South Sudan

PRIMARY 6

Mathematics

Pupil's Book 6

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THIS BOOK IS NOT FOR SALE

FOREWORD

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

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

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

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

Deng Deng Hoc Yai, (Hon.)

Minister of General Education and Instruction, Republic of South Sudan

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UNIT 1: NUMBERS

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

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

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

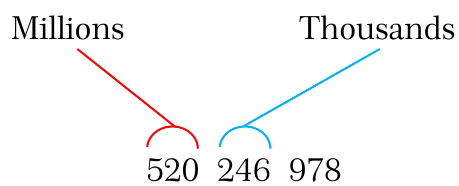
Reading Larger Numbers

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

Reading and writing numbers to a million

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

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



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

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

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

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

Putting it all together, we have;

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

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

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

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

Try to do the following:

two hundred cars + forty cars + six cars.

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

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

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

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

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

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

The whole number can be read as:

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

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

Example 1.

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

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

Activity 1.

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

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

Exercise 1:

Write the following in words or numbers.

1. 5 821 456
2. 1 235 847
3. Six million, five hundred and forty thousand, six hundred and seventy four.
4. Seven million, eight hundred and twenty one thousand three hundred and sixty five.

Compare and order numbers to a million

First we need to identify the place value of the numbers.

Activity 2.

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

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

a. 12, 415, 62, 418, 3468, 1345
b. 65, 89, 45, 672, 456 , 196
c. 980, 768, 560, 356, 45, 120
d. 765, 980, 134, 1452, 698, 19 345

Exercise 2:

There are 645 465 people living in Unity while there are 962 716 people living in Eastern Equitoria.

Which state has greater population? Explain why it is so.

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

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

1.2 Divisibility test of 8 and 11.

Divisibility of 8

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

Attempt in pairs if they are divisible by 8

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

Is it easy? How was the experience?

Example 2.

a. 723 810

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

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

b. 456 791 824

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

c. 923 780

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

So this number is not divisible by 8.

Activity 3.

1. Discuss and identify which number is divisible by eight. How do you check your answer?
   a) 23 751 b) 396 c) 506 d) 1 624

2. Discuss and identify which number is not divisible by eight. How did you work it out?
   a)56 816 b) 63 424 c) 31 326 d)6 832

Divisibility of 11

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

Example 3.

A.) 280 819:

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

B.) 53:
$5 - 3 = 2$, so it is not divisible by 11.

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

Example 4.

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

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

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

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

Activity 4.

1. Discuss and identify which number is not divisible by 11. How did you get your answer?

   a) 54 637 b) 7894 c) 891 d) 2494

2. Discuss and identify which number is divisible by 11. How did you get your answer?

   a) 69 859 b) 23 469 c) 38 929 d) 18 958

Exercise 3:

1. Which of the following numbers is not divisible by 11? Is there another way of working out the answer?

   a)2 547 039 b)10 604 c)31 415 d)292 215

2. Which of the following numbers is divisible by 8? How did you work it out?

   a)760 672 b)89612 c)93 732 d)65 432

3. Identify numbers divisible by 8 or 11. Which method will you use?

   a)3 624 b)2 728 c)28 182 d)7 120

1.3 Squares and square roots

Square

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

Example 5.

What is the square of 3?

3 squared =

1	2	3
4	5	6
7	8	9

= $3 \times 3 = 9$

What is the square of 5?

5 squared =

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

= $5 \times 5 = 25$

Squared is usually written as a little 2 like this

This means "squared"

$4^2 = 16$

This says "4 squared equals 16"

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

Activity 5.

1. In groups, discuss and give the squares of the following numbers.

a) 9^2 b) 10^2 c) 14^2 d) 24^2

e) 19^2 f) 32^2 g) 13^2 h) 20^2

Square root

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

Square root goes the other way of square.

9 is the square of 3

3 is the square root of 9

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

This means square root

$\sqrt{9}=3$

This says square root of 9 equals 3

Activity 6.

1. In groups, discuss and give the squares of the following numbers. Explain the steps in doing this.

a) 5^2 b) 12^2 c) 15^2 d) 8^2

2. Discuss and give the square roots of the following numbers. Explain the steps in doing this.

a) $\sqrt{169}$ b) $\sqrt{289}$ c) $\sqrt{16}$ d) $\sqrt{400}$

Exercise 4:

1. Write the squares and square roots of the following numbers. Explain to your partner the steps in working it out.

   a) 9^2 b) 11^2 c) 25^2 d) 6^2

2. What is the square root of the following numbers? Explain to your partner the steps in working it out

   a) $\sqrt{4}$ b) $\sqrt{196}$ c) $\sqrt{144}$ d) $\sqrt{100}$

1.4 Decimals, fractions and percentage conversions

Converting from decimal to percent

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

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

Example 6.

Convert 0.125 to percentage.

$$0.125 \times 100 = 12.5\%$$

Activity 7.

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

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

Exercise 5:

Express the following decimals to percentages.

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

Explain how you have worked it out.

Converting from percent to decimal

To convert from percent to decimal, divide by 100, then remove the % sign.
The easiest way to divide by 100 is to move the decimal point two places to the left

Example 7.

Convert 55% to decimal.

$55\% = 55 \div 100 = 0.55$

Activity 8.

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

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

Exercise 6:

Express the following percentages to decimals.

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

Explain how you have worked it out.

Converting fraction to percent

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

Example 8.

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

First divide 3 by 8: 3÷8= 0.375

Then multiply by 100: $0.375 \times 100 = 37.5$

Then add the % sign: 37.5%

Answer: 3/8 = 37.5%

Activity 9.

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

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

Ask your partner how they got their answers

Exercise 7:

1. Convert the following fractions to percentage.

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

   Explain how you have worked it out.

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

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

Converting from percent to fraction

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

Example 9.

Convert 60% to a fraction.

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

Simplify the fraction $\frac{6\not{0}}{10\not{0}}$

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

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

Activity 10.

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

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

Can you describe the method used?

Exercise 8:

1. Convert the following percentages to fractions.

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

   What did you notice when converting percentages to fractions?

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

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

Converting from fraction to decimal

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

Example 10.

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

$1 \div 3 = 0.3$

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

Activity 11.

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

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

Exercise 9:

Convert the following fractions to decimals.

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

How did you arrive at your answer

Converting from decimal to fraction

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

Example 11.

Convert 0.55 to a fraction

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

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

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

Simplify the fraction

Activity 12.

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

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

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

Exercise 10:

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

1.5 Ratios and Proportion

Activity 13.

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

Ratios

A ratio is a comparison between two quantities.

Example 12.

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

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

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

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

Therefore 3:6 is 1:2

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

Activity 14.

1. There are 80 tables and 160 chairs in a class, what is the ratio of desks to chairs? How did you get your answer?

2. A herd of 52 cows has 12 white and some black cows. What is the ratio of white to black cows? How are you going to tackle this?

Exercise 11:

In groups, solve the following questions.

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

Proportion

Proportion is a pair of ratios equal to each other

Example 13.

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

2 learners ⟶ 10 books
1 learner ⟶ $10 \div 2 = 5$ books

5 learners with equal number of books $5\times 5 =$ **25books**

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

$$2 \div \frac{1}{2}l = 2 \times \frac{2}{1}$$

$=$ **4 bottles**

Activity 15.

1. If the cost of 5kg of wheat is 180, what is the cost of 12kgs?

2. A shop sells 200 for every two bags of rice, how much will 5 bags of rice cost in the same shop?

3. One pen weighs 2kg, what is the mass of 8 such pens?

4. 41 kg of tomatoes cost SSP 8 200. How many kilograms of tomatoes can you get with 3 600?

5. 35 kg of onions cost SSP 3 500. How much would 16 kg cost?

6. A car can travel 180 Kilometres on 5 litres of petrol. How much petrol will it need to go 252 Kilometres?

7. A boat travels 365 kilometres in 5 hours (with a constant speed). How much time will it take traveling 454 kilometres?

Exercise 12:

1. A shopkeeper sells bags of maize and rice in the ration of 3:4, if in that period, he sells 108 bags of maize how many bags of rice did he sell in that period? How did you get your answer?

2. In a test, the ratio of the learners who passed to those who failed was 3:2 if the learners who failed were 4, how many learners passed? What did you notice when working out this question?

3. Express each of the ratios in the simplest form

   a) 14:16 b) 20:100 c) 60:140 d) 12:36

   e) 35:60 f) 9:45

UNIT 2: MEASUREMENT

2.1 Millimetres as units of length

When we use millimetres, it is more accurate and precise

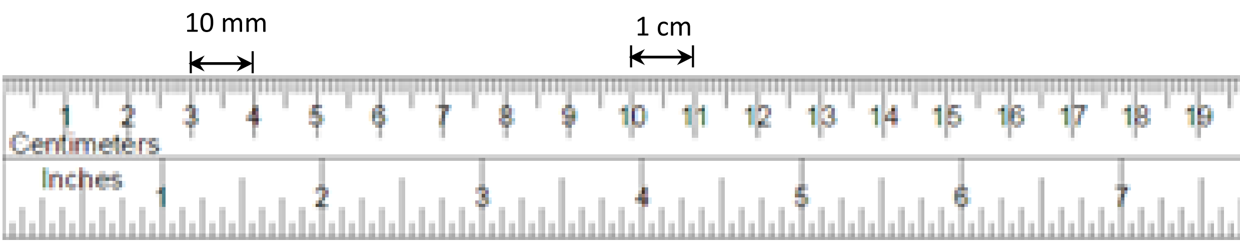
For example in the building industry we require accuracy and this can be achieved by using millimetres.

Activity 1.

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

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

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



Millimetres (mm)

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

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

Centimetres (cm)

A centimetre is roughly the width of a finger.

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

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

Metres (m)

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

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

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

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

Example 1.

Express 5 810 millimetres in metres.

Solution:

1 metre = 1000 millimetres

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

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

$$Distance\ in\ m = \left(\frac{5810}{1000}\right) m.$$

$$Distance\ in\ m = 5.810\ m.$$

Answer:

5810 millimetres is 5.810 metres.

Activity 2.

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

Exercise 1:

In pairs, convert to the unit in brackets.

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

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

Exercise 2:

1. In pairs, convert the following measurements.

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

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

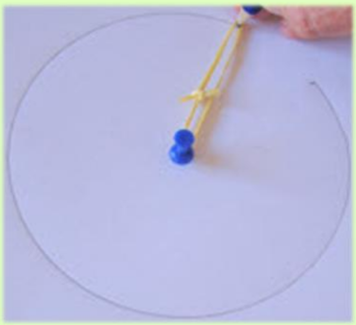
3. A piece of string measures 1.4m. How long is this in centimetres/

2.2 Parts of a circle

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

Activity 3.

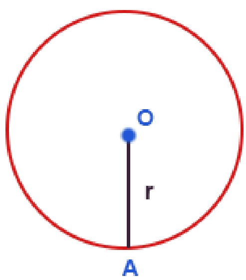
Put a pin in a board or a stick on the ground, put a loop of string or rope around it, and insert a pencil or another stick into the other loop. Keep the string stretched and draw the circle.



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

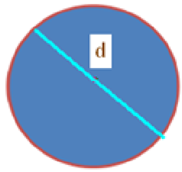
Radius, Diameter and Circumference

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



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

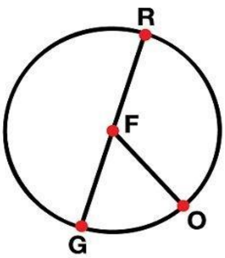
$$d = 2r \text{ or } r = \frac{d}{2}$$



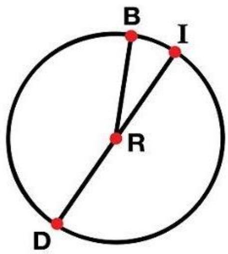
Exercise 3:

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

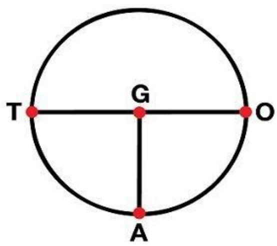
a.



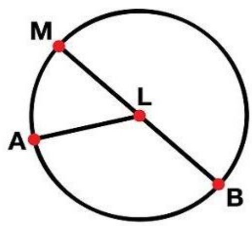
b.



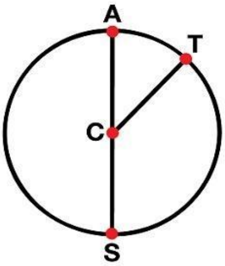
c.



