 1.

Object	Circumference	Diameter	Ratio (C ÷ d)

- Then calculate the ratio of the circumference to the diameter and write that in your table as well.
  (a) What have you discovered about the relationship between circumference and diameter of different objects?

Step 3: You will notice that;

- The ratios are all close to 3 or 3.1 or $\frac{22}{7}$

- If that is true, then you have been able to prove that all the ratios equal a number called **Pi**. Pi is almost equal to **3.14**. Sometimes, $\frac{22}{7}$
- **Pi** is denoted by π

Circumference of a Circle using a formula

Remember the ratio;

$$\frac{Circumference\ (C)}{Diameter\ (d)} = \pi$$

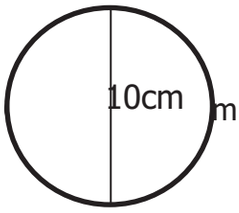
If you multiply diameter on both sides you should have;

$$\frac{C}{d} \times d = \pi \times d$$

This leads us to the formula for circumference which is; **C = πd**

Step 2:Study this example;

1. Find the circumference of the circle whose diameter is 10cm. ($\pi = 3.14$)



C = 3.14 × d

C = 31.4cm

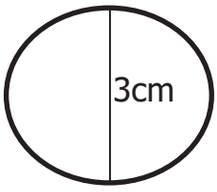
2. Calculate the circumference of circle whose diameter is 7cm. ($\pi = \frac{22}{7}$)

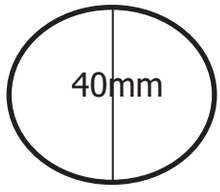
C = πd

$\frac{22}{7} \times 7cm = 22cm$

Exercise:

Find the circumference of these circles.

1. 

2. 

3. The diameter of a circular basin is 40cm. Calculate its circumference.

4. A saucepan is 42dm in diameter. What is the circumference of the saucepan? (Use $\pi = \frac{22}{7}$)

Area

Lesson2: Area of a Parallelogram

In this lesson, you will;

- Derive the formula for finding the area of a parallelogram
- Calculate the area of a parallelogram.

You will need;

- Piece of paper, Pencil, ruler, Pen, Note book

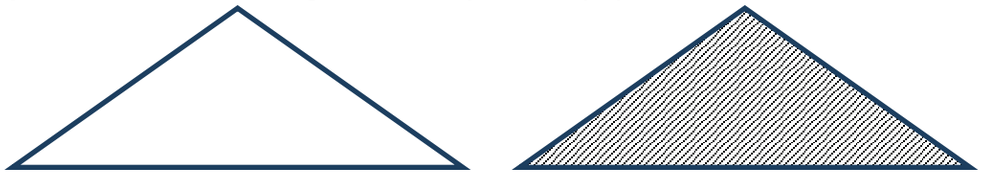
Introduction:

In the P.5 class, you learnt how to find the area of a square, rectangle andtriangle.You will need this knowledge of area of a triangle in this lesson. In this lesson, you will learn howto find the area of a parallelogram.

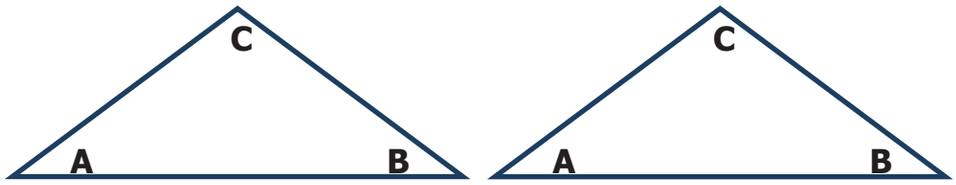
Step 1:

Activity:

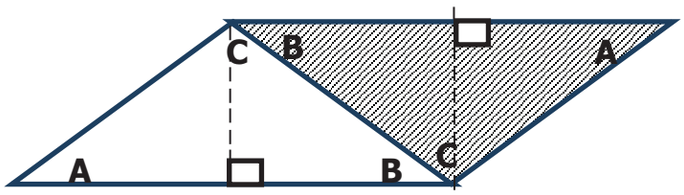
(a) Cut two similar triangles from a piece of paper and shade one of them.



(b) Mark the corners of the triangles with letters as shown below.



(c) Put the triangles together in such a way that side BC of the shaded triangle touches side BC of the unshaded triangle.



Step 2:

- You will notice that two similar triangles will always form a parallelogram.

  Remember that the area of a triangle = $\frac{1}{2} \times b \times h$

- This leads you to the formula for finding the area of a parallelogram;

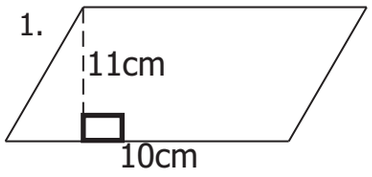
$$\text{Area of a parallelogram} = \text{Area of triangle} \times 2$$
$$= \frac{1}{\cancel{2}} \times b \times h \times \cancel{2}$$
$$= \mathbf{b \times h}$$

Step 3:

Study these examples;

Calculate the area of the parallelogram given below.

1.

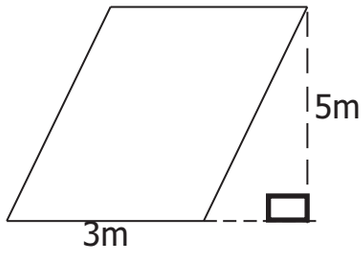


Area = b × h

= 10cm × 11cmArea = b × h

= 110cm²

2.



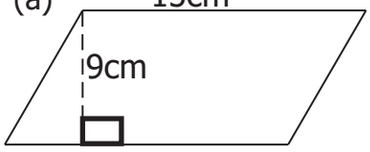
= 3m × 5m

= 15m²

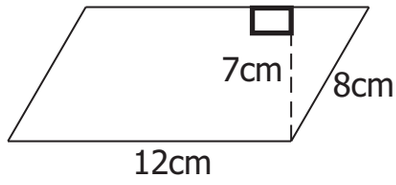
Exercise

1. Work out the area of these shapes.

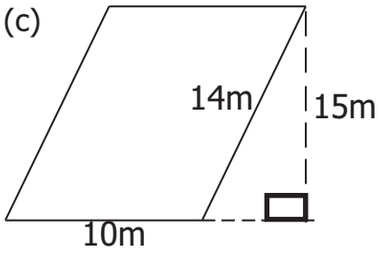
(a)

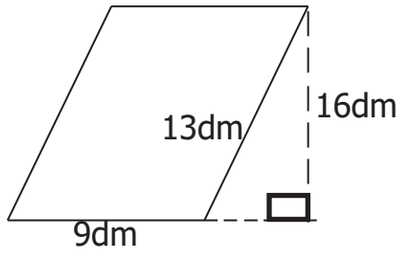


(b)



(c)





2. Find the area of a parallelogram whose base is 12cm and height 20cm.

Lesson 3: Total Surface Area of cubes and cuboids

In this lesson, you will;

- State the formula for finding surface area.
- Find the surface area of a cube and cuboid.
- Give the correct units for surface area

You will need;

- A String
- A ruler
- Pen
- Note book
- pencil

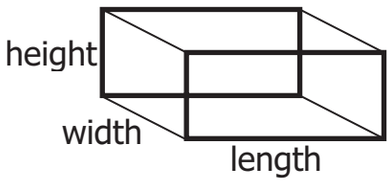
Introduction:

The surface area of an object is the sum of the areas of all its faces. As for other areas, we measure surface area in square units, for example mm^2, cm^2, m^2. In this lesson, you will learn how to find the surface area of a cube and cuboid. Remember, a cube has 6 identical square faces. A die is an example of a cube. A cuboid also has 6 faces, but its faces can be squares and/or rectangles. A matchbox is an example of a cuboid.

Phase 1

Look at the figures below;

Cuboid

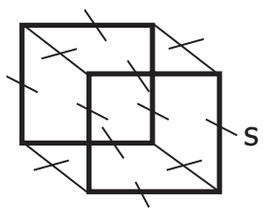


A rectangular box has **6** faces
2faces of **l**ength and **w**idth
2 faces of **w**idth and **h**eight
2 faces of **l**ength and **h**eight

- To Find the surface area;
- Find the Area of each face is given by;
  $2 \times L \times W = 2(L \times W)$
  $2 \times W \times H = 2(W \times H)$
  $2 \times L \times H = 2(L \times H)$
- Then add the area of all the faces

Area of all faces = 2(L W) + 2(W H) + 2(L H)

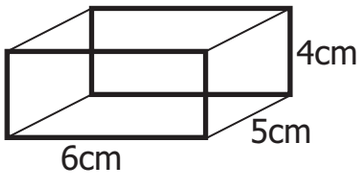
Cube

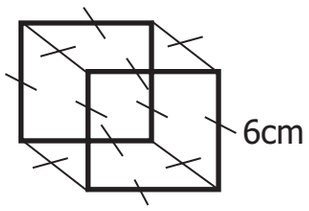


- A cube has all its 6 faces equal.
- Each face is a square.
- Area of each face = $S \times S$
  $= S^2$
- **Area of all faces = $6 \times S^2$**
  $= 6\ S^2$

Phase 2

Find the total surface area of the figures below;





Step I: Find the area of each face

$2(l \times w) = 2(6 \times 5)$

$= 60cm^2$

$2(w \times h) = 2(5 \times 4)$

$= 40cm^2$

$2(l \times h) = 2(6 \times 4)$

$= 48cm^2$

Step 2: Add the area of all the faces.

