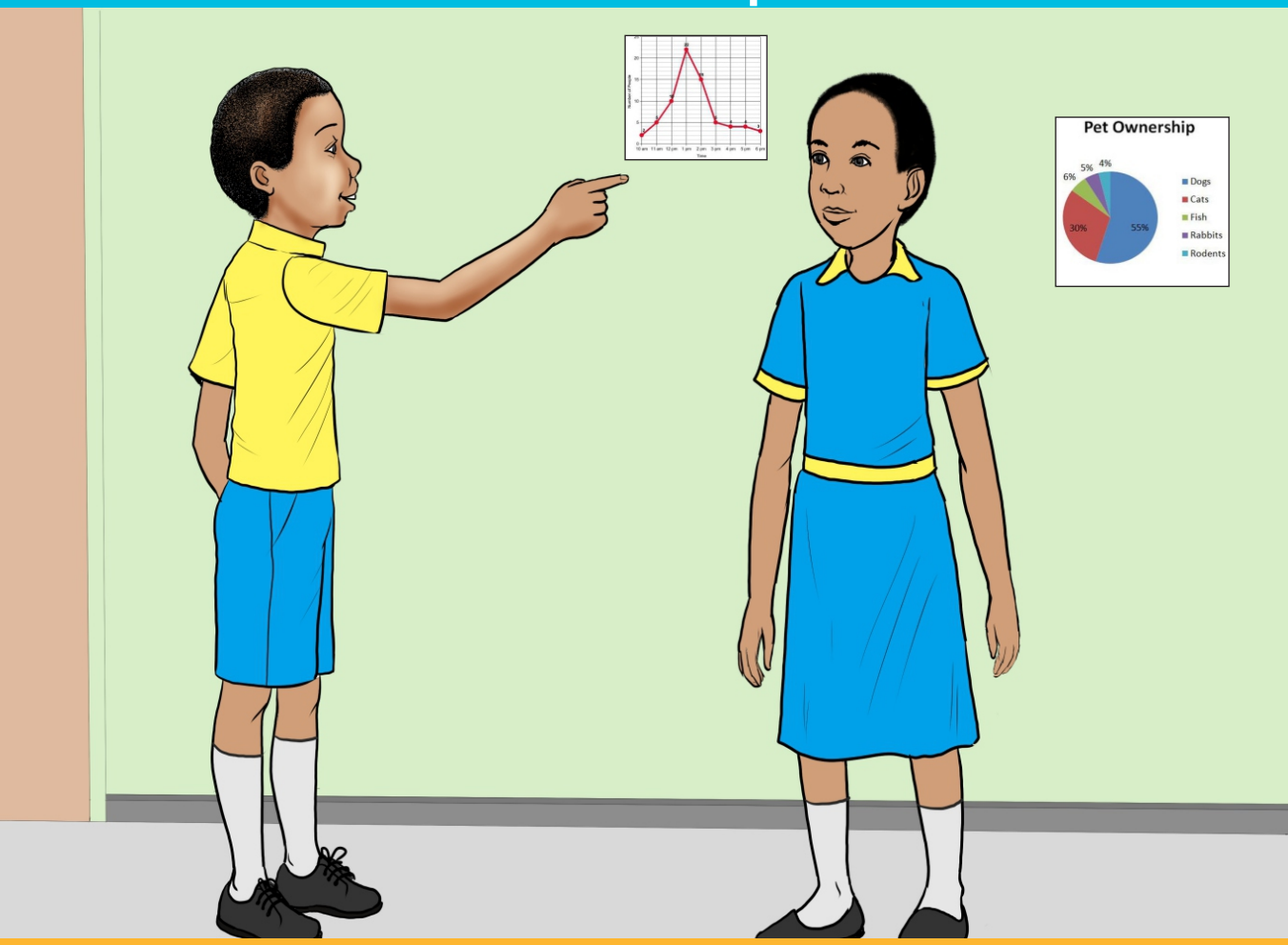
South Sudan

Primary Mathematics 5

Pupil's Book



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8. **Do not use your book as a seat.**