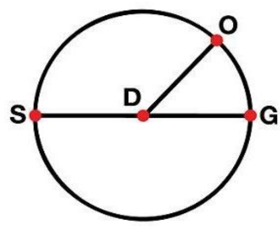
d.



e.



f.

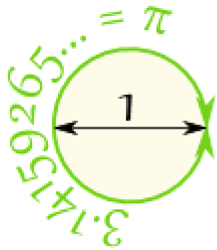


2.3 Calculate the value of π

The distance round a circle is the circumference.

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

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



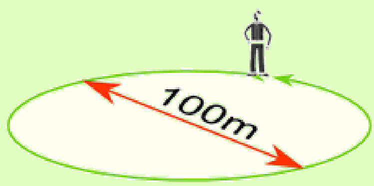
When we divide the circumference by the diameter, we get 3.141592654... Which is the number π (Pi)

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

We can say: Circumference = π × Diameter

Activity 4.

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



Distance walked = Circumference = π × 100m

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

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

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

Activity 5.

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

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

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

Divide:

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

That is how we find π of a circular object.

Try it again and measure more accurately.

Also, note that the Diameter is twice the Radius:

Diameter = 2 × Radius

Therefore, this is true:

Circumference = 2 × **π** × Radius

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

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

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

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

Example 2.

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

   Answer:

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

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

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

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

   Answer:

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

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

   Finally, r = (288 × 7)/44 = 14 cm.

2.4 Units of area in acres and hectares

Convert acres to hectares

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

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

Example 3.

Convert 20 acres to hectares.

Formula: $Acres \times 0.405 = Hectares$

Calculations: $20\ Acres \times 0.405 = 8.1\ hectares$

Result: 20 acres is equal to 8.1 hectares

Activity 6.

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

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

Convert hectares to acres

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

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

Example 4.

Convert 40 hectares to acres.

Formula: $hectares \times 2.471 = acres$

Calculations: $40\ hectares \times 2.471 = 98.84\ acres$

Result: 40 hectares is equal to 98.84 acres

Activity 7.

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

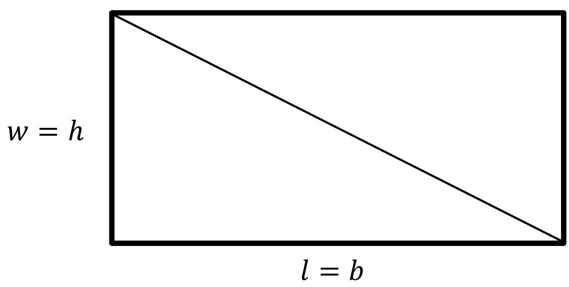
a. 164 hectares
b. 634 hectares
c. 46 hectares
d. 363 hectares
e. 349 hectares
f. 67 hectares
g. 797 hectares
h. 946 hectares
i. 82 hectares

2.5 Find the area of triangles

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

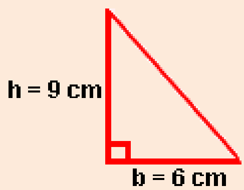
It is simply **half of base times height**

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



Example 5.

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



Solution:

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

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

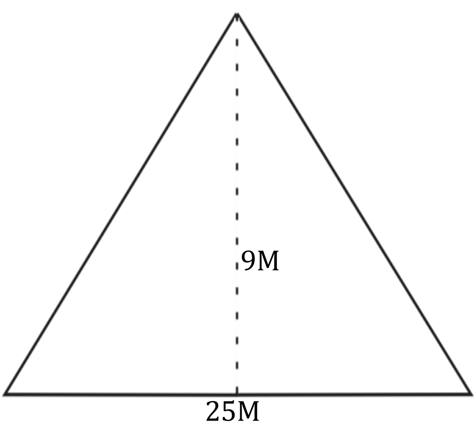
$A = \frac{1}{2} \times (54 \text{ cm}^2)$

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

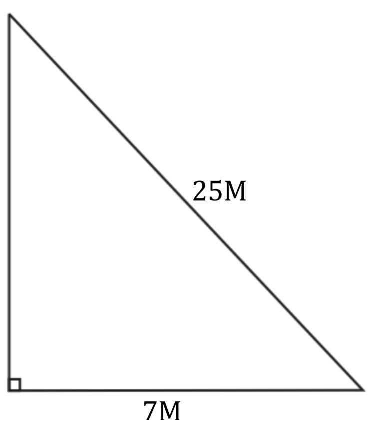
Exercise 4:

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

a)



b)



2.6 Solve problems involving units of capacity

We use liter to represent as the standard unit.

1 millilitre = 0.001 litre

1 centiliter = 0.01 litre

1 decilitre = 0.1 litre

1 kilolitre = 1000 litres

Example 6.

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

Solution:

First, find the total volume of the water.

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

Total volume in ml = 5000 ml

Second, convert ml to L

1 L = 1000 ml

Set up the conversion so the desired unit will be cancelled out.

In this case, we want L to be the remaining unit.

Volume in L = $(volume\ in\ ml) \times (1\ L/1000\ ml)$

volume in L = $\left(\frac{5000}{1000}\right)$ L

volume in L = 5 L

ANSWER:

5 liters of water was poured into the bucket.

Activity 8.

In groups;

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

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

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

Exercise 5:

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

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

2.7 Conversion of tonnes to kilograms and kilograms to grams

How to convert Tonnes to Kilograms

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

1 t = 1000 kg

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

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

Example 7.

Convert 5t to kilograms:

$m_{(kg)}$ = 5t × 1000 = 5000 kg

How to convert Kilograms to Tonnes

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

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

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

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

Example 8.

Convert 5 kg to tons:

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

How to convert Grams to Kilograms

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

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

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

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

Example 9.

Convert 5 g to kilograms:

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

How to convert Kilograms to Grams

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

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

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

Example 10.

Convert 5kg to grams:

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

Exercise 6:

Show your working out.

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

2.8 Profit and loss

Formulas of profit and loss are given below.

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

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

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

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

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

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

Example 11.

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

Solution

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

Profit = SP – CP

= SSP 3 820 – SSP 3 390 = SSP 430

Exercise 7:

Work in groups to write some word problems that:

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

Give your problem to another group to work it out.

Check that they have solved the problem correctly.

UNIT 3: GEOMETRY

3.1 Constructing and bisecting lines

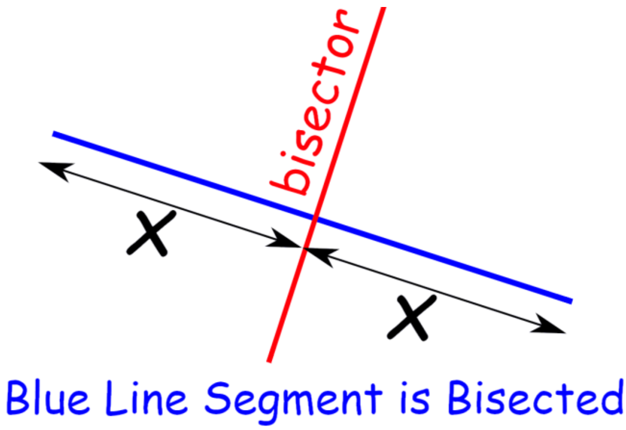
"Bisect" means to divide into two equal parts.

You can bisect lines, angles, and more.

The line which divides other line into two equal parts is called “bisector”.

Bisecting a Line

Here the red line bisects the blue line:



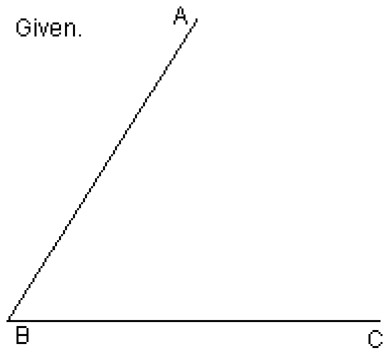
Activity 1.

In groups collect safe objects and bisect them.

For example, piece of paper and sticks.

Below are the steps used to construct bisecting lines

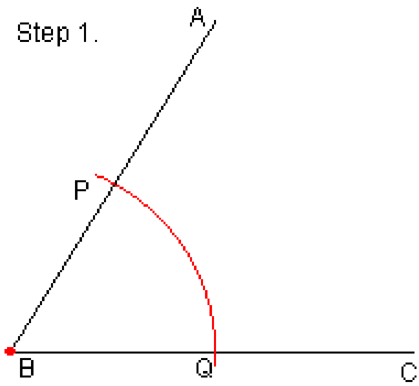
Given. An angle to bisect. For this example, angle ABC.



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

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

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

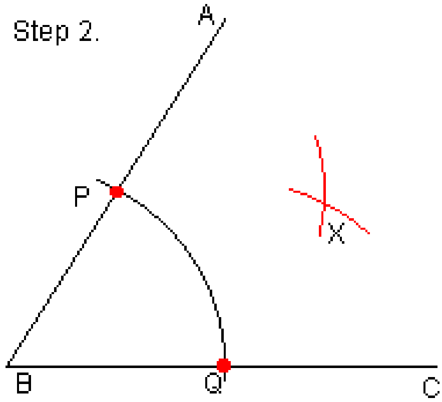


Step 2. Draw two more arcs. The first arc must be centered on one of the two points **P** or **Q**. It can have any length radius.

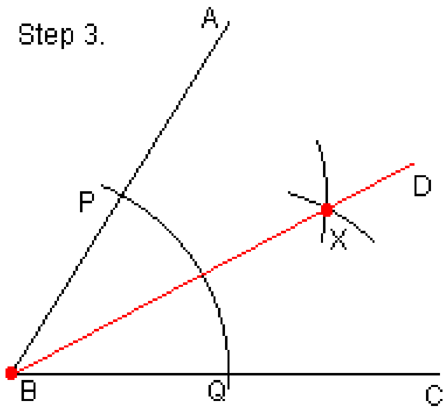
The second arc must be centered on whichever point (P or Q) you did NOT choose for the first arc.

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

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



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



Line BD is the angle bisector

Activity 2.

Now, try to do this construction of 60^0 in pairs. Explain the steps to your partner.

Exercise 1:

Draw an angle of any size and bisect the angle.

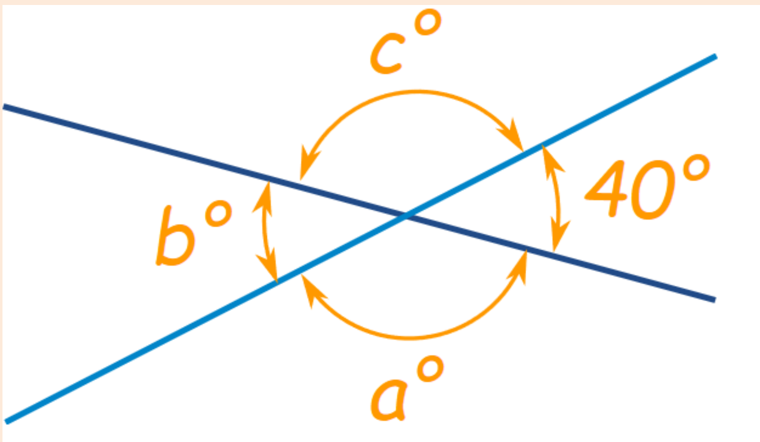
3.2 Identifying vertically opposite and supplementary angles

Vertically Opposite Angles

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

Example 1.

Find angles a°, b° and c° below:



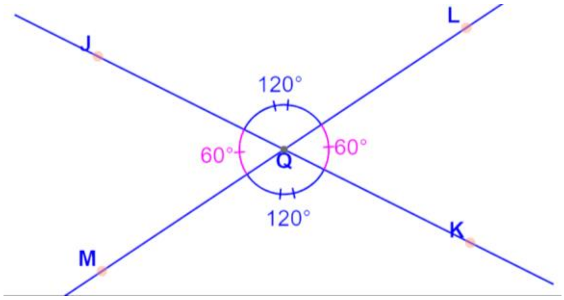
Because b° is vertically opposite 40°, it must also be 40°

A full circle is 360°, so that leaves $360° - 2 \times 40° = 280°$

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

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

Observe the angles below.



Angle MQK is vertically opposite to angle JQL.

Angle MQJ is vertically opposite to angle KQL.

Activity 3.