$60cm^2 + 40cm^2 + 48cm^2 =$ **$148cm^2$**

Step I: Find area of each face

$S \times S = 6cm \times 6cm$

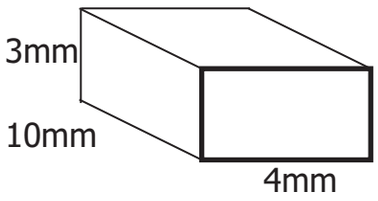
$= 36cm^2$

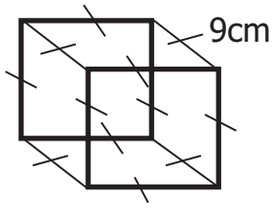
Step 2: Multiply area of each by 6

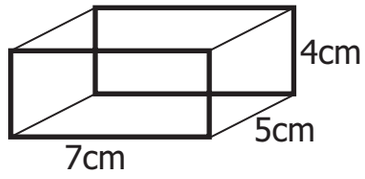
$6 \times 36cm^2 =$ **$216cm^2$**

Exercise:

1. Find the total surface area of the following figures;







2. Find the total surface area of a cube whose side is 14cm.

3. A rectangular tank has a length of 4m, width 3m and height 2m. Find its total surface area.

Volume

Lesson 4: Volume in cubic centimetres

In this lesson, you will;

- Identify the formula and units for volume.
- Apply the formula to find the volume of cubes and cuboids.

You will need;

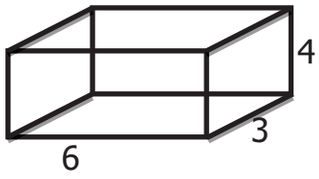
- A ruler, Pen, Note book, pencil

Introduction:

In the previous lesson, you learnt how to find the surface area of a cube and a cuboid. The volume can be expressed as cubic units. Volume is how much of the liquid a container holds. So, in this lesson you will learn how to find volume a cube and a cuboid.

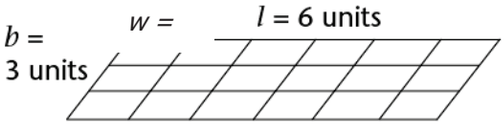
Phase 1

Study the figure below;

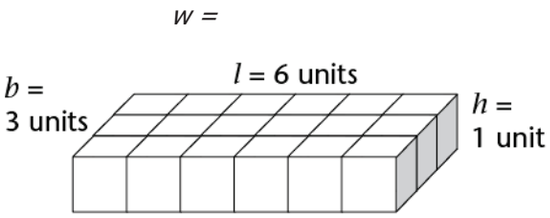


Step 1: Measure the area of the bottom face (also called the base) of the cuboid.

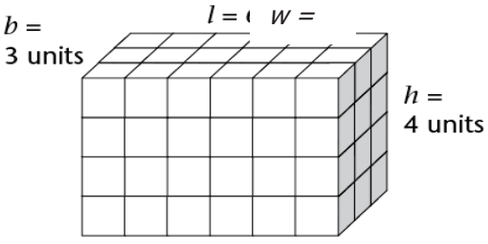
A = l × w = 6 × 3 = 18 squares



Step 2: A layer of cubes, each 1 unit high, is placed on the flat base. The base now holds 18 cubes. It is 6 × 3 × 1 cubic units



Step 3: Three more layers of cubes are added so that there are 4 layers altogether. The cuboid's height is 4 units.



The volume a cuboidis: V = (6 × 3) × 4

Or V = Area of base × number of layers

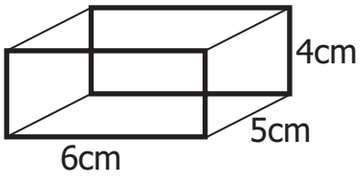
= (l × w) × h

For a cube, V = S × S × S; since it is made of square faces.

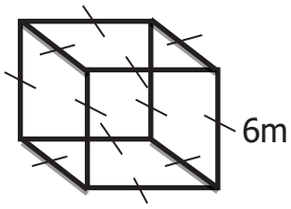
= S^3

Examples:

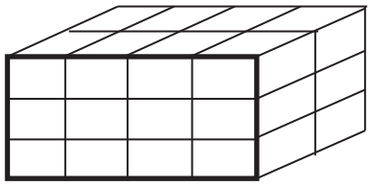
Find the volume of the figures below;



Volume = (base area) × h
= (6 × 5) × 4
= 30 × 4
= 120 cubic cm
OR = 120cm³



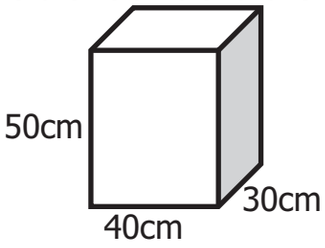
Volume = (base area) × h
= (6 × 6) × 6
= 36 × 6
= 216 cubic m
OR 216m³

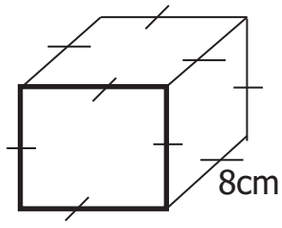


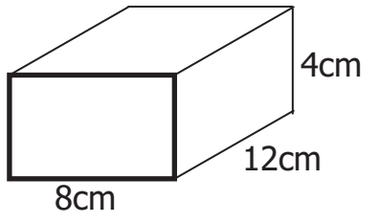
Volume = (base area) × h
= (4 × 2) × 3
= 8 × 3
= 24 cubic units

Exercise

Find the volume of the following figures;







Lesson 5: Volume in litres

In this lesson, you will;

- Change cubic centimetres to litres
- Finds the volume in litres (capacity).

You will need;

- 3 different – sized empty containers e.g. 2litre, 3litre, 5litre and 10litre
- Liquid measuring mugs/cups
- Access to water
- Note book
- Pen
- Pencil

Introduction:

In this lesson you will learn howto find volume in litres. Learning how to find volume in litres will help you both at school and home to estimate the amount of juice a mug, bottle or glass can hold.

Phase 1:Activity

- Set up 3 different-sized containers as shown below.







- Use the liquid measuring mug/cup to fill the containers.

(a) How many mugs/cups filled each container?

- The number of mugs/cups will be different depending on the size of the mug/cup you have used.

(b)What do you observe about the volume of the three containers?

- The containers have different volumes since they are of different sizes.

Phase 2:

Study these examples;

1. Kato, a primary one child was told to fetch a twenty jerrycan of water. He could not lift the jerrycan but had a five litre jerrycan which he could lift without any difficulty.
   (a) What advice would you give to Kato?
   Use the 5 litre jerrycan to fill the 20 litre jerrycan.

   (b) If Kato was to use the five litre jerrycan to fill the twenty litre jerrycan, How many times would he go to the water source?

Solution

(i) - You need to get an empty 20 litre jerrycan and a 5 litre jerrycan.

- Try to fill the 20 litre jerrycan with water using a 5 litre jerrycan.

(ii) You notice that 4 five litre jerrycans of water can fill a 20 litrJerrycan.

So, Kato would go to the water source 4 times.

OR

Let the number of times be **m**

(i) When you multiply the number of times by the 5 litres, you must get the 20 litres needed.

$5 \times m = 20$

(ii) To find m, divide each side of the equation by 5

$5 \div 5 \times m = 20 \div 5$

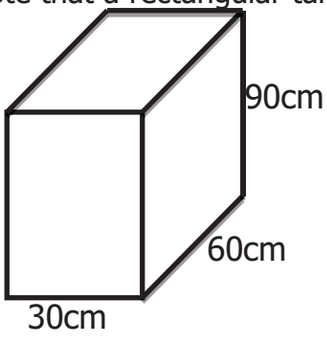
$m = 4$

So, Kato would go to the water source 4 times.

2. A rectangular tank is 30cm by 60cm by 90cm. find its volume in litres.

Solution

(i) Note that a rectangular tank is in the form of a cuboid.



(i) Find the volume of the tank in cm^3.

Volume = L × W × H

= (30 × 60 × 90)cm^3

= 162000cm^3

Recall that 1000cm^3 = 1 litres

(iii) Divide the volume in cm^3 by 1000 to cane it to litres.

Volume in litres = $\frac{162000}{1000}$ litres

= 162 litres

Exercise

1. How many half litre mugs can fill a 15 litre container?

2. Calculate the capacity of the rectangular tanks whose lent, width and height are given below;

Length	Width	height	capacity
40cm	60cm	80cm	
70cm	30cm	50cm	
80cm	30cm	40cm	

3. How many litres are in a rectangular tank 100cm by 90cm by 75?

4. How many litres are in a rectangular tank measuring 80cm by 100cm by 2m?

Topic: Lines, Angles and Geometric Figures

Lesson 1: Construction of perpendicular lines

In this lesson, you will;

- Identify perpendicular lines

- Construct perpendicular lines.
- Use symbols of perpendicular lines.

You will need;

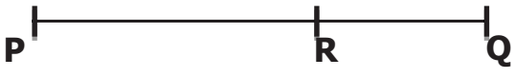
- Geometric instruments, pen, Note book, Ruler, pencil

Introduction:

You noted that perpendicular lines intersect each other at 90^0. In this lesson, you will learn how to construct a line perpendicular using a ruler and pair of compasses to a given line segment.

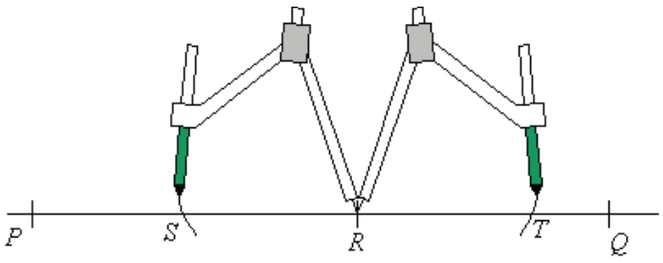
Phase I:Activity

You will constructa line perpendicular to PQ through point R on PQ.