South Sudan

PRIMARY 5

Mathematics

Pupil's Book 5

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UNIT 1 NUMBERS

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

With the help of the teacher,

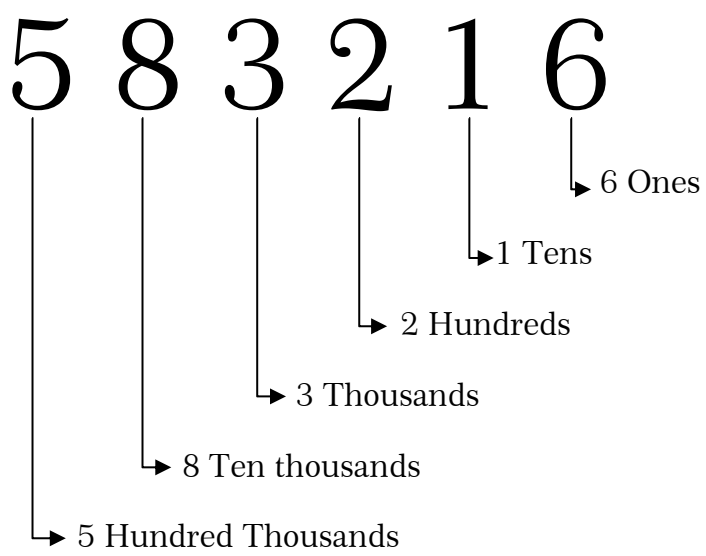
Tell your partner the biggest number you know.
Tell your partner the smallest number you saw.
Write them down in figures and in numbers.

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

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

Example 1.

583216



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

Activity 1:

In groups of 4, make a pack of 10 flash digit cards.

Shuffle the cards and take in in turns to draw 3 digits at a time. Place the cards in the middle of your group and then read aloud the number that you have made together.

Now place the cards back into the pile, shuffle and repeat the activity. Once you are confident at making 3 digit numbers, move on to shuffle and make 4 digit numbers, then 5 digit number and finally 6 digit numbers.

Now go back to 3 digit numbers. Pull out 3 numbers to make one number, then make two more 3 digit numbers from the remaining cards. Read aloud the three numbers that you have made and then order them from smallest to largest number. Repeat this.

Now move into pulling out 2, 4 digit numbers. Say them aloud and order them so that you have a small and larger number.

Individually.

In your books, write these groups of numbers in ascending order.

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

Exercise 1.

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

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

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

a. Which state has the largest population? b) Which state has the smallest population?
b. Which state is almost half the size of Central Equatoria?
c. Which state has an area of about 43 000

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

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

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

Activity 2:

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

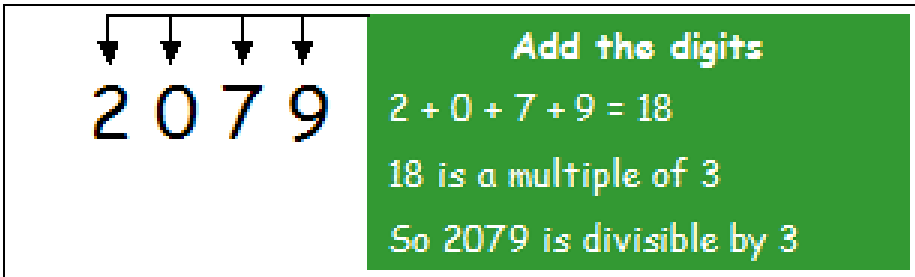
Number	Item	Price (SSP)
1	Sugar 50kg	
2	Rice 50kg	
3	Wheat flour 50Kg	
4	Beans 50Kg	
5	Maize 50Kg	

a. What is the cost of the most expensive item? What is it?
b. What is the cost of the least expensive item? What is it?
c. What do you notice about the costs of items?