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

Material required:

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

Procedure:

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

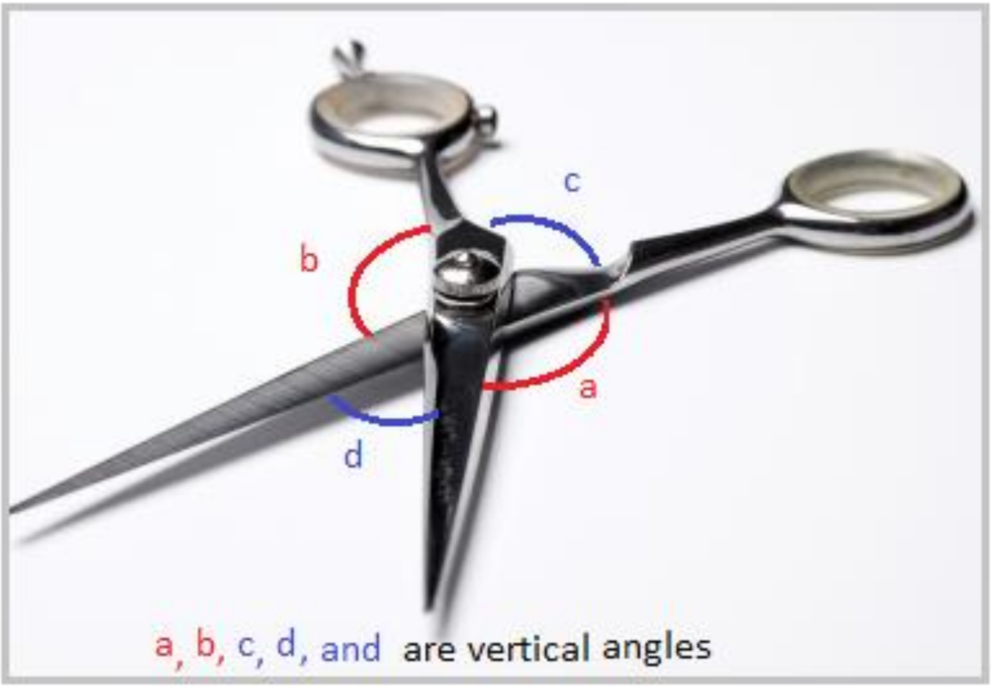
Step 2: Label the two pairs of vertically opposite angles as angle1 opposite to angle 2 and angle 3 opposite to angle 4.

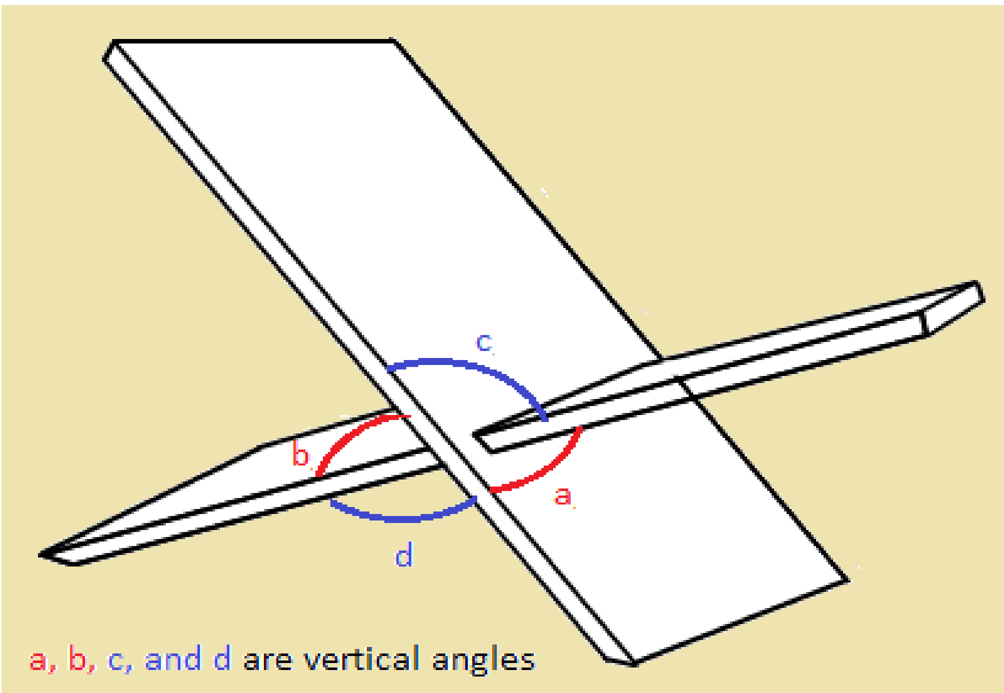
Step 3: Make a duplicate of angle 2 and angle 3 and cut it.

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

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

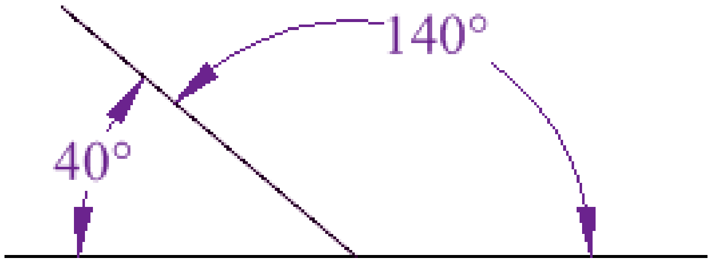
In real life, vertical angles are shown as follows:





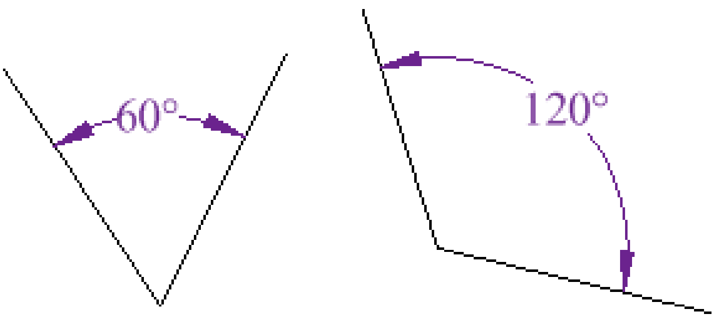
Supplementary Angles

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



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

Notice that together they make a straight angle.



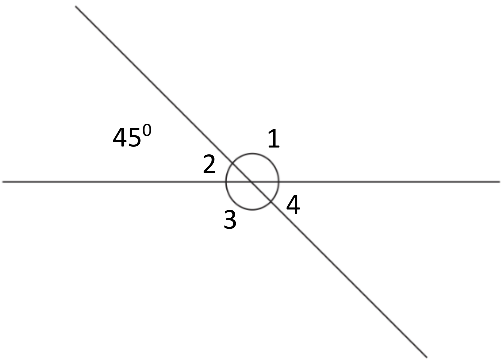
But the angles don't have to be together.

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

Exercise 1:

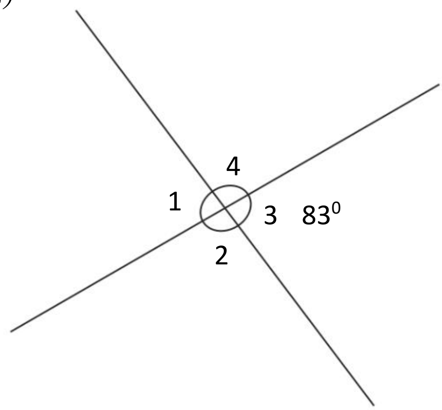
Find angles using the information given.

1)



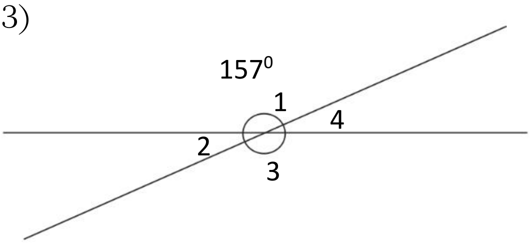
1=_______
2=45^0
3=_______
4=_______

2)



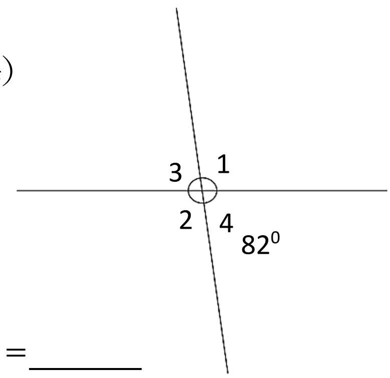
1=_______
2=_______
3=83^0
4=_______

3)



1=157^0
2=_______
3=_______
4=_______

4)



1=_______
2=_______
3=_______
4=82^0

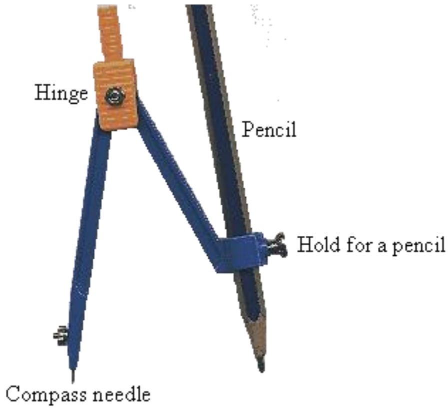
Explain how you can work this out.

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

3.3 Constructing a circle of a given radius

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

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



Steps to draw a circle with a pair of compasses:

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

Example 2.

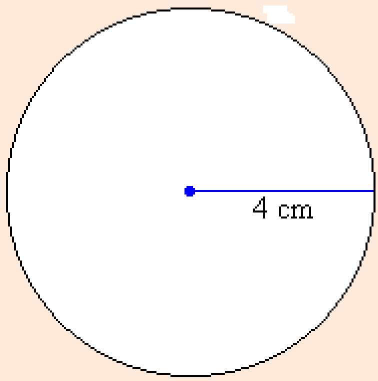
Use a pair of compasses to draw a circle of radius 4 cm.

Solution:

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

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

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



Activity 4.

Work in pairs,

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

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

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

Exercise 2:

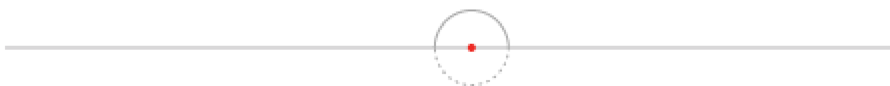
In pairs, draw;

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

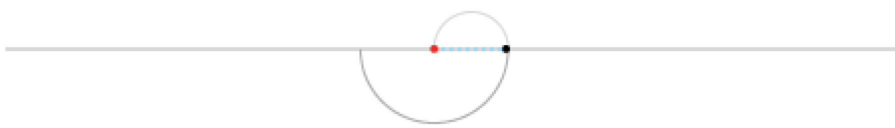
3.4 Making patterns with circles

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

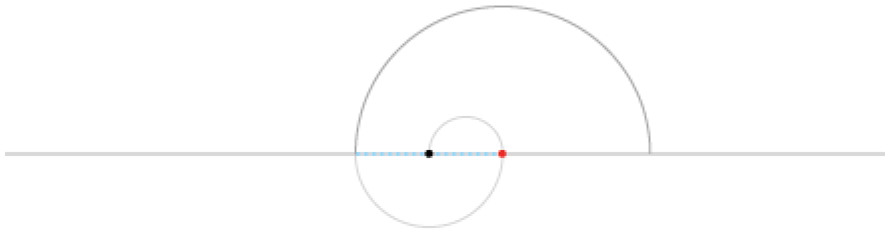
Step 1
On a horizontal line, draw a semicircle that is as small as possible. This is the first turning of the spiral, and the two points where it cuts the line are the construction points.