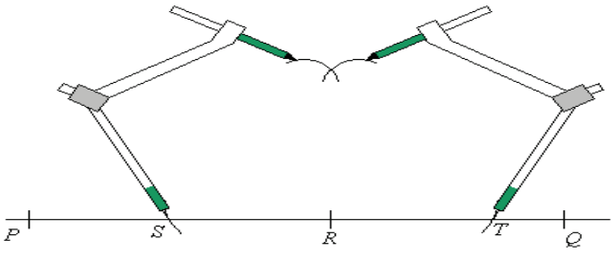
Step I:

- Stretch your compasses a short length.
- Put the sharp end of the compass on point R and make two arcs S and T on the line PQ.



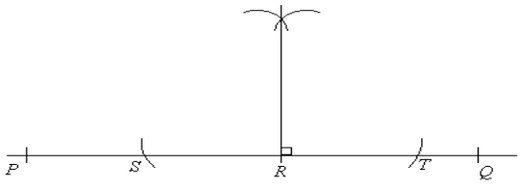
Step II:

- Stretch the compasses a little more.
- Put the sharp end of the compasses on point S and make an arc with the pencil end.
- Do the same on point T but make sure that the second arc intersects the first arc.



Step III:

- Draw a line from point R to pass throughthe point where the arcs intersect.
- This line is perpendicular to PQ and passes through point R.

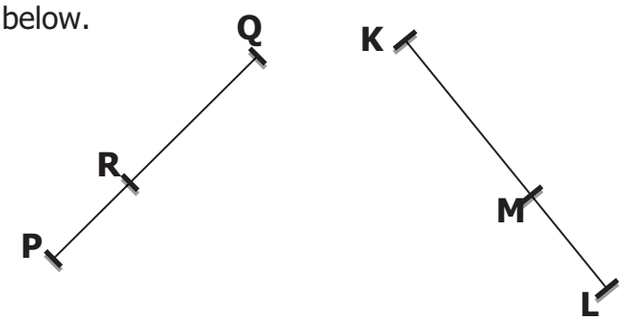


Note: The symbol for perpendicular lines is ⊥

Activity:

Using a pair of compasses and a ruler only, construct perpendiculars through the given points on the line segments below.





Lesson 2: Construction of parallel lines using a pair of compasses

In this lesson, you will;

- Construct parallel lines.
- Use symbols of parallel lines.

You will need;

- Geometric instruments
- A pen / pencil
- Note book
- Ruler

Introduction:

The opposite edges of a door? One of the interesting facts about these is that they are examples of parallel lines. . Straight lines which do not meet if extended in both directions are called **parallel lines**. In this lesson, you will learn how to construct parallel lines.

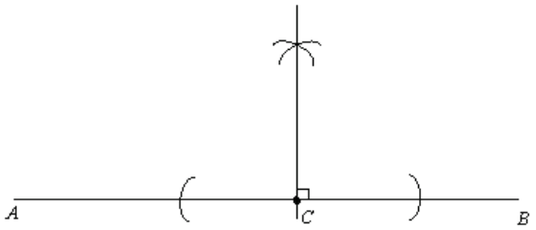
Phase I:Activity

Construct line parallel to line AB and2cm apart.



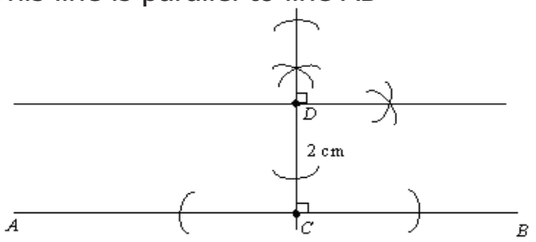
Step I:

- Mark a point C anywhere on the line AB.
- Construct a perpendicular to AB and passing through C.



Step II:

- Construct a line segment on the perpendicular line 2cm above C. Label point as D.
- Then construct a line perpendicular to CD passing through D.
- This line is parallel to line AB



Note: The symbol for parallel lines is 

Lesson 3: Identifying and naming polygons

In this lesson, you will;

- Name polygons.
- Identify polygons.

You will need;

- Geometric instruments
- A pen / pencil
- Note book
- Ruler

Introduction:

Polygons are all around us. We use tables which can be in any shape like square, rectangle, hexagon, heptagon, octagon, nonagon or decagon. We daily see the traffic signals which can be rectangular, square or triangular in shape. In this lesson you will learn how to identify and name the different polygons.

Phase I:Activity

Look at the road signal below;



(a) Have you ever seen the road sign above?

(b) How many sides does it have?

(c) Can you tell the name of the shape above?

- You notice that the road signal in abovehas 8 sides.
- And a shape wit 8 sides is called an Octagon

You now notice that a polygon is named according its number of sides.

Now study the table below;

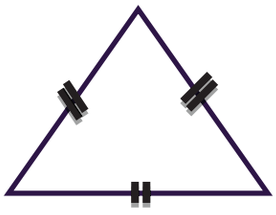
Name of polygon	**Number of sides**
Triangle	____
Quadrilateral	____
Pentagon	____
Hexagon	____
Septagon / Heptagon	____
Octagon	____
Nonagon	_____
Decagon	10
Nuodecagon / Hendecagon	11
Duodecagon	12

Polygons are classified as *regular* or *irregular.*

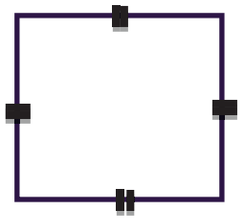
Regular polygons

These are polygons withequal angles and equal sides.

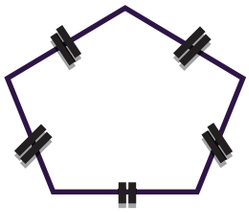
Examples



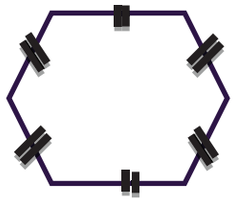
Regular Triangle



Regular quadrilateral



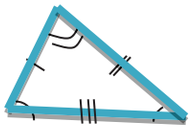
Regular pentagon



Regular Hexagon

Irregular polygons

These are polygons whose angles and sides are not equal.



Scalene triangle



Irregular quadrilateral



Irregular pentagon

Exercise:

1. Draw a regular pentagon

2. A regular hexagon has one of its sides measuring 7cm. What is its perimeter?

3. Work out the perimeter of a regular triangle whose one side measures 6.4dm.

4. An athlete ran around a square field twice. If the length of one side of the field is 100m, what distance did the athlete cover?

Lesson 4: Constructing polygons

In this lesson, you will;

- Construct a regular hexagon.

You will need;

- Geometric instruments
- A pen / pencil
- Note book
- Ruler

Introduction:

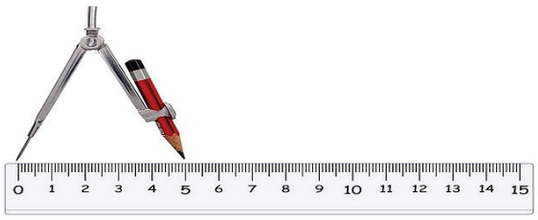
In the previous lesson, you named different and identified some polygons used in our daily life. In this lesson you will learn how to construct some polygons like the regular hexagon.

Phase I:Activity

You are going to construct a regular hexagon in a circle of radius 5cm.

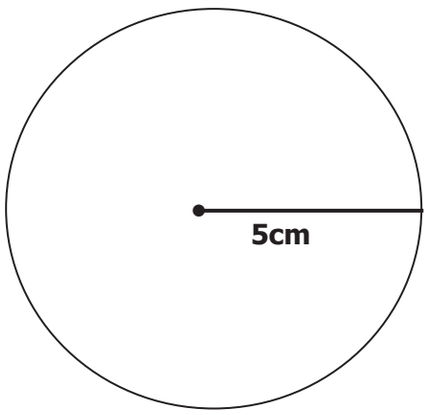
Step I:

Open your pair of compasses to a radius of 5cm as shown below.



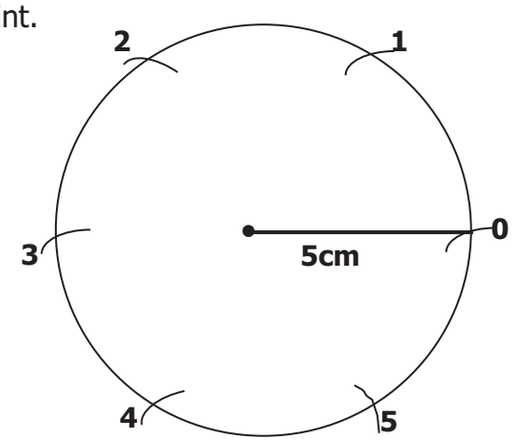
Step 2:

Draw a circle using that radius.



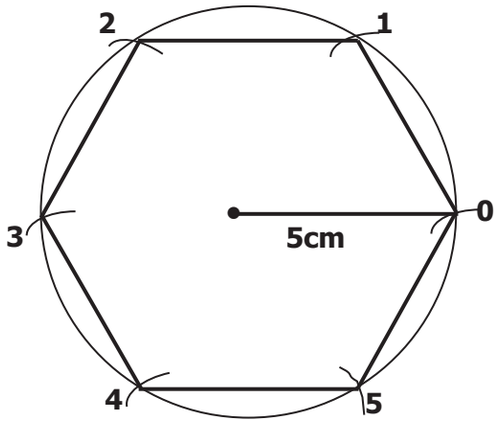
Step 3:

With the same radius, mark off arcs 1, 2, 3, 4, 5, on the circumference using 0 as your starting point.