1.2 Divisibility tests of numbers 3, 4, 6 and 9

Divisibility test of 3

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



Number	Divisible?	Why?
405	Yes	4 + 0 + 5 = 9 (9 is a multiple of 3)
381	Yes	3 + 8 + 1 = 12 (12 is a multiple of 3)
928	No	9 + 2 + 8 = 19 (19 is *not* a multiple of 3)
4,616	No	4 + 6 + 1 + 6 = 17 (17 is *not* a multiple of 3)

Example 2.

381 (3+8+1=12, and 12÷3 = 4) Yes

217 (2+1+7=10, and 10÷3 = $3\ ^{1}/_{3}$) No

This rule can be repeated if needed.

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

Activity 3:

In pairs;

1. Identify which of the following numbers are divisible by three.

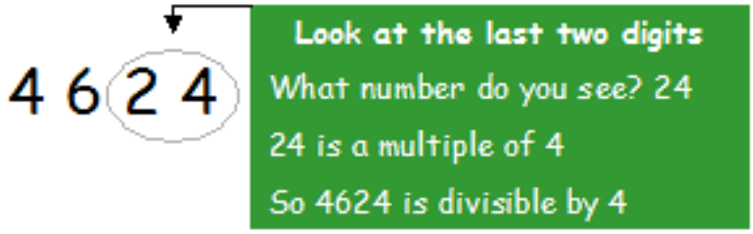
   a. 2916 b. 39 c. 1008 d. 927 e. 143,706

2. You have got 96 questions for homework and you have three days to do them. You want to do the same number of questions on each day.

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

Divisibility test of 4

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



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

Example 3.

13**12** is (12÷4=3) Yes
70**19** is not (19÷4=4 $^{3}/_{4}$) No

Another way to identify if a number is divisible by 4 especially for small numbers.
Halve the last two digits of a number twice and if the result is still a whole then the number is divisible by 4.
$\frac{12}{2}$= 6, $\frac{6}{2}$ = 3, 3 is a whole number. Yes

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

Activity 4:

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

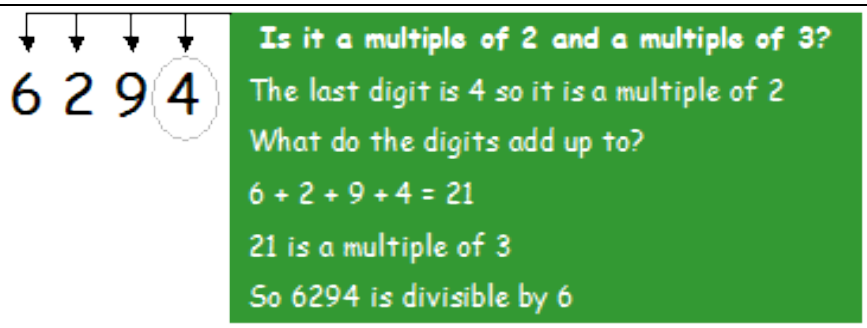
Divisibility test of 6

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

Example 4.

114 (it is even, and 1+1+4=6 and 6÷3 = 2) Yes

308 (it is even, but 3+0+8=11 and 11÷3 = 3 $^{2}/_{3}$) No



Number	Divisible?	Why?
5,106	Yes	The last digit is a 2 (it is a multiple of 2) and... 5 + 1 + 0 + 6 = 12 (12 is a multiple of 3)
636	Yes	The last digit is a 6 (it is a multiple of 2) and... 6 + 3 + 6 = 15 (15 is a multiple of 3)
5,912	No	The last digit is a 2 (it is a multiple of 2) *but*... 5 + 9 + 1 + 2 = 17 (17 is *not* a multiple of 3)
508	No	The last digit is a 8 (it is a multiple of 2) *but*... 5 + 0 + 8 = 13 (13 is *not* a multiple of 3)

Activity 5:

1. In pairs, identify which of the following numbers are divisible by six. Explain how do you work it out.

a. 408 b. 1 364 c. 189 024 d. 103 e. 10 230

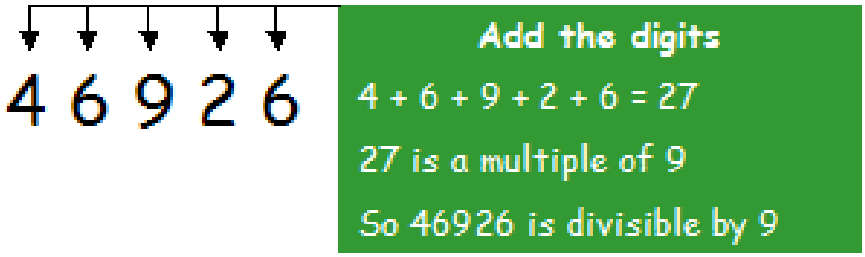
2. Our class teacher had 294 bottle tops and she wanted to share them equally to 6 learners. Use the divisibility test of 6 to check if she was able to share the bottle tops equally. Show your working out.

3. You and five friends have 294 mangoes and you want to share them equally. Use the divisibility test of 6 to check if you can share equally. Show your working out.

Divisibility test of 9

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

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



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

Example 5.

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

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

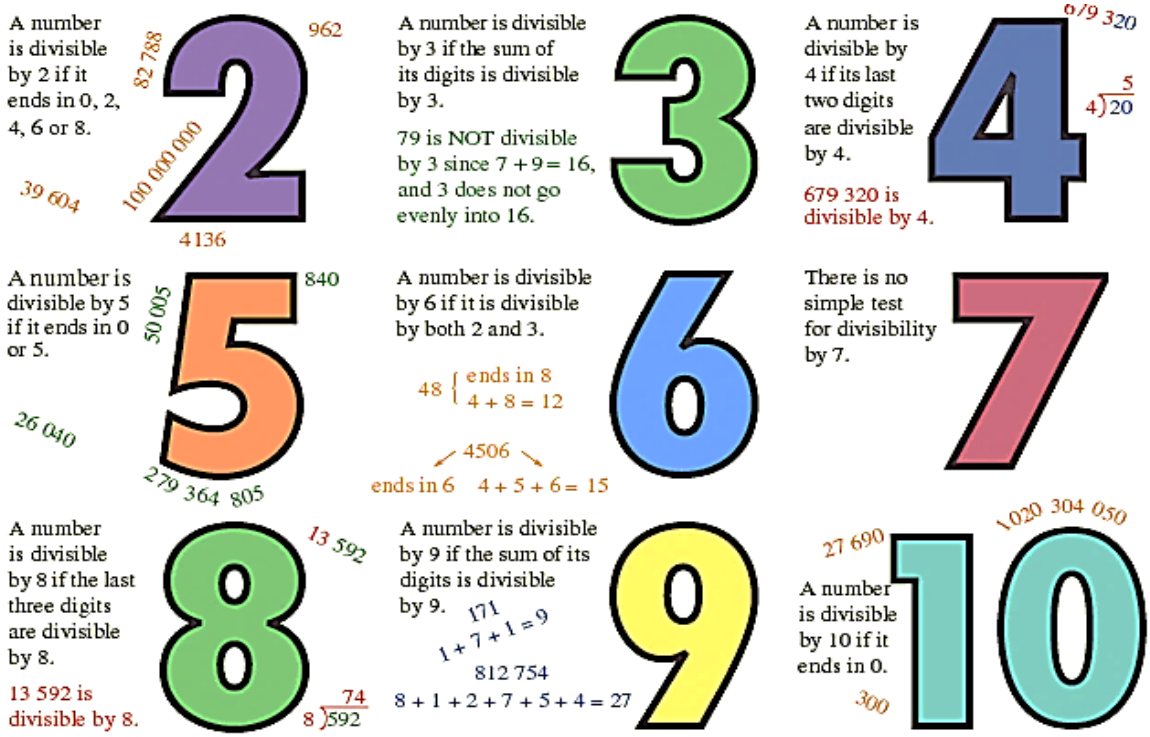
Activity 6:

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

   a. 729 b.788 c. 913 680 d. 554 704

2. A farmer had 636 kg of animal feed and 9 cows. Use the divisibility test of 9 to check if the farmer can divide the animal feed equally.