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

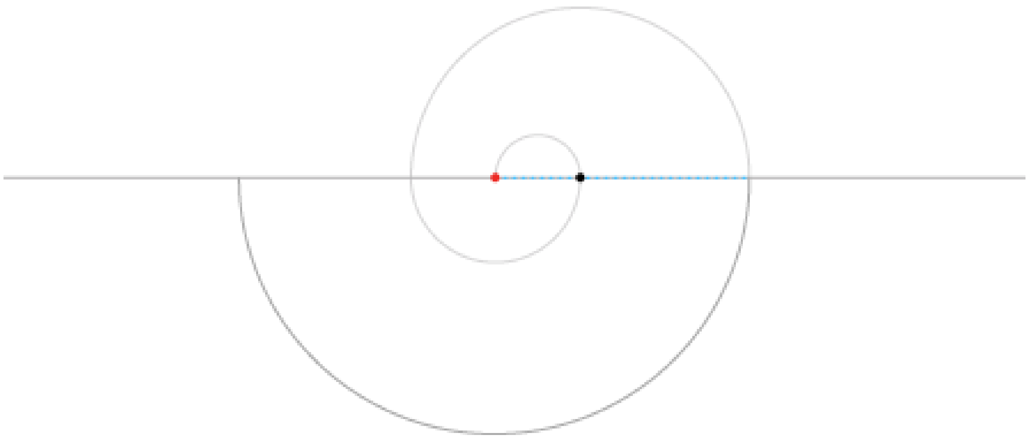


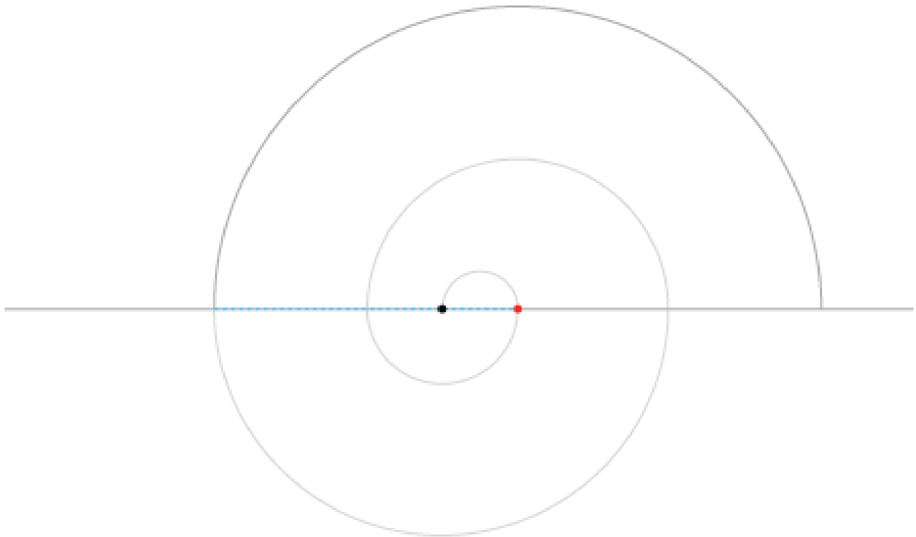
Step 3
Move the pair of compasses back to the first point, open it to meet the end of the curve, and draw another semicircle.



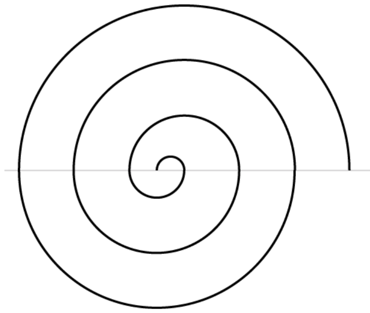
Step 4

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





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



Activity 5.

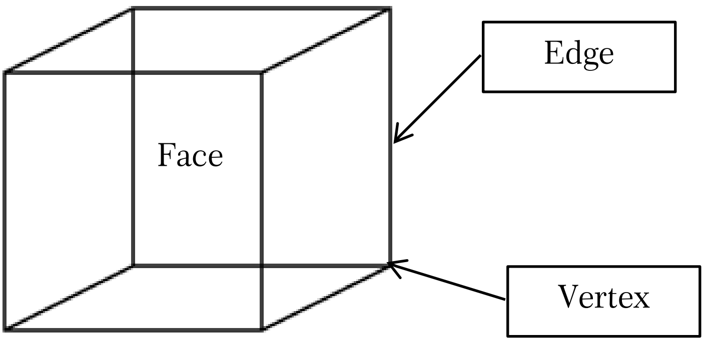
In groups, use a pair of pair of compasses to draw this spiral shape. Present your final product to the class.

Exercise 3:

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

3.5 Properties of 3D shapes

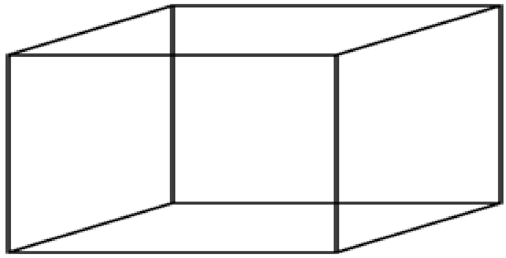
Cube



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

A cube has:

6 square faces
8 vertices
12 Edges

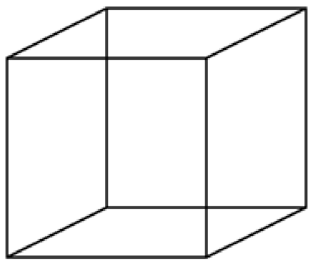


Look at the cuboid;
With your partner write the number of faces.

3.6 Making cubes and cuboids

Cube

A cube is a box-shaped solid object that has six identical square faces.

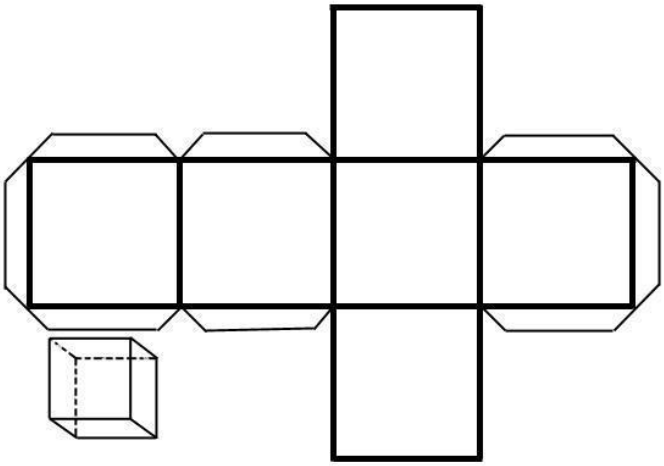


Steps to follow:

1. Draw the net below on your choice of material, whether it be paper, cardboard or paper-board.

   Make sure all sides of each square are the same size, as well as making the flaps similar. Consistency and correct measurements are key here.

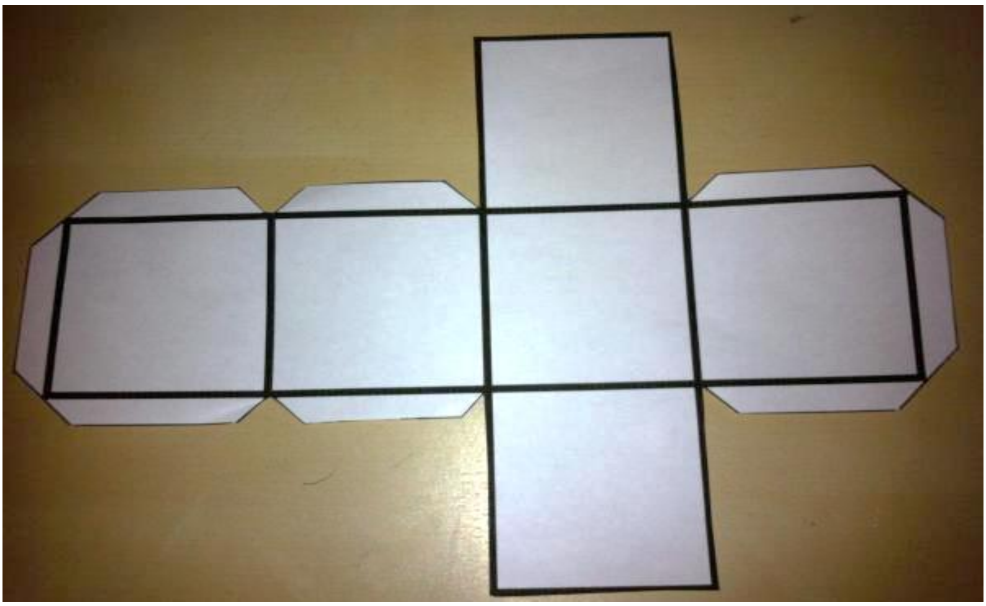
   We have used thick lines to easily show what to do as a guide.



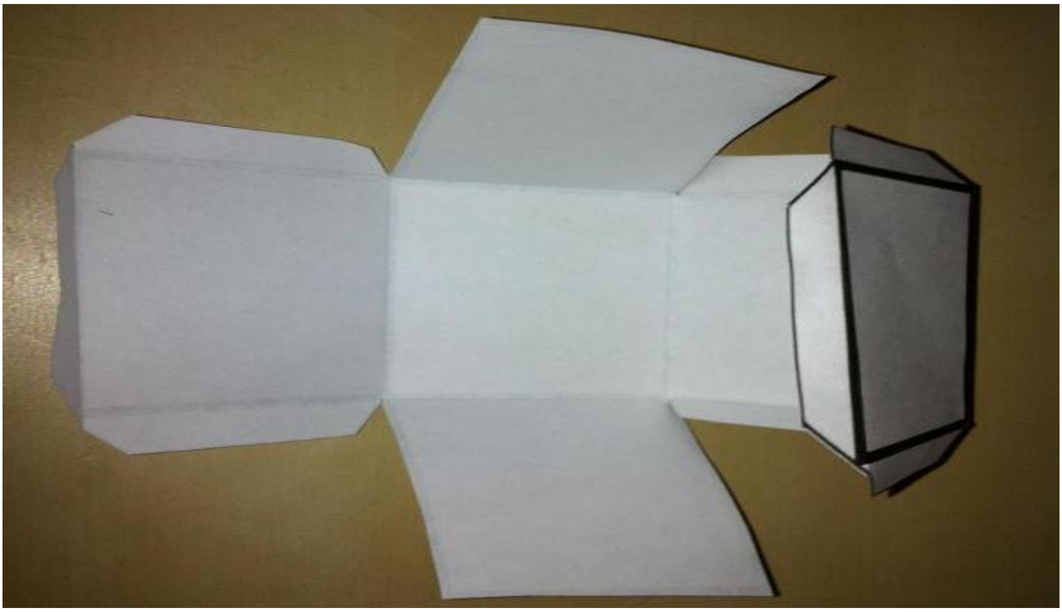
2. Cut out the cube net with scissors. This is the most convenient method.

However, you could also use a razor and ensure your surface does not get damaged.

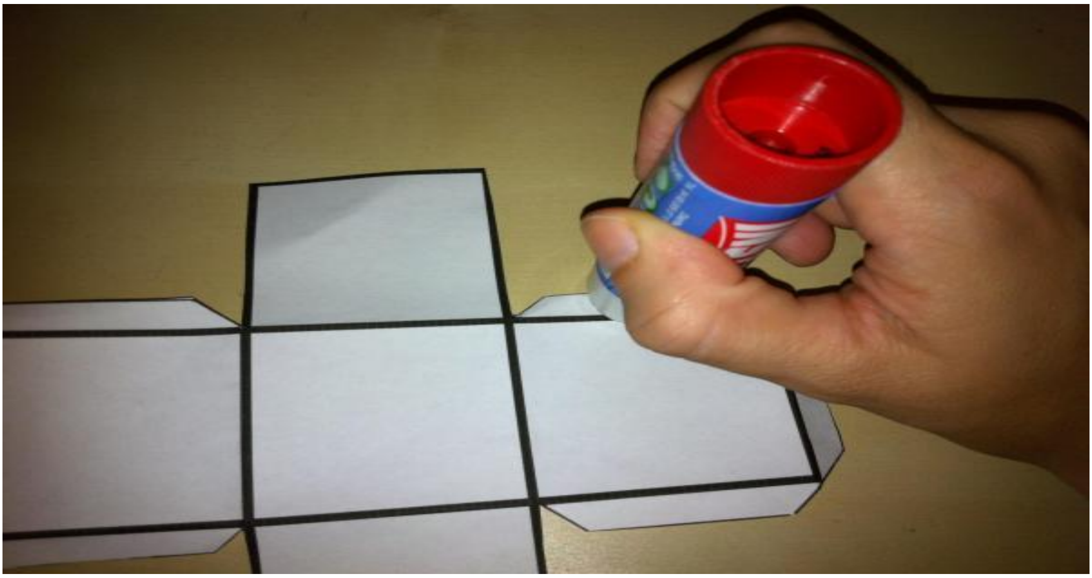
When working with blades of any kind you must ensure safety.