Step 4:

Join 0 to 1, 1 to 2, 2 to 3, 3 to 4, 4 to 5 and 5 to 0



Activity:

Use a pair of compasses and a ruler only to construct a regular hexagon in a circle of radius;

(a) 3cm (b) 4.5cm (c) 3.5cm

Lesson 5: Constructing a square in a circle

In this lesson, you will;

- Construct a perpendicular
- Construct a square (regular quadrilateral)

You will need;

- Geometric instruments
- A pen / pencil
- Note book
- Ruler

Introduction:

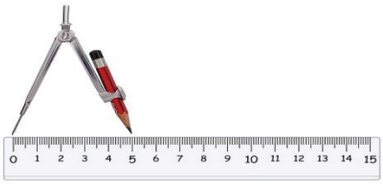
In the previous lesson, you constructed the regular hexagonusing geometric instruments such as a ruler and a pair of compasses. In this lesson you will learn how to construct a square in a circle.

Phase I:Activity

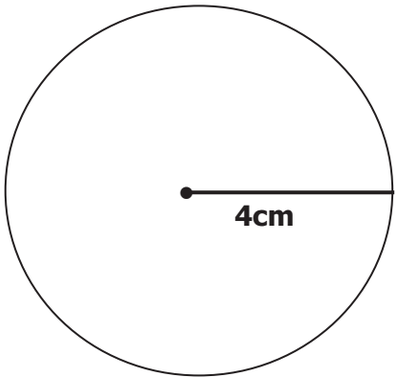
You are going to construct a square in a circle of radius 4cm.

Step I:

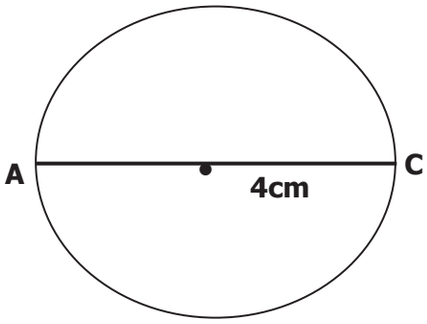
Open your pair of compasses to a radius of 4cm as shown below.



Step 2: Draw a circle using the radius of 4cm as shown.

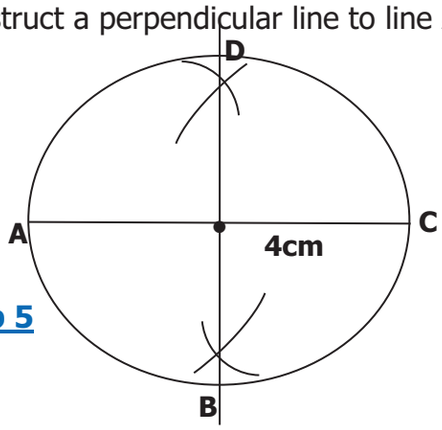


Step 3: Draw diameter AC of the circle as sown.



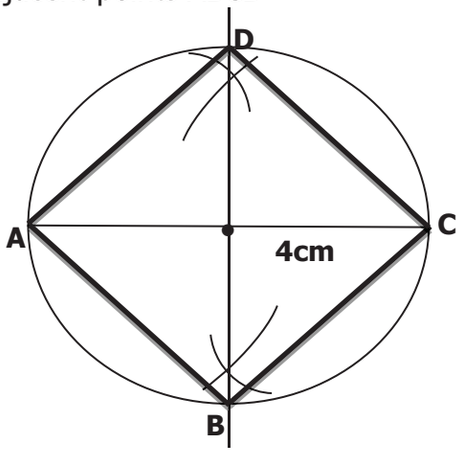
Step 4:

Construct a perpendicular line to line AC through the centre to cut the circle at B and D.



Step 5

Join the adjacent points ABCD



Activity:

Construct a square in a circle of radius;

(a) 3.5cm (b) 3cm

Lesson 6: Bisecting angles

In this lesson, you will;

- Give the meaning of bisecting.
- Bisect a given angle.
- Construct angles by bisecting.

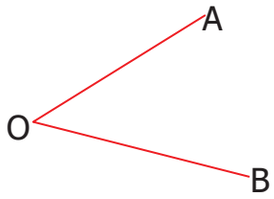
Introduction:

In the primary five, you learnt how to draw angles using a ruler, pencil and a protractor. constructed the regular hexagon using geometric instruments such as a ruler and a pair of compasses. In this lesson you will learn how to construct and bisect angles.

Phase I

Bisecting an angle means dividing an angle into two equal angles.

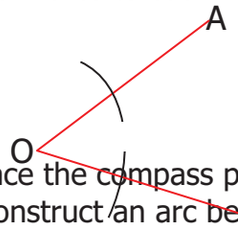
Bisect the angle give below;



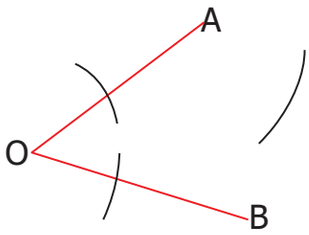
Step I: Place the compass point on the vertex of the angle. (Point O)

Step II: Stretch the compass to any length that will stay on the angle arms.

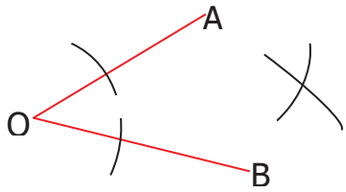
Step III: Mark arcs to cut line AO and OB as shown.



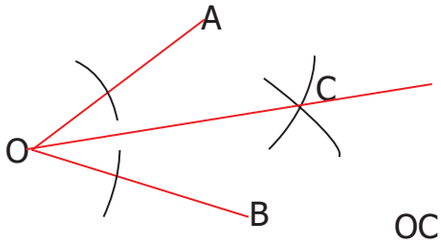
Step IV: Place the compass point on one of the intersection points on the arms of the angle. Construct an arc between the angle arms.



Step V: Without changing the radius of the compass, place the point of the compass on the other intersection point on the arm and make a similar arc.



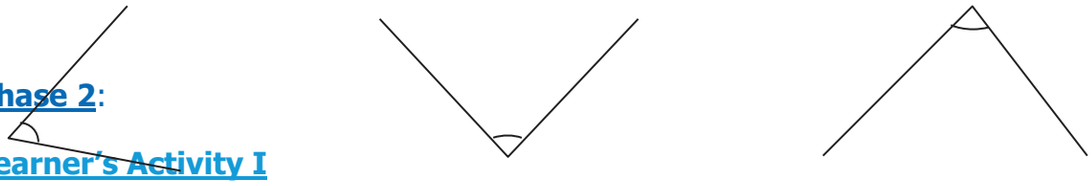
Step VI: Connect the vertex of the angle (point O) to C, the intersection of the two small arcs.



OC is the bisector of angle AOB

ACTIVITY:

Draw angles similar to the ones below in your exercise books and bisect each of them using a ruler and a pair of compasses.



Phase 2:

Learner's Activity I

Constructing an angle of 60^0

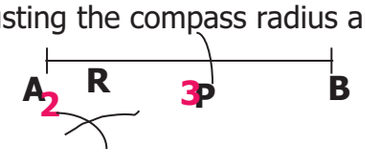
1. Draw a line and mark two end points **A** and **B.**



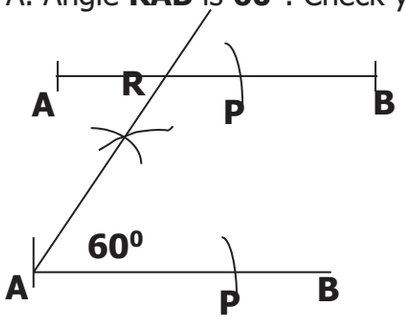
2. Using a pair of compasses with radius less than AB and A as centre, draw 2 arcs; Arc 1 to cut AB at P and Arc **2** above **AB** as shown below.



3. Without adjusting the compass radius and using P as centre, draw arc 3 to cut arc 2 at **R**.



4. Join R to A. Angle **RAB** is **60^0**. Check your angle using a protractor.



Learner's Activity II

Constructing an angle of 90^0

Given line AB, construct an angle of 90^0 at B



1. Prolong line AB at B using a dotted line.



2. With B as the centre and radius less than AB, draw arcs to cut AB at P and the dotted line at S.

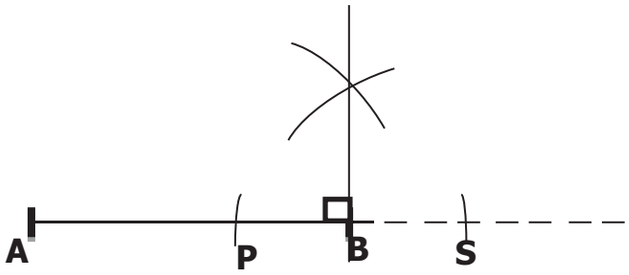


3. Using Pas the centre and radius slightly bigger than PB, draw arc 1; with the same radius and S as centre, draw arc 2 to meet arc 1 at C.





4. Join C to B. Angle CBA is 90^0. Check your angle using a protractor.



ACTIVITY:

1. Draw line **AC**, 6cm long. Mark point **B** between **AC** and construct an angle of **60^0**at **B.**

2. Draw line **PQ**, of length 6cm and construct an angle of **60^0** at **P**.

3. Draw line **PR**, 7cm long. Mark point **Q** along it and construct an angle of **90^0** at **Q**.

4. Draw line **MN**, 5.5cm and construct an angle of 90^0 at **M**.

Lesson 7: Pythagoras Theorem

In this lesson, you will;

- Identify the sides of a right – angled triangle.
- Construct a right – angled triangle.
- Apply Pythagoras theorem to find the length of a right – angled triangle.

You will need;

- Geometric instruments, A pen, pencil, Note book, Ruler

Introduction:

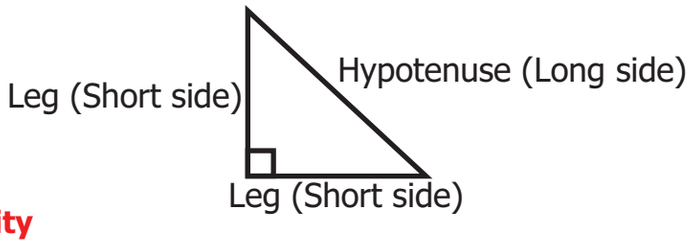
A right – angled triangle is a triangle which has one of its interior angles equal to 90^0. In primary five, we saw the relationship between the interior angles of a triangle. In this lesson, we are going to learn about the relationship between the three sides of a

right angled triangle. Pythagoras theorem tells us about the sides on a right angled triangle.