3. What if you and 8 friends wanted to share 12 candies equally? Draw a picture showing how the candies can be shared.



Exercise 2.

Work in pairs;

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

A 3 B 4 C 6 D 9

Ca you explain your answer to your partner

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

A 5 994 B 5 996

C 5 992 D 5 990

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

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

is divisible by:

A 3 B 4 C 6 D 9

4. Check whether the following are divisible by 3

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

5. Check whether the following are divisible by 4

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

6. Check whether the following are divisible by 6

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

7. Check whether the following are divisible by 9

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

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

1.3 Prime numbers

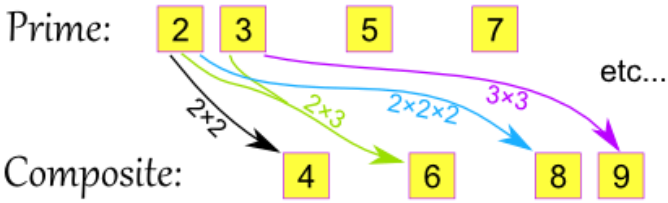
A prime number is any number that can be divided evenly by 1 or itself.

Example 6.

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

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

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



Example 7.

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

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

Whole numbers above 1 are either prime or composite.

Exercise 3.

1. How many different prime factors does the number 252 have?

A 2 B 3
C 4 D 5

2. Which of the following numbers is not a prime number?

A 101 B 103
C 105 D 107

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

A 18 B 19

C 20 D 21

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

A 67 B 69

C 71 D 73

1.4 Roman numbers and Hindu numbers up to 50

Roman Numbers

Roman numerals are based on the following symbols

1	5	10	50
I	**V**	**X**	**L**

Basic combination of numeral numbers is.

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

Example 8.

VI = V + I = 5 + 1 = 6

When a symbol appears after a large symbol it is added.

IX = X - I = 10 - 1 = 9

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

Activity 7:

In groups, identify the equivalent Roman numeral notations to the following. How will you work it out?

A 31 B 43

C 49 D 27

Converting numbers into roman notations.

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

Example 9.

Covert 34 to roman numerals.

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

10 = X 10 X 3 = 30 = XXX

5 = V

1 = I

5-1=4 V-I =IV

34 = XXXIV

Exercise 4.

1. Convert 21 to roman numerals.

2. Convert to roman numbers.

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

3. Covert to roman numerals.

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

Hindu – Arabic notation

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

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

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

1.5 Factor of numbers and their multiples

Factors are numbers we multiple together to get another number.

Example 10.

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

A number can have many factors.

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

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

Common factors of numbers

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

Example 11.

Factors of 12 and 30.

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

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

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

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

Activity 8:

In groups of three identify the factors of the following

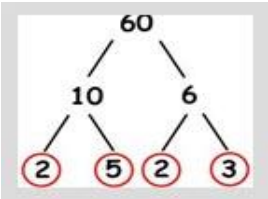
(A) 15 (B) 24
(C) 36 (D) 22

Explain how you worked it out.

1.6 How to find the HCF and the LCM of numbers

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

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



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

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

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

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

Exercise 5.

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

1. Ben has collected 6 T-shirts and 16 buttons from his favorite band. He wants to combine them into identical sets to sell, with no pieces left over. What is the greatest number of sets Ben can make?

2. Kamal has 6 cans of regular soda and 15 cans of diet soda. He wants to create some identical refreshment tables that will operate during the football game. He also doesn't want to have any sodas left over.
   What is the greatest number of refreshment tables that Kamal can stock?

3. At a family reunion, each of Sana's aunts and uncles is getting photographed once. The aunts are taking pictures in groups of 5 and the uncles are taking pictures in groups of 10.
   If Sana has the same total number of aunts and uncles, what is the minimum number of aunts that Sana must have?