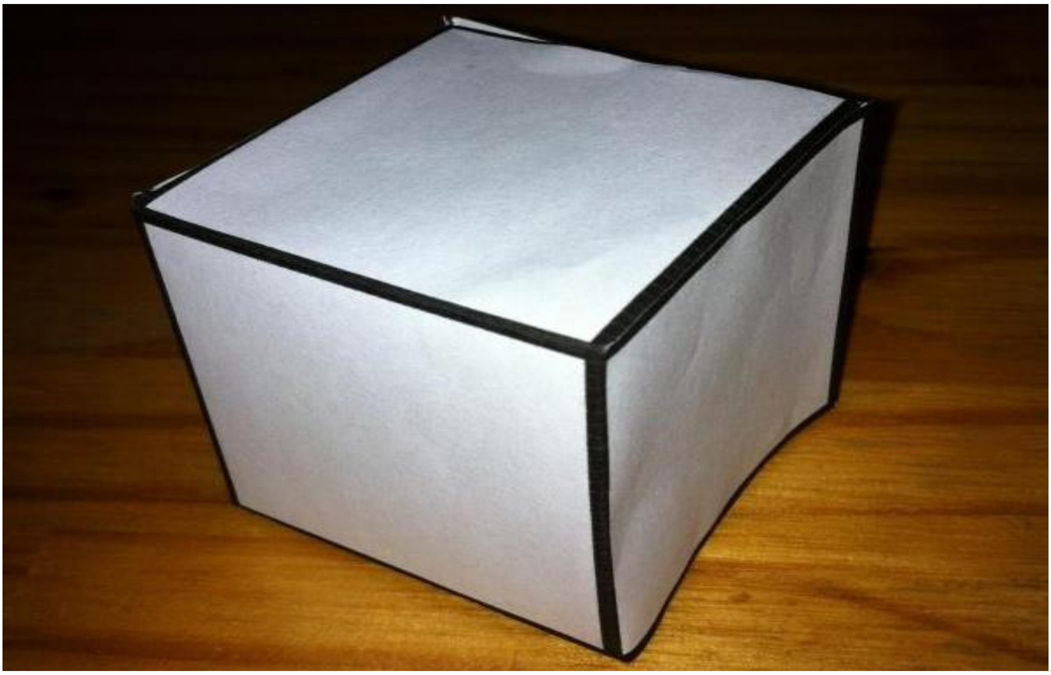
3. Fold along all lines of the net. Try mounting the cube before applying any glue to be sure that each tab fits in and the template has been measured and cut accurately.



4. Put glue on one of the tabs and paste it into place. Press it so that it is well attached. Do the same with the other sides.



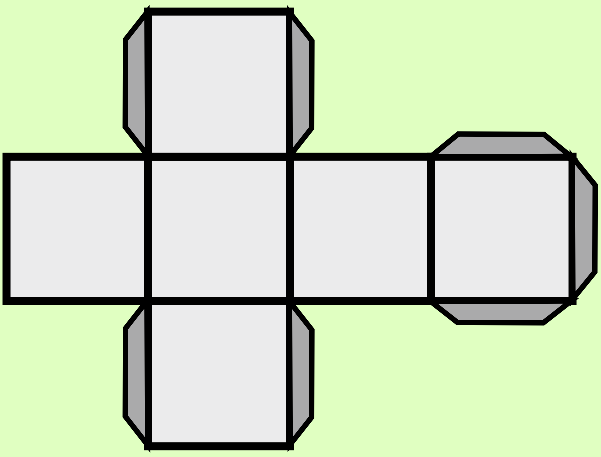
5. Then you have made your cube.



Activity 6.

Draw and cut out the net diagram below.

Apply glue to the dark parts and fold the edges.



What object did you make?

How many sides does it have?

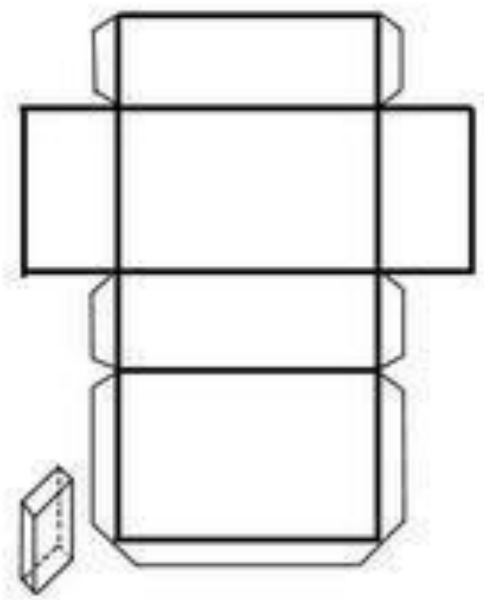
Cuboid

A cuboid is a box-shaped solid object. It has six flat sides and all angles are right angles.

All of its faces are rectangles.

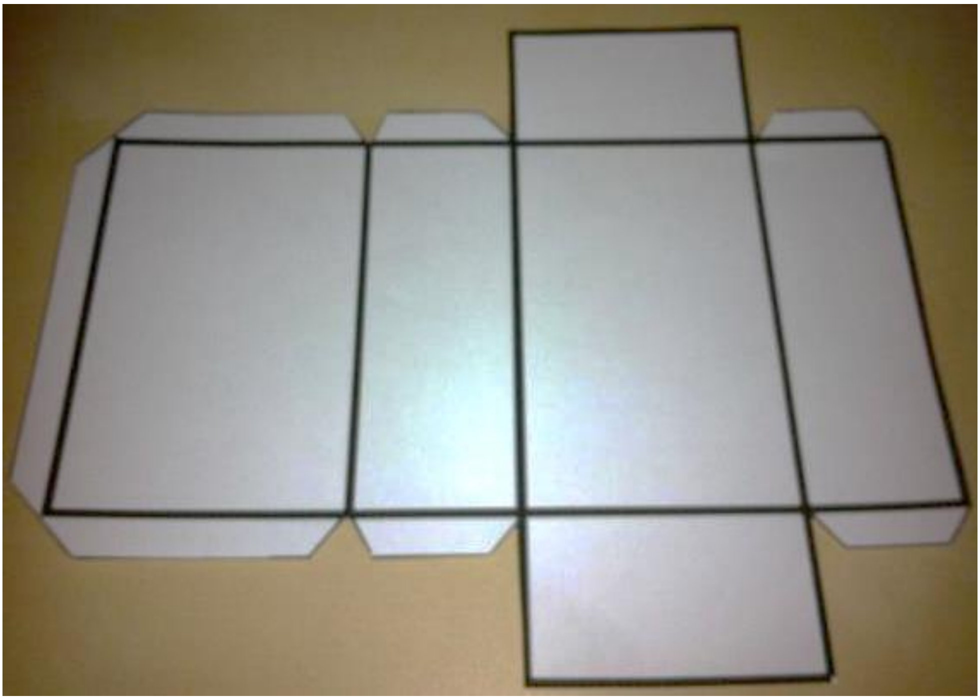
Steps to follow:

1. Copy this cuboid net on paper or cardboard. We have used thick black lines so that we can easily identify where to fold.



2. Cut out the cuboid net with scissors. The tabs on the side of the cuboid net designed to seal the cuboid tight when you glue them.

They are cut at 45º angles so that they all fit snugly together.



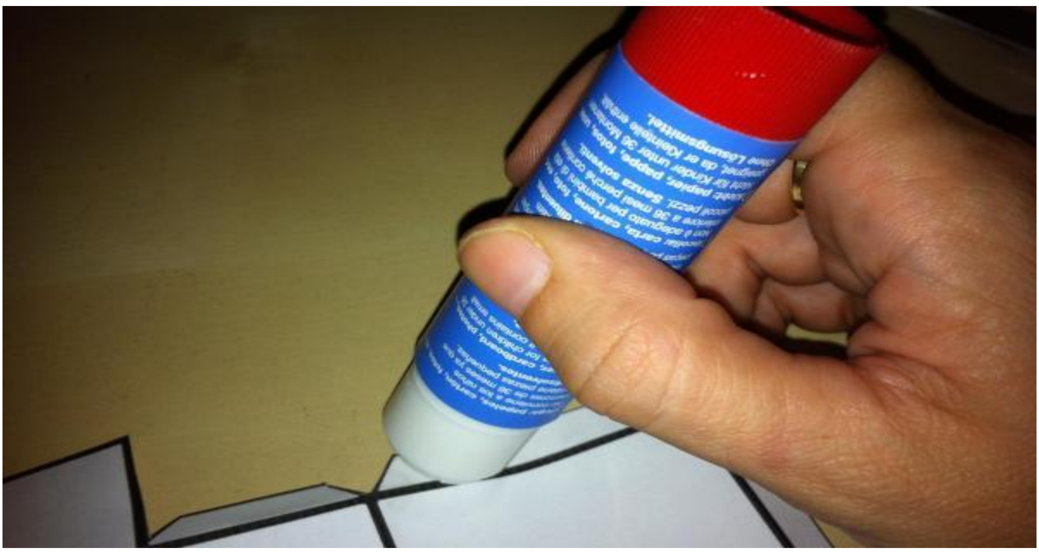
3. Fold along all the lines of the template. Try to put the rectangular prism together before adding glue to be sure where each tab will go.

We do this to make sure the cuboid net has been drawn and cut out correctly.

Depending on how we want to use our cuboid, we should consider which type of material we want to make it from.

4. Put glue on one of the tabs of the sides of the cuboid net and paste it into place.

Press it, so that it is well attached. Do the same with the other sides.

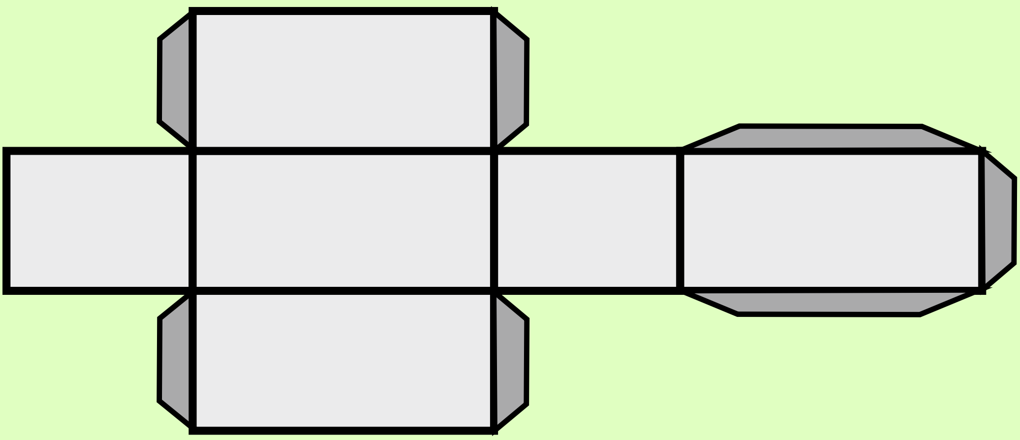


5. Once all the tabs have been glued into place, check that the shape is properly rectangular and there you have it, your cuboid from paper.

Activity 7.

Draw and cut out the net diagram below.

Apply glue to the dark parts and fold the edges.



What object did you make?

How many sides does it have?

3.7 Conversion of length

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

Example 2.

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

These common measurements that we use are:

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

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

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

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

1 centimetre = 10 millimetres

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

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

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

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

1 metre = 100 centimetres

The length of this guitar is about 1 metre

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

And because a centimetre is 10 millimetres:

1 metre = 1000 millimetres

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

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

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

Example 3.

Convert 298 cm to m

100 cm = 1 m

298 cm = 298

100

= 2.98 m

Convert 2.98 m = cm

1 m = 100 cm

2.98 m = 2.98 × 100

= 298 cm

Exercise 3:

In groups, convert the following.

1. Centimetres to metres

a. 9200 cm	b.4620 cm	c.6426 cm	d.2130 cm
e.7718 cm	f.976 cm	g.3580 cm	h.5800 cm
i.25.3 m			

2. Metres to Centimetres

a.83.6 m	b.17.45 m	c.79.21 m	d.28.64 m
e.87.9 m	f.3.49 m	g.3 m	

3.8 Writing scale in ratio form

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

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

Example 4.

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

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

Architects often write the scale of a drawing when drawing plans

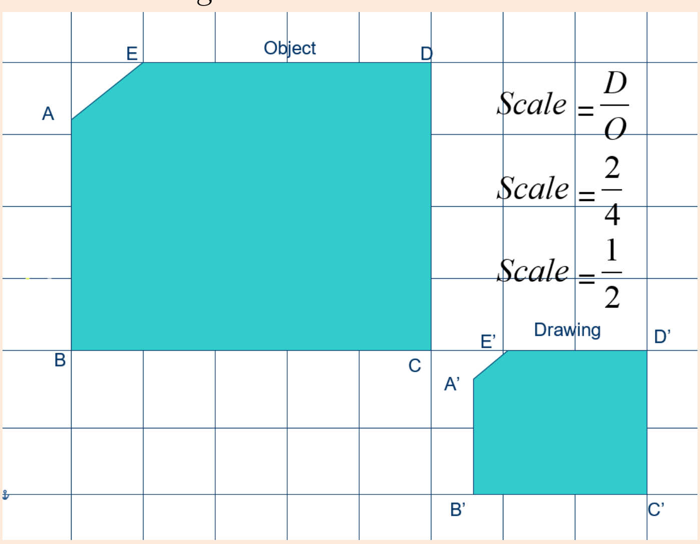
3.9 Making scale drawing.