Learning Pythagoras theorem will help acquire skills needed for construction work, navigation and surveying.

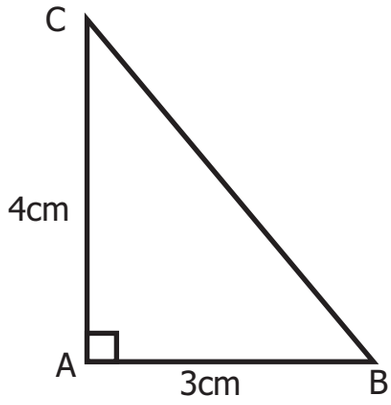
Phase I:

The figure below is a right angled triangle. Study it carefully;



Activity

Step I: Construct accurately a triangle ABC with AC = 4cm, AB = 3cm and angle A is 90^0.



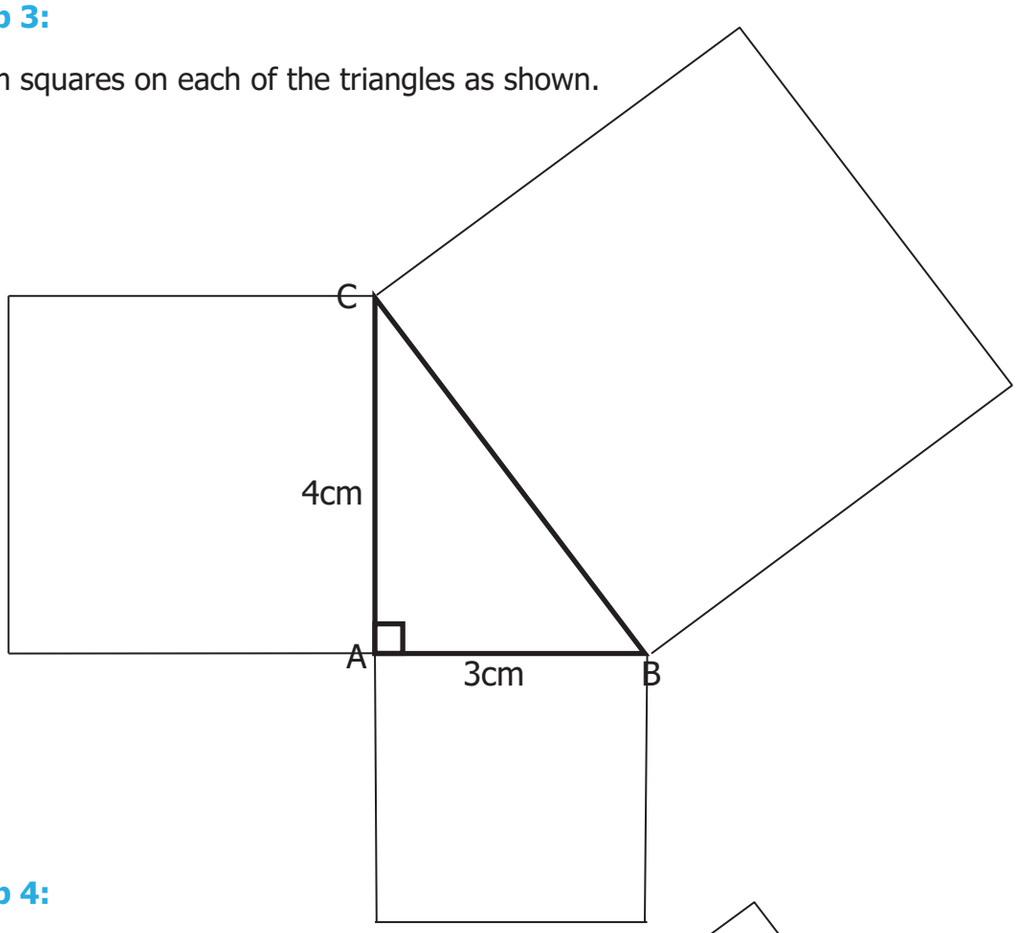
Step 2:

Measure side BC.

You note that side BC = 5cm.

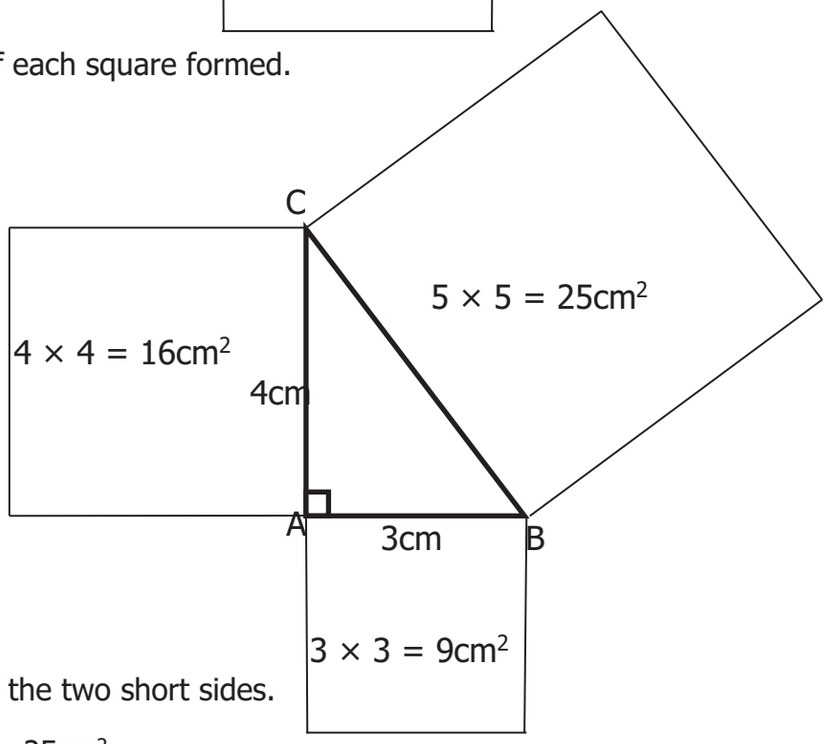
Step 3:

Form squares on each of the triangles as shown.



Step 4:

Find the area of each square formed.



Add the area of the two short sides.

$16cm^2 + 9cm^2 = 25cm^2$

You note that the sum of the area of the two short sides is equal to the area of the long side.

So, Pythagoras states that ***"the sum of the square of the two legs of a right angled triangle equals the square of the hypotenuse".***

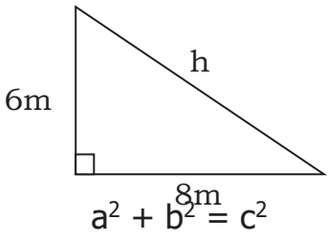
If we name the short sides **a** and **b** and the long side **c**.

Then we have the Pythagoras theorem stated as; $a^2 + b^2 = c^2$

Phase 2:

Now, study these examples;

1. Find the value of h in the figure below.



$a^2 + b^2 = c^2$

$6^2 + 8^2 = h^2$

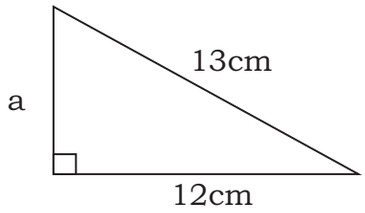
$(6 \times 6) + (8 \times 8) = h^2$

$36 + 64 = h^2$

$\sqrt{100} = \sqrt{h^2}$

$10m = h$

2. The hypotenuse of a right angled triangle is 13cm and one of the short sides is 12cm. Find the length of the other short side.



$a^2 + b^2 = c^2$

$a^2 + 12^2 = 13^2$

$a^2 + (12 \times 12) = (13 \times 13)$

$a^2 + 144 = 169$

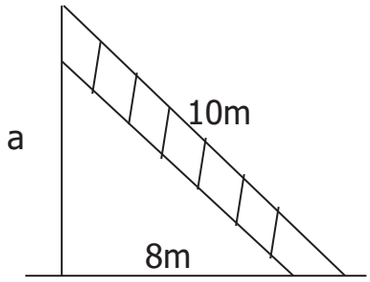
$a^2 = 169 - 144$

$a^2 = 25$

$\sqrt{a^2} = \sqrt{25}$

$a = 5$

3. A ladder 10m long leans against a wall such that its foot is 8m long away from the wall. What is the height of the wall?



$a^2 + b^2 = c^2$

$a^2 + 8^2 = 10^2$

$a^2 + (8 \times 8) = (10 \times 10)$

$a^2 + 64 = 100$

$a^2 = 100 - 64$

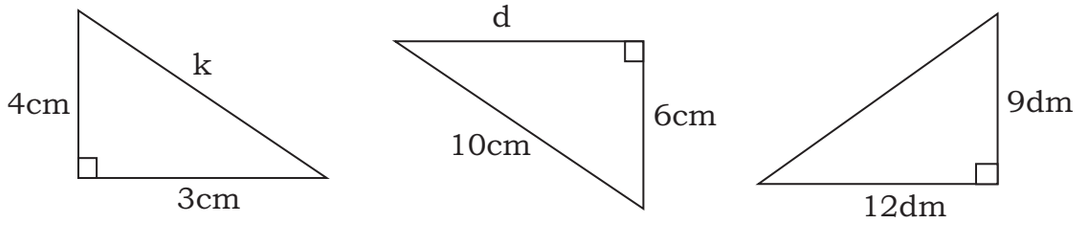
$a^2 = 36$

$\sqrt{a^2} = \sqrt{36}$

$a = 6m$

Exercise:

1. Find the side of a right angled triangle marked by letters.



2. A pole 5 metres long is used to support a banana plant 3 metres high. Find the distance between the foot of the plant and that of the pole.