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

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

Example 4.

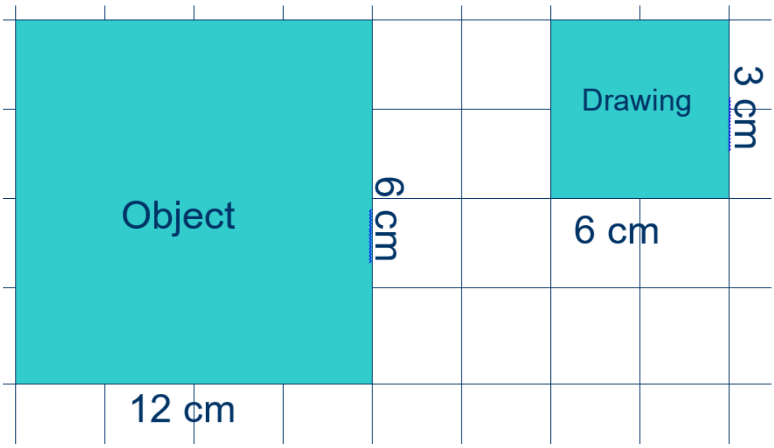
Find the scale of the drawing.



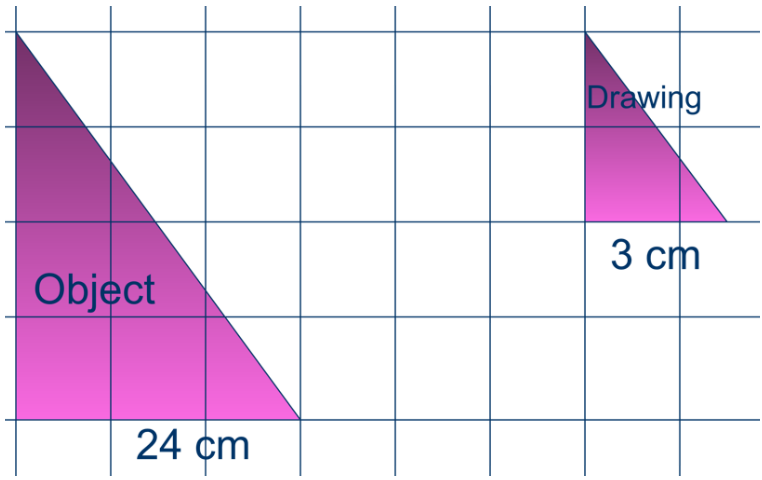
Exercise 4:

1. Find the scale of the following.

a.



b.



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

UNIT 4: ALGEBRA

4.1 Solving equations

We use this method to find the unknown.

Example 1.

Solve $4w + 2 = 18$

What do I add to 2 to get 18?

4w = 16

What do I multiply by 4 to get 16?

W = 4

Activity 1.

In pairs, solve the following equations.

a. $3z - 4 = 5$

b. $7p + 3 = 17$

c. $9y - 8 = 19$

d. $5y - 17 = 18$

e. $6e + 7 = 31$

f. $22f + 2 = 46$

Example 2.

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

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

Everything with the common denominator.

$4q - 10 = 30$

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

$4q = 40$

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

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

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

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

Activity 2.

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

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

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

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

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

4.2 Simplify algebraic equations

Example 3.

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

$(5y + 2y) + 14$	First combine the like terms.
$7y + 14$	Simplify.

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

$(3x \times y) + (3x \times 1) + (3x \times 2y)$	First multiply everything by 3x to remove the bracket.
$3xy + 3x + 6xy$	Combine the like terms together.
$9xy + 3x$	Simplify.

Activity 3.

In groups, simplify the following equations

a) $7y + 9y + 6$

b) $2x\ (2 + 7y + 2y)$

c) $3x + 6 = 2x$

Example 4.

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

$(4\ x\ y) + (4\ x\ 4) + (2\ x\ y) - (2\ x\ 6) - 4z$	First you have to remove the brackets, by multiplying by the number outside each bracket.
$4y + 16 + 2y - 12 - 4z$	
$4y + 2y + 16 - 12 - 4z$	Put like terms together.
$6y + 4 - 4z$	Answer

Activity 4.

In groups, solve the following equations and show your working

a) $8(2y + 3x) - 2(y + 6x)$

b) $y(5 + 2x) + 2(2 - y)$

c) $2(3x - 4) + x(2 + y)$

d) $3(4y - 6) + 2(4 - y)$

Exercise 1:

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

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

Example 5.

Write each phrase as an algebraic expression.

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

Activity 5.

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

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

Word problems

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

Example 6.

Find three consecutive numbers whose sum is 216.

Solution:

1. Understand the problem

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

2. Write the variable

Let "x" represent the first number

So, x = First number

$x + 1$ = Second number

$x + 2$ = Third number

3. Write the equation

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

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

$3x + 3 = 216$

4. Solve the equation

Subtract 3 from both sides

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

$3x = 213$

Divide each side by 3

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

$x = 71$

5. Check your answer

First number + Second number + Third number = 216

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

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

$71 + 72 + 73 = 216$

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

Example 7.

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

Solution:

1. Understand the problem

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

2. Write the variable

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

3. Write the equation

Length × Width = Area

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

4. Solve the equation

$2x^2 =$ Area

$2x^2 = 72$

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

$x2 = 36$

$x = 6$

x = Length

So, the length is $6\ cm$

The width is twice its length

$2x = 2\ x\ 6 = 12$

So, the width is 12 cm

5. Check your answer

The length is 6 cm and width is 12 cm

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

$2 \times (\text{Length} + \text{Width})$

$2 \times (6 + 12) = 2 x 18 = 36\ cm$

Exercise 2:

Using the strategy shares, solve the equations below;

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

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

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

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

c) 8 less than twice a number is twelve.

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

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

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

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

UNIT 5: STATISTICS

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

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

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

5.1 Reading and interpretation of data from tables

What is 'interpreting data?

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

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

Tables

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

This is used in preparing data for interpretation.

Example 1.

Table example

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

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

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

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

Tally marks and frequency tables

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

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

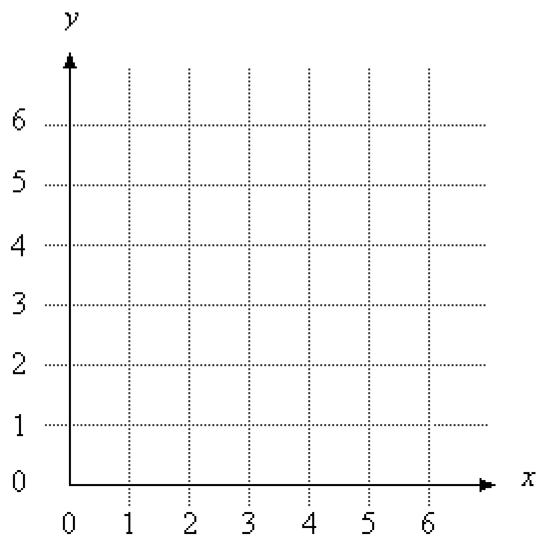
In the second column of the table below, we have used tally marks to keep track of how many bikes we have sold.

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

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

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

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



Scale

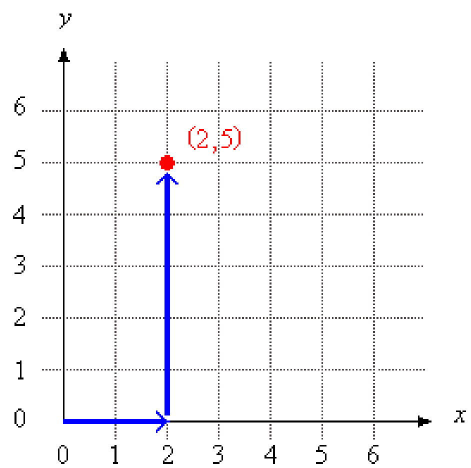
The scale is what you mark on the axes. It is the relation between the units you're using, and their representation on the graph i.e., the distance between marks.

In the graph on page 73 the scale is 1 square box represents 1 unit.

Co-ordinates

The numbers on a coordinate grid are used to locate points. **Ordered pair** of numbers is a number on the x-axis called an ***x*-coordinate**, and a number on the y-axis called a **y-coordinate**. Ordered pairs are written in parentheses (x-coordinate, y-coordinate). The origin is located at (0,0)..

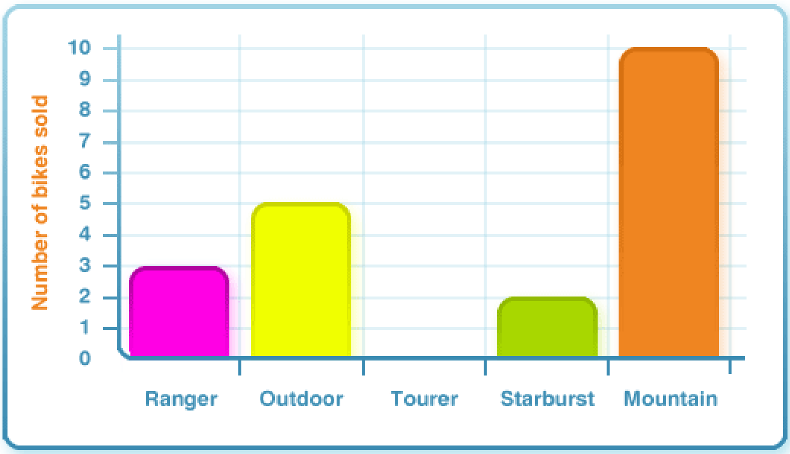
The location of (2,5) is shown on the coordinate grid below. The x-coordinate is 2. The y-coordinate is 5. To locate (2,5), move 2 units to the right on the x-axis and 5 units up on the y-axis.



Bar charts

Bar charts are one way of showing the information from a frequency table.

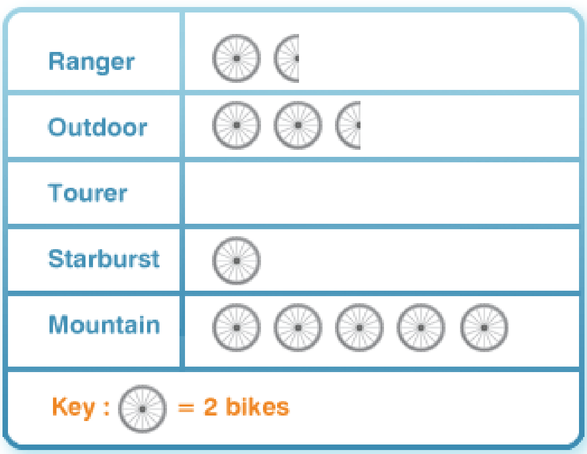
This bar chart represents the data from the table on the previous page:



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

Pictograms

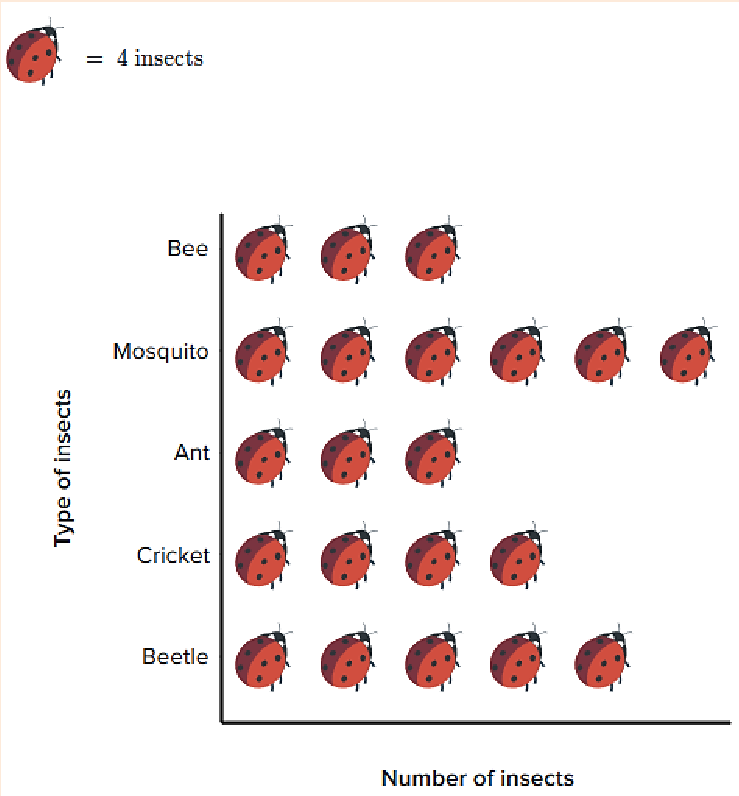
A picture graph is a type of graph that uses pictures and symbols to represent data.