Lesson 8: Complementary and supplementary angles

In this lesson, you will;

- Identify complementary and supplementary angles.
- Calculates complements and supplements of angles.

You will need;

- Geometric instruments, A pen, pencil, Note book, Ruler

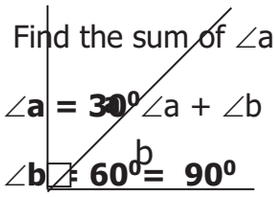
Introduction:

Complementary angles are any two angles whose measures add to 90^0.Supplementary angles are any two angles whose measures add to 180^0. In this lesson we are going to learn about complementary and supplementary angles.

Learning complementary and supplementary angles will help acquire skills needed for construction work, navigation and surveying.

Phase I: Activity I:

Given the right angle below, measure angle ∠**a** and angle ∠**b** accurately.



Find the sum of ∠a and∠b respectively.

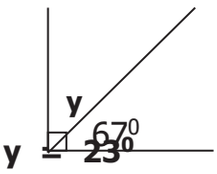
∠**a = 30⁰** ∠a + ∠b = $30^0 + 60^0$

∠**b = 60⁰** **= 90⁰**

What do you notice?

We notice that the sum of ∠a and ∠b is 90^0

Example 1:Find the marked angle y.



y + 67^0 = 90^0

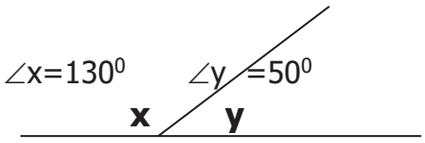
y + 67^0 – 67^0 = 90^0 - 67^0

y = 23⁰

Activity II:

Now measure angle **X** and **Y** on a straight line below.

Use the outer scale for angle x and the inner scale for angle y.



Find the sum of ∠x and ∠y

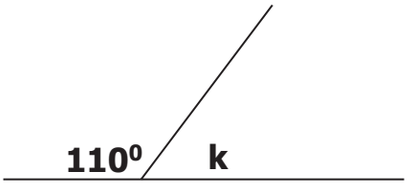
Sum = 130^0+ 50^0

= 180^0

What do you notice?

We notice that "Angles on a straight line add up to 180^0

Example 2: Find the value of angle marked **k**.



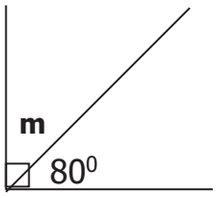
k + 110^0= 180^0

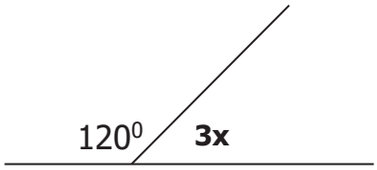
k + 110^0– 110^0= 180^0– 110^0

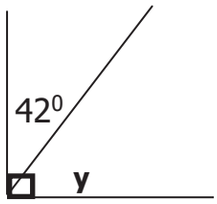
k = 70^0

EXERCISE

1. Work out the value of the missing angles below.







2. What is the supplement of 120^0?

3. Two complementary angles are x and 43^0. What is the value of x?

4. 3y and 60^0 are supplementary angles. Find the value of y.

Lesson 9: Interior angles of a triangle

In this lesson, you will;

- Identify interior angles of a triangle.
- Calculates missing angles in triangles.

You will need;

- A pen / pencil, Note book, Ruler

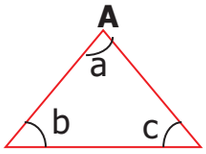
Introduction:

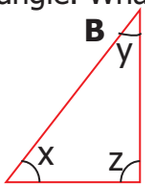
A triangle is a tree sided figure with 3 interior angles.

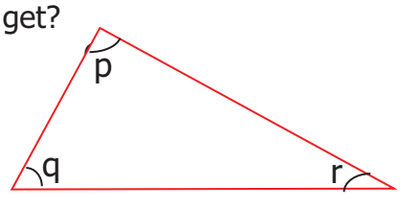
Learning interior angles of a triangle will help us acquire skills needed for construction work, navigation and surveying.

Phase I:Activity:

- Copy the triangle below in your exercise books and use a protractor to measure each angle.
- Add the angles for each triangle. What sum do you get?



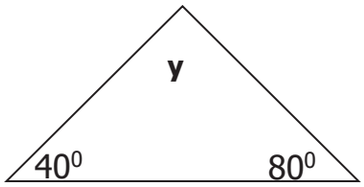


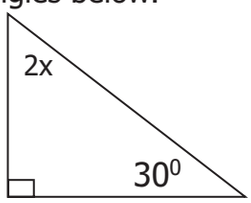


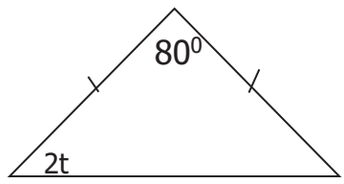
You note that the sum of the interior angles of any triangle is 180^0.

Exercise

1. Work out the value of the missing angles below.







2. Two interior angles of a triangle are 36^0 and 54^0. What is the size of the third angle?

Topic 3: Integers

Lesson 1: Addingintegers on a number line

In this lesson, you will;

- Add positive integers using a number line.

You will need;

- Counters such as sticks, stones, leaves, etc.
- A pen / pencil, Note book, Ruler

Introduction:

You were already introduced to integers in P.5. In P.6, we are going to learn more about integers and relate them to our daily life experiences. We shall continue using number lines as it was in the P.5 class.In this lesson, you will learn more about adding integers using a number line.

Step 1:

Activity 1

Note: - Your face is your forward (positive) direction.

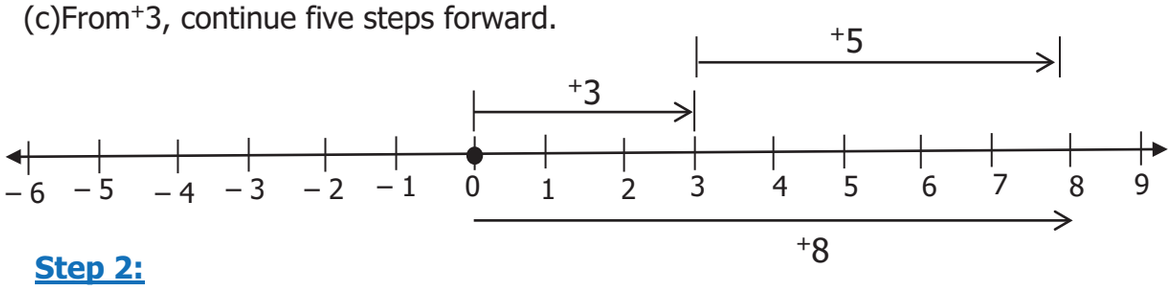
- Your back is your backward (negative) direction.

Consider $^{+}3 + {}^{+}5$

(a) Draw a ground number line with positives and negatives like the one below.

(b) From the starting point (**zero**), move three steps forward to $^{+}3$.

(c)From$^{+}3$, continue five steps forward.



Step 2:

(a) What is your final position after all the movements on the number line?

- You notice that your final position is 8 steps from the starting point in the positive direction.
- This can be written as $^{+}8$

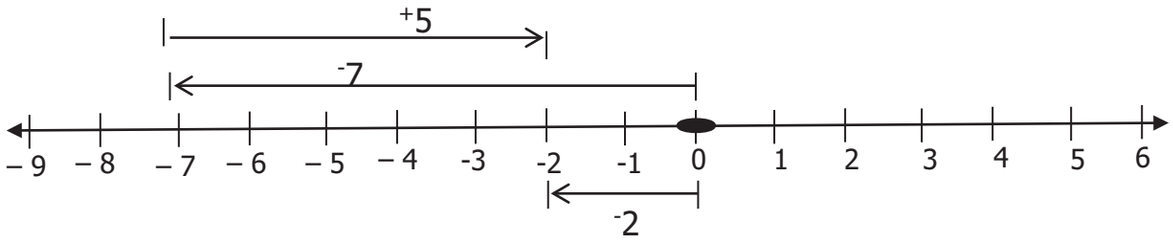
Example 2:

Add: $^{-}7 + {}^{+}5$

(a) From zero, move 7 steps backward.

(b) From -7, move 5 steps forward.

(c) Your final position after the two movements will be your answer.



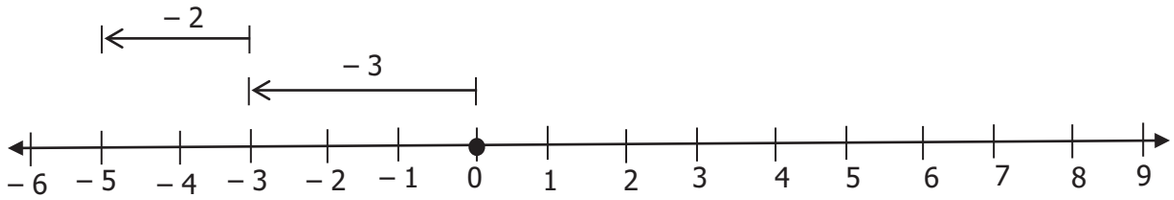
So, $^{-}7 + {}^{+}5 = -2$

Example 3: Work out: $^{-}3 + {}^{-}2$

(a) Draw a ground number line with positives and negatives like the one below.

(b) From the starting point (**zero**), move three steps backward to $^{-}3$.

(c) From $^{-}3$, continuetwo steps backward.



Step 2:

(a) What is your final position after all the movements on the number line?

- You notice that your final position is $^{-}5$
- So, $^{-}3 + {}^{-}2 = {}^{-}5$

Exercise

Work out the following using a number line;

(a) $^{+}4 + {}^{+}3$ (b) $^{+}3 + {}^{+}7$ (c) $^{+}2 + {}^{+}3$

(d) $^{+}6 + {}^{-}4$ (e) $^{+}5 + {}^{-}8$ (f) $^{+}7 + {}^{-}4$

(g) $^{-}4 + {}^{-}3$ (h) $^{-}3 + {}^{-}5$ (i) $-2 + {}^{-}3$

LESSON 2: Subtraction of integers on a number line

In this lesson, you will;

- Subtract integers using a number line.

You will need;

- Counters such as sticks, stones, leaves, etc.A pen / pencil, Note book, Ruler

Introduction:

In the previous lesson, you looked at adding negative and negative integers on a number line. You saw that negative integers suggest a movement to the left on a number line. In this lesson you will subtractpositive integers and negative integers on a number line.

Step 1:

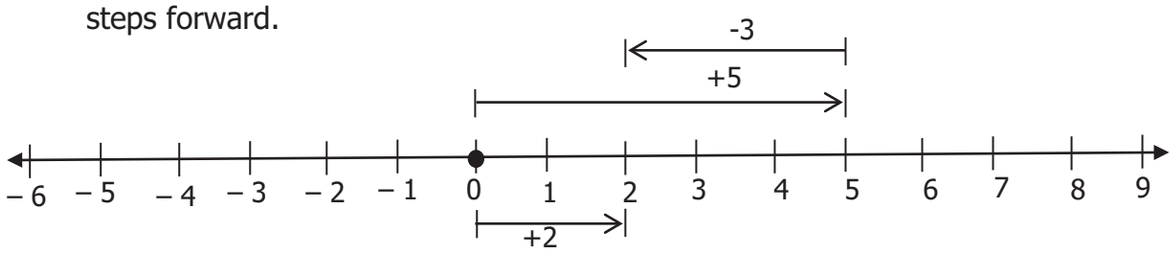
Activity 4

Remember: - Your face is your forward direction.

- Your back is your backward direction.

Work out; $^{+}5 - ^{+}3$

(a) Get a friend to work with
(b) Draw a ground number line with positives and negatives.
(c) From the starting point (**zero**), move five steps forward to $^{+}5$.
(d) While at $^{+}5$, change direction following the subtraction operation and move 3 steps forward.



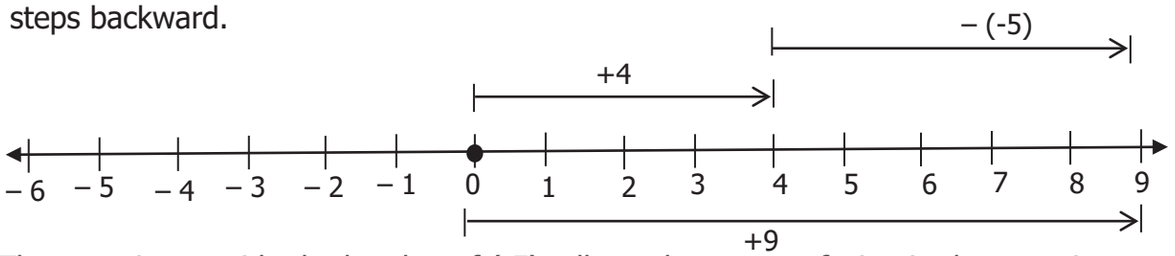
So, $^{+}5 - ^{+}3 = ^{+}2$

Example 2;Subtract: $^{+}4 - ^{-}5$

(a) Draw a round number line like the one below.

(b) From zero, move four steps forward to $^{+}4$

(c) While at $^{+}4$, change direction following the subtraction operation and move 5 steps backward.



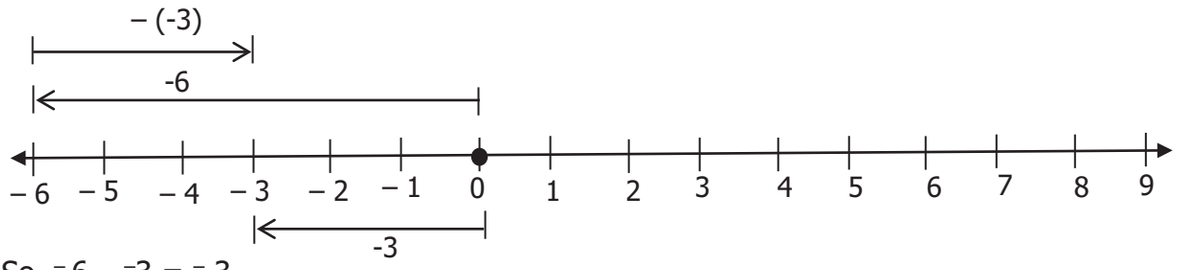
The negative outside the bracket of (-5) tells us that we are facing in the negative direction. The negative on 5 shows the backward movement.

Example 3: Subtract: $^{-}6 - -3$

(a) Draw a round number line.

(b) From zero, move 6 steps backwards to $^{-}6$

(iii) While at $^{-}6$, change direction following the subtraction operation and move 5 steps backward..



So, $^{-}6 - {}^{-}3 = {}^{-}3$

Exercise:

(a) $^{+}3 - {}^{+}7$ (b) $^{+}2 - {}^{-}3$ (c) $^{-}5 - {}^{-}8$

LESSON 5: Solving word problems involving integers

By the end of this lesson, you will;

- Give examples where integers are applied in daily life.
- Solve word problems involving integers.

You will need;

- Counters such as sticks, stones, leaves , etc.A pen / pencil, Note book, Ruler

Introduction:

In the previous lessons, you looked at adding and subtracting integers on a number line. In this lesson, we are going solve word problems involving integers.

Step 1:

We are going to look at some of the words in real life that may represent positive and there opposites may mean negative and fill the table below.

- Draw a table like the one below and complete it correctly:

Positive	Negative
Forward	Backward
Above	
Right	
Profit	
	Downwards
	Empty
	Subtract

Step 2:

Examples;

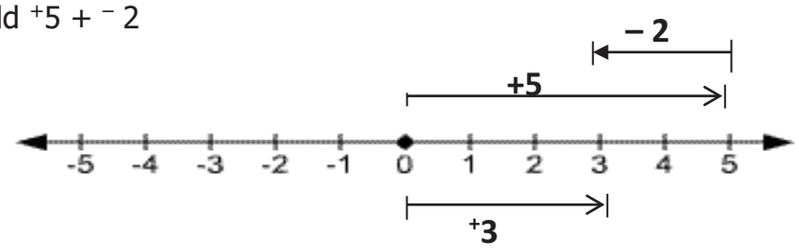
1. In a game, Kamya made 5 steps forward from the starting point. He then made 2 steps backward. How many steps from the starting point is Kamya?

Solution:

(a) Think of 5 steps forward as $^{+}5$

(b) Also think of 2 steps backward as $^{-}2$

(c) Add $^{+}5 + {}^{-}2$



So, Kamya is 3 steps from the starting point.

2. Akello's weight dropped by 10kg from 60kg. Find Akello's weight.

Solution

(a) Think of the drop of 10kg as a reduction in Akello's weight.

(b) Subtract 60kg – 10kg

So Akello's weight now is 50kg

Exercise

1. Move 4 steps backward and another 5 steps backward. Write your final position using integers.

2. A man is 4 years older than his wife who is 30 years. Calculate the man's age.

3. Kisakye cycled 6km to the village and another 2km to her garden. How far is Kisakye now?

4. The temperature of water 2^0C. When the water put in a freezer, its temperature fell by 5^0C. Find the temperature of the water in the freezer.

5. In a water well, there was water to a level of 2 metres from the bottom. When it rained, the water level rose by 3 metres. What was the water level in the well after it had rained?

TOPIC 4: ALGEBRA

Lesson 1: Algebraic Expressions

In this lesson, you will;

- Form algebraic expressions.
- Write sentences for algebraic expressions.

You will need;

- Stones, sticks, leaves, bottle tops of different colours, or anything you can count.A pen / pencil, Note book

Introduction:

Writing an algebraic expression in Mathematics is like writing a sentence in English. You do this by allocating letters to numbers. An algebraic expression is a set of instructions on how to perform a calculation. Learning Algebra helps to develop your critical thinking skills, including problem solving and reasoning.

Step I:

Example

Arikohasfivebooksandfourpencils.

What steps would you take to write a Maths expression for the books and pencils that Ariko has?

Solution

(a) First, you need to use letters for the books and pens.

The books can be called **b**, and the pencils, called **p**

Five b and four p *(note that you replace the books with **b** and pencils with **p**)*

(b) You replace the words withMaths symbols so that you have;

5 b + 4 p

This is your algebraic expression.

Step 2:

Example I;

Write **seven times a number minus three times another number** as an algebraic expression

Solution

(a) First, you need to assign letters to the unknown numbers.

- You can call the first one, **n** and the second one, **m**.

(b) So you now have; **seven times n minus three times m**

(c) Next, replace the words withMaths symbols so that you have;

7 × n – 3 × m

(c) Finally you have: **7n – 3m**

This is your expression.

Note: When writing algebraic expressions you can choose any letter but make sure that different numbers are allocated different letters. Avoid using capital letters in Algebraic expressions.

Example II:

A number plus 5 all multiplied by 3.

Solution

Let the number be **y**.

Then add 5 to y: y + 5

Put the sum of 5 and y in brackets: (5 + y)

Finally, multiply the sum by 3: (5 + y) × 3

We usually put the number at the front so we could rewrite this as: $3(y+5)$

Exercise:

Write each of the phrases below as an algebraic expression;

(i) the sum of x and y

(ii) Add k to seven times b

(iii) Four times a number take away five times another number

(iv) The area of a rectangle is equal to the product of its length in and its width.