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

Example 2.

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



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

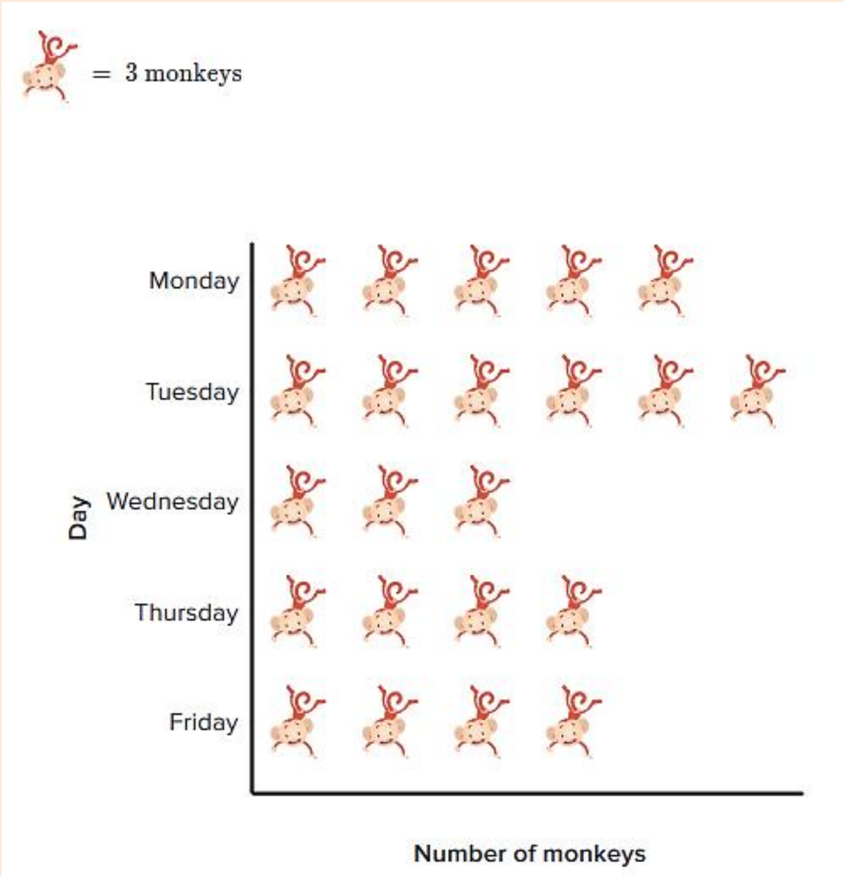
   Beetle

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

   Cricket

Example 3.

Lopir loves animals. The picture graphs below show the number of monkeys and seals Lopir counted at the zoo last week.



On which day did Lopir count fewer monkeys?

Wednesday

On which day did Lopir count more monkeys?

Tuesday

On which days did Lopir count same number of monkeys?

Thursday and Friday

Pie charts

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

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

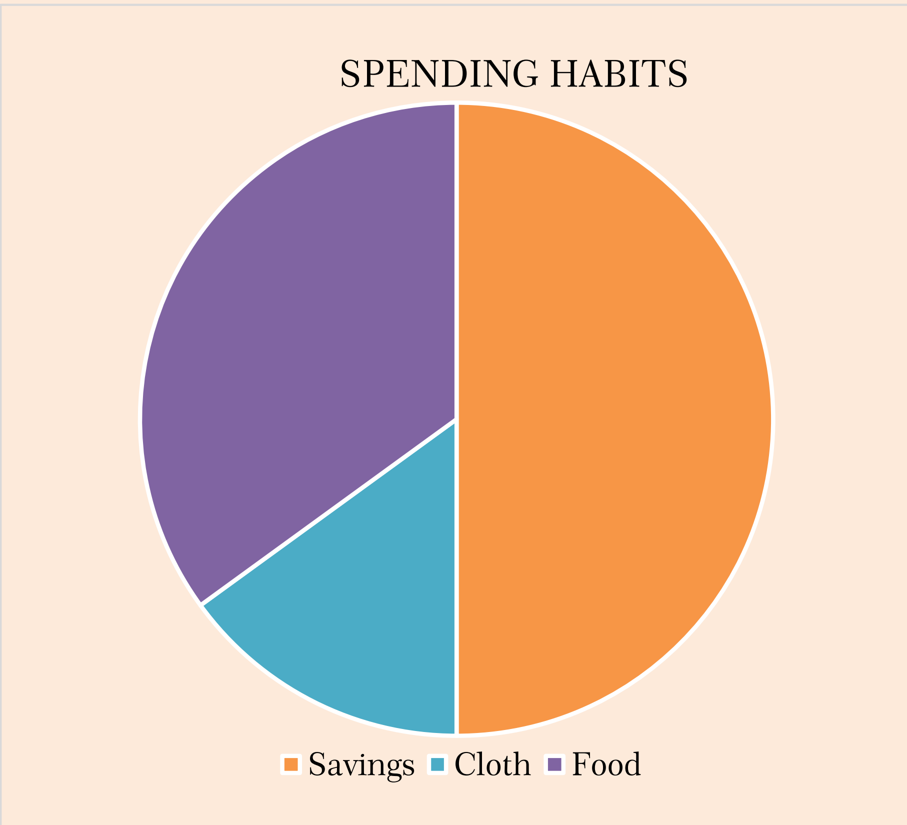
Each section shows what part of 100 that item represents.

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

The colours are used to show different segments.

Example 4.

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



What percent is not spent on saving?

Solution:

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

First, look at the wedge that represents savings.

The orange wedge represents the amount spent on savings.

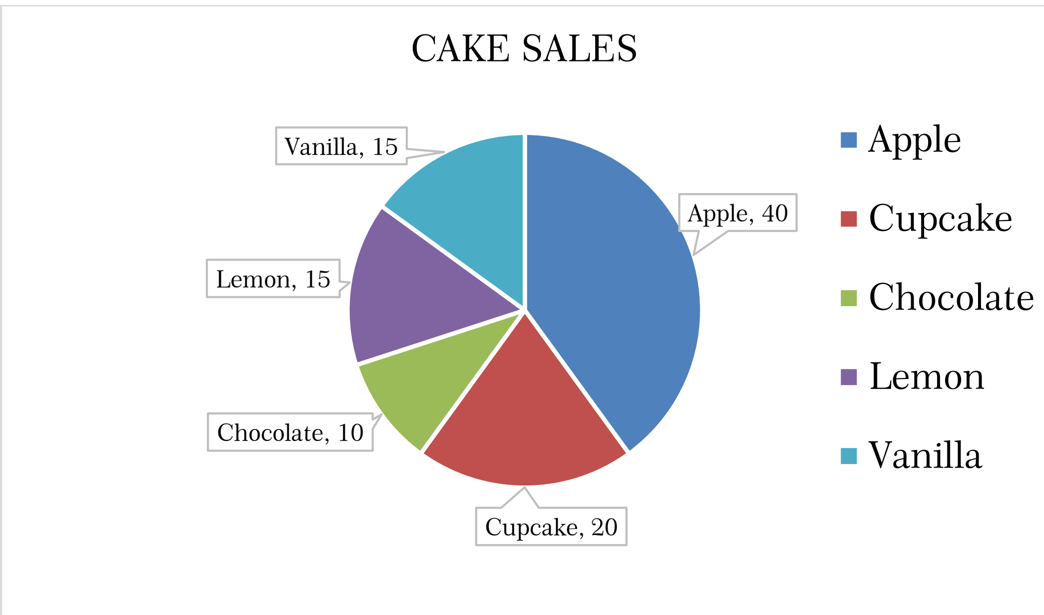
Then, determine about how much of the total is spent on savings.

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

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

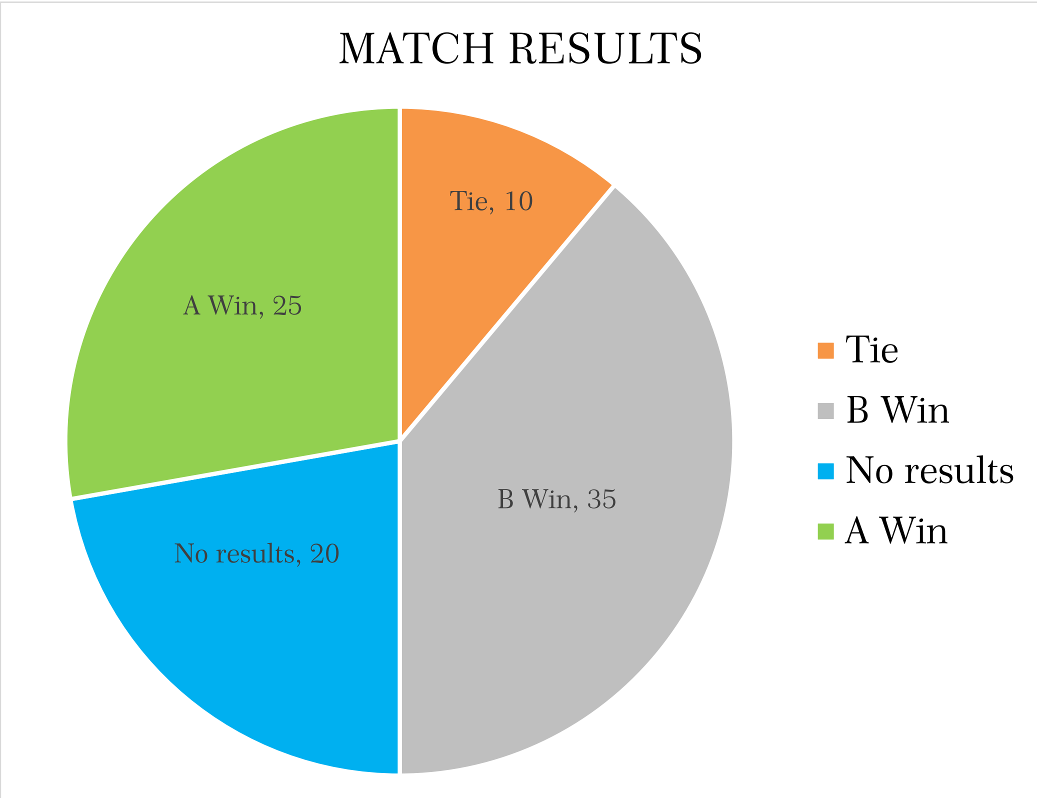
Exercise 1:

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



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

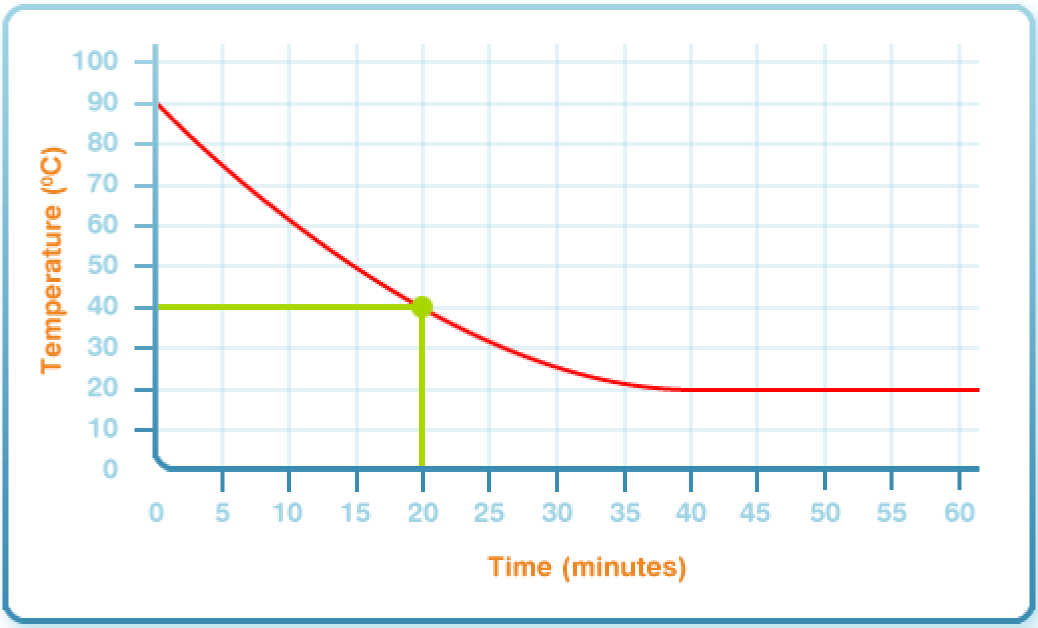
2. Two Teams A & B played some matches. Here are the results:



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

Line graphs

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



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

To find the temperature of the drink after 20 minutes:

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

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

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

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

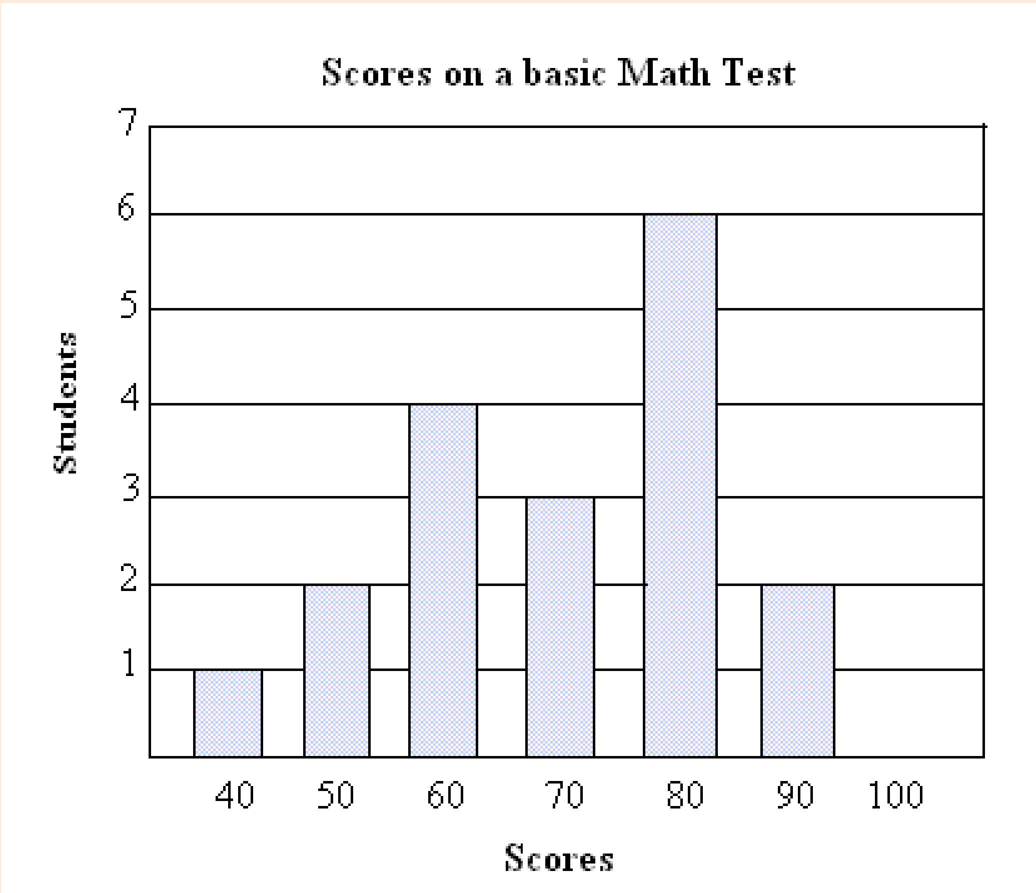
Activity 1.

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

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

Example 2.

Use the bar graphs below to answer the following questions:



What is the scale of the graph?

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

What is the title of the graph?

The title is "score on a basic math test"

How many student scored 80?

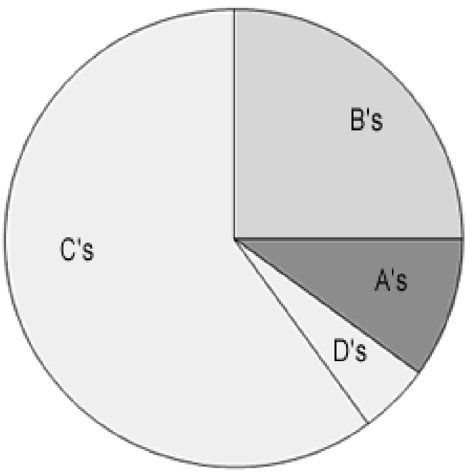
6 students score 80

How many students got 60 on the test?

4 students score 60

Exercise 2:

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



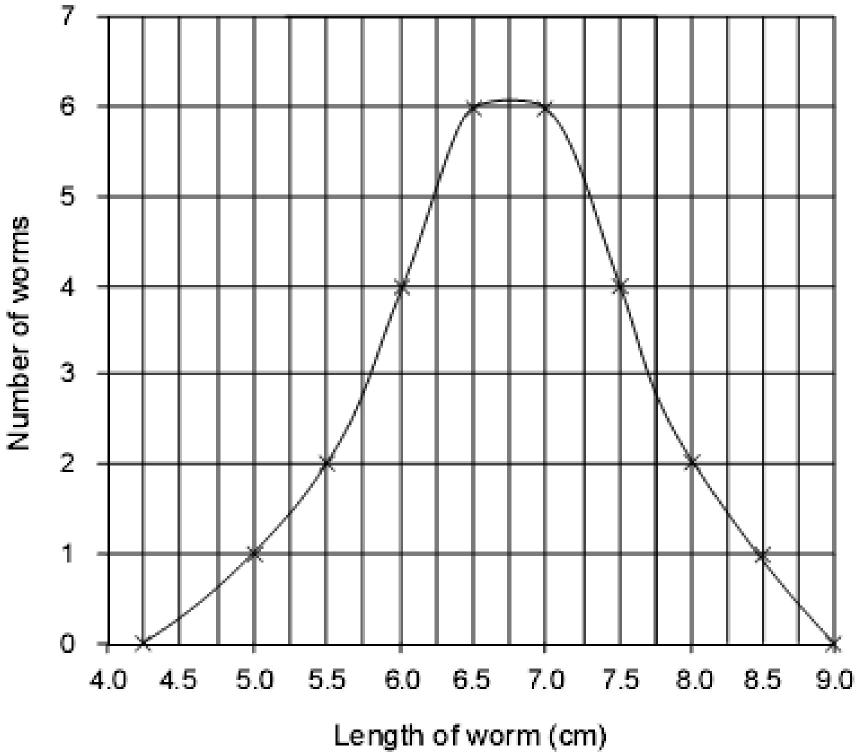
a) Which grade did the largest percentage of learners receive?

b) The smallest percentage of learners received what grade?

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

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

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



With your partner discuss and answer the following questions.

a) What length of worm is most common?

b) What was the longest worm found?

c) How many worms were 6 cm long?

d) How many worms were 7.25 cm long?

e) The peak of the curve represents?

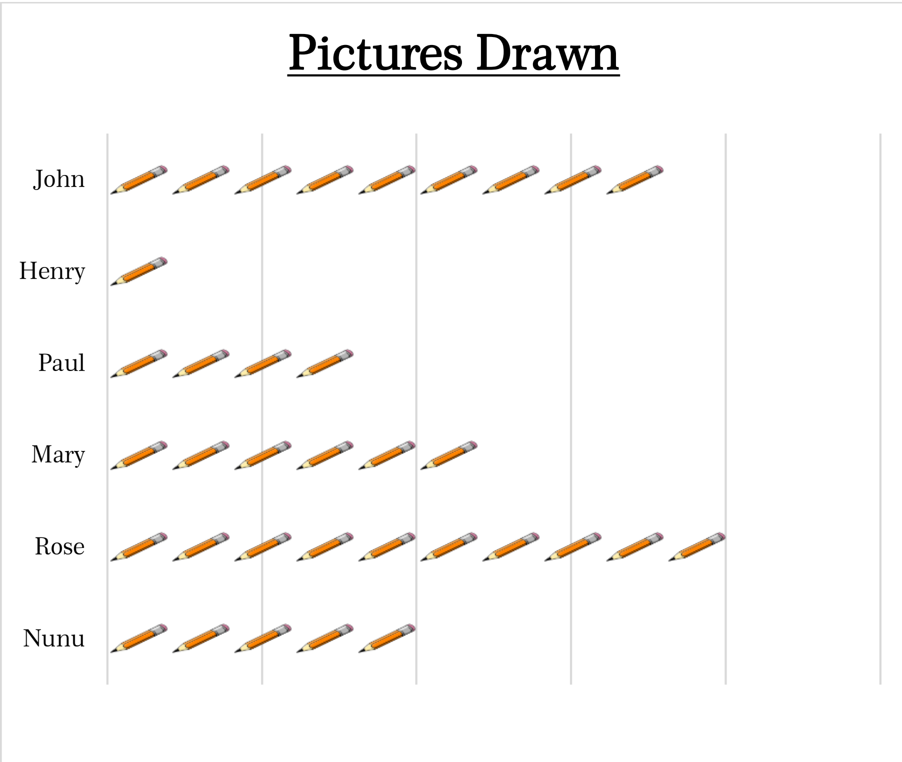
Activity 2.

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

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

Exercise 3:

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



 = 2 pictures drawn

a) Who drew the most pictures?

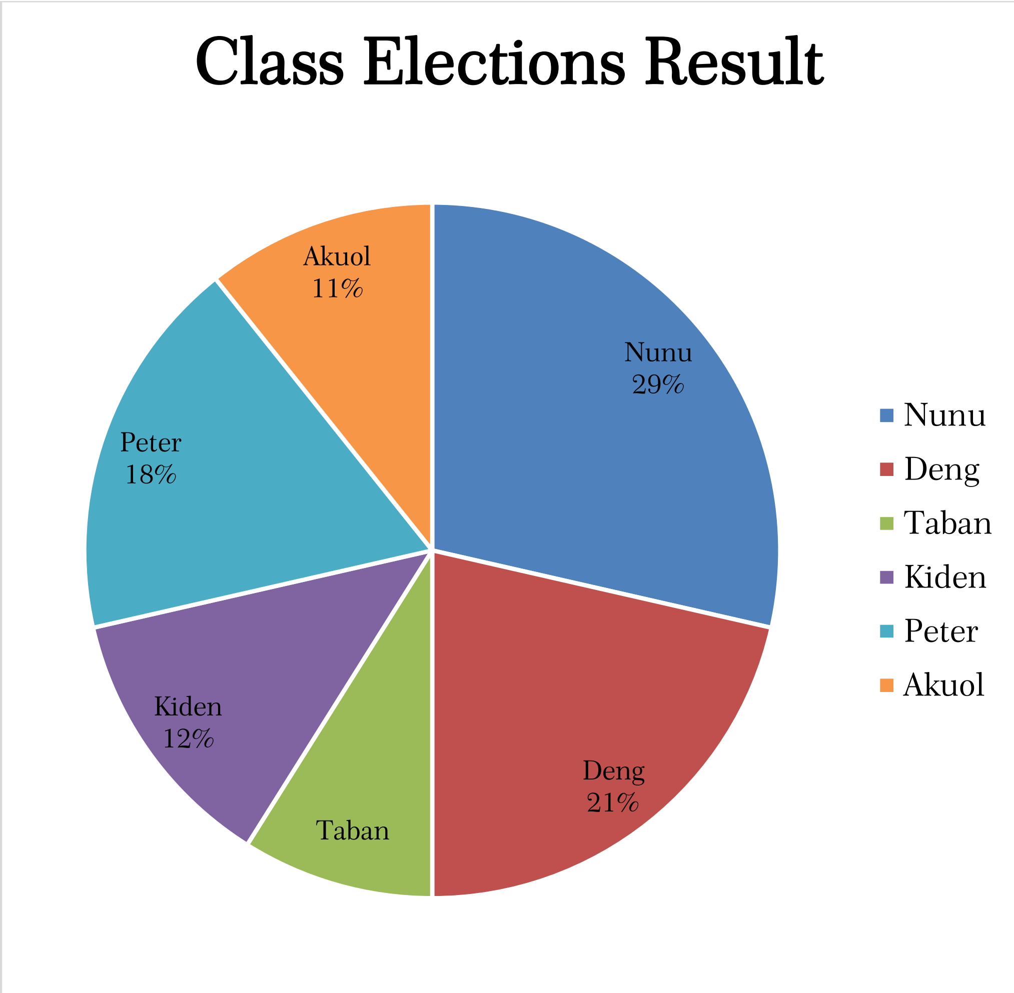
b) Who drew the fewest pictures?

c) Did Mary or Nunu draw more pictures?

d) How many pictures did Henry draw?

e) How many pictures did Paul draw?

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



a) Who won the election?

b) Who got the least number of votes?

c) What percent of people voted for Kiden?

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

e) Which two candidates had about half the votes?