(v) Subtract 7 from k then multiply the result by 4.

Lesson 2: Simplifying Algebraic Expressions

In this lesson, you will;

- Identify like terms in algebraic expressions.
- Simplify algebraic expressions.

You will need;

- Stones, sticks, leaves, bottle tops of different colours, or anything you can count.A pen / pencil, Note book

Introduction:

In the previous lesson, you learnt how to write algebraic expressions. Once you have an algebraic expression it can be simplified by collecting all the 'like terms' together (i.e. combining things that are the same letter or combination of letters). If an expression includes brackets then you may need to multiply out the brackets first to see what will combine. This will help you to enjoy Mathematics with flexibility.

Step I:

Example I:

Collect the like terms; 3c + 4h + 2c + 3h

Solution

Collecting like termsgives;

3c + 2c + 4h + 3h

Simplifying the like terms willgive;

5c + 7h

Example II:

Simplify this expression: $\boldsymbol{3a + 7b - 2c - 4b - 6c + a}$

Solution

(a) Collect together any letters that are the same:

(i) Look at the a's: $3a + a = 4a$

(ii) Look at the b's $7b - 4b = 3b$

(iii) Look at the c's $-2c - 6c = -8c$

You note that the term moves with its sign.

(b) Put everything together and you have: $\boldsymbol{4a + 3b - 8c}$

Example III:

Simplify: $3a\,(b - c) + 5ab$

Solution

(a) First remove the bracket.

To do this you need to multiply the term outside the bracket by every term inside the bracket.

$3a\,(b - c) + 5ab$

$3a \times b = 3ab$

$3a \times -c = -3ac$

So, after multiplying out the brackets we have:

$3ab - 3ac + 5ab$

(b) Collect the like terms;

3ab + 5ab – 3ac

(c) Simplifying the like terms gives; 8ab – 3ac

So, $3a\,(b - c) + 5ab = = 8ab - 3ac$

Example IV:

Simplify: $(4y+2) - 5y + 12$

Solution

(a) First remove the bracket.

$3\,(4y+2) - 5y + 12$

$3 \times 4y = 12y$

$3 \times 2 = 6$

So, after multiplying out the brackets we have:

$12y + 6 - 5y + 12$

(b) Collect the like terms;

12y – 5y + 12 + 6

(c) You simplify the like terms to get; 7y + 18

So, $(4y+2) - 5y + 12 = 7y + 18$

Exercise:

Simplify the following:

1. m + n + 2n + 4y
2. 3y + 6x – y – 2x
3. 6k + 5 – 2k + 5
4. 3(h + 4) + 6h + 5
5. 6(p – 3) + 2p – 6

Lesson 3: Substitution

In this lesson, you will;

- Identify unknowns in algebraic expressions.
- Substitute value for the unknown.

You will need;

- Counters such as Stones, sticks, leaves, A pen / pencil, Note book

Introduction:

To substitute values of the letters into an algebraic expression means to replace all the letters with their respective values or numbers. Once the values of the letters are substituted, then the expression is evaluated. While evaluating, the correct order of operations must be observed.

Phase I:

Remember: **a + b** means **(a) + (b)**

n^2 means **n x n**

ab means **(a) x (b)**

ab + ac means **(a x b) + (a x c)**

3abc means **3 x (a) x (b) x (c)**

ak – bm means **(a x k) - (b x m)**

Study the examples below;

(1) If $a = 4$ and $b = 6$ find $3a + 2b$.

3a means 3 × a

2b means 2 × b

(a) You Replace a with 4 and b with 6 and multiply;

3 × 4 = 12

2 × 6 = 12

(b) Finally, add: 12 + 12 = 24

(2) If $c = 3$ and $d = 4$ find $5(c + 2d)$.

2d means 2 × d

(a) You Replace d with 4 and multiply

2 × 4 = 8

(b) You Replace c with 3 to get; 5(3 + 8)
You Add first, 3 + 8 = 11
(c) Then multiply the sum by 5 to get the value for the expression
5 × 11 = 55

(3) If n= -5, y = -9 and z = 4 find the value of; $3n - 2y + z$.
3×(**-5**) – 2×(**-9**) + **4**
-15 – (-18) + 4
-15 + 18 + 4 = 7

Exercise:

If a=2, b=4, c=7, d=1, e=0 find the value of:

1. 3+a
2. b+4a
3. a+3c+d
4. 2a+4b – 2c - 4e
5. 3(a+2b)
6. 2(a + b) - 3(2c - d)

If a=-4, b=6, c=-8, d=2 find the value of:

1. b+ a
2. b+ 4a
3. 3c – b + 2a
4. 2 + 2a – 3b + c
5. 6(2a - 3b)
6. 9(5c - d) - 4(a - 2b)

Lesson 4: Simple Equations

In this lesson, you will;

- Simplify algebraic expressions.
- Solve simple equations with one unknown

You will need;

- Counters such as Stones, sticks, leaves, bottle tops of different colours, e.t.c
- A pen / pencil, Note book

Introduction:

When solving an equation, you find the value of the letter in the equation. You do this by leaving the letter on its own at one side of the equation. In this lesson, you are going to learnsolving simple equations with one unknown.

Step I:

Example I:

Solve the equation: 5a = 15

Solution

You notice that the starting equation has a multiplication.

$$5 \times a = 15$$

You divide each side by 5 to leave "**a**" on its own;

$$\frac{\overset{1}{\cancel{5}} \times a}{\underset{1}{\cancel{5}}} = \frac{\overset{3}{\cancel{15}}}{\cancel{5}}$$

You have solved the simple equation and found the answer;

So, **a = 3**

Example II:

Solve the equation: 4k – 3 = 17

Solution

You collect **k**'s at one side and numbers at the other.
To do this, *Add 3 to each side (to get rid of the -3).*

4k – 3 + 3 = 17 + 3

4k = 20

You then divide each side by 4 to leave "**k**" on its own;

$$\frac{\overset{1}{\cancel{4}} \times k}{\underset{1}{\cancel{4}}} = \frac{\overset{5}{\cancel{20}}}{\cancel{4}}$$

You have solved the equation and found the answer;

So, **k = 5**

Example III:

Solve the equation: 4 (2m + 5) = 44

Solution

(a) First multiply out the brackets;

4 × 2m = 8m

4 × 5 = 20

You now have; 8m + 20 = 44

(b) Collect the like terms (i.e. the m's and numbers)

To do this, *subtract 20 from each side (to get rid of the 20).*

8m + 20 – 20 = 44 – 20

8m = 24

(c) You then divide each side by 8 to leave "**m**" on its own;

$$\frac{\overset{1}{\cancel{8}} \times m}{\underset{1}{\cancel{8}}} = \frac{\overset{3}{\cancel{24}}}{\cancel{8}}$$

You have solved the equation and found the answer;

So, m = 3

Exercise:

1. Solve the following equations.

(a) $3n - 1 = 11$ (b) $3m + 2 = 20$ (c) $6y + 3 + 2y = 43$

2. Multiply out the brackets and solve:

(a) $4(p + 3) = 20$ (b) $6(x - 3) = 30$

3. When a number is multiplied by 5 and 8 is added to it, the result is 23. What is the number?

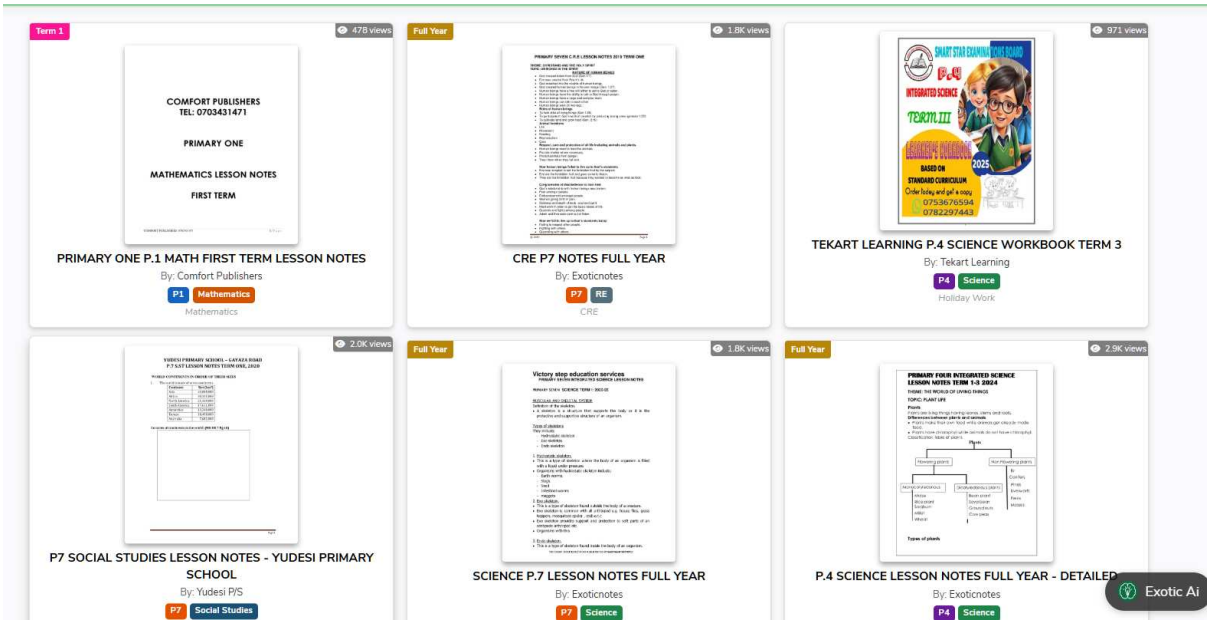
4. Alice has y pens, Ben has 2y pens and Charles has 9 pens. If they all have 18 pens, how many pens does Alice have?



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