4. Sapphire and Abe are shelving books at a public library. Sapphire shelves 5 books at a time, whereas Abe shelves 6 at a time.

   If they end up shelving the same number of books, what is the smallest number of books each could have shelved?
   What do you need to calculate? What method would you use and why? Can you estimate or predict the answer?

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

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

Example 12.

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

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

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

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

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

Example 13.

Real life example:

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

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

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

1.7 Add and subtract fractions using LCM

Addition of fraction using L.C.M

Example 14.

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

Find the L.C.M of denominators 3 and 6.
L.C.M of 2 and 3 is 6.
Divide each denominator by the L.C.M (i.e.) 6÷3= 2 multiply 2 numerator by 1 = 2× 1= 2.
Record 2 above L.C.M 6 then divide 6 by denominator 6.
6 ÷ 6= 1.
Multiply 1 by numerator 1 = 1.
Record 1 above L.C.M 6 and then add.

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

Exercise 6.

1. Use L.C.M to find the sum of the following fractions with different denominators. Show your working out.

   a) $\frac{1}{6}+\frac{1}{7}=$ b) $\frac{2}{9}+\frac{1}{2}=$ c) $\frac{3}{7}+\frac{2}{6}=$

   d) $\frac{2}{5}+\frac{1}{3}=$ e) $\frac{2}{4}+\frac{1}{3}=$ f) $\frac{1}{8}+\frac{1}{7}=$

   g) $\frac{2}{11}+\frac{1}{3}=$ h) $\frac{1}{12}+\frac{1}{9}=$ i) $\frac{1}{4}+\frac{1}{2}=$

2. Gachire did $\frac{1}{3}$ of his mathematics homework and $\frac{2}{5}$ of his homework in English. What was his total homework done in both English and Mathematics? Show your working out.
3. Abdul had $\frac{3}{5}$ of his mathematics marked and $\frac{1}{4}$ of Science marked by the teacher. What fraction of his work in Mathematics and Science was marked? Show your working out.
4. Amondo spent $\frac{1}{12}$ of her savings in one month and $\frac{1}{5}$ the following month. What fraction in her savings did she spend in the 2 months? Show your working out.

Subtraction of fractions using L.C.M

Example 15.

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

Find the L.C.M of 2 and 3

	2	3
2	1	3
3	1	1

- L.C.M of 2 and 3 is $2\times3=6$.
- Divide each denominator with the L.C.M $6\div2=3$ then multiply the result by the numerator so, 3×1.
- Record it above the denominator 6.
- Repeat the same with denominator 3.

Exercise 7.

1. Use L.C.M to work out the following: Show your working out.

   a) $\frac{2}{5} - \frac{1}{4} =$ b) $\frac{3}{4} - \frac{1}{5} - \frac{1}{8} =$ c) $\frac{1}{3} - \frac{2}{9} =$

   d) $\frac{2}{3} - \frac{3}{10} - \frac{1}{5} =$ e) $\frac{3}{4} - \frac{5}{7} =$ f) $\frac{2}{3} - \frac{1}{5} - \frac{1}{4} =$

   g) $\frac{5}{6} - \frac{1}{7} - \frac{1}{3} =$ h) $\frac{2}{3} - \frac{2}{4} =$ __ or __ i) $\frac{2}{5} - \frac{2}{7} =$

   j) $\frac{2}{4} - \frac{2}{9} =$

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

1.8 Fractions and decimals

Converting decimals into factions.

1) Write down the decimal divided by 1 $\left(\frac{0.5}{1}\right)$

2) Multiple both top and bottom by 10 for every digit after the decimal point. $\left(\frac{0.5\times10}{1\times10}\right)$

3) Simplify the fraction. $\left(\frac{5}{10} = \frac{1}{2}\right)$

Example 16.

Convert 0.75 to a fraction.

$$\frac{0.75}{1}$$

Multiple both top and bottom with a hundred because in this case there are two digits after the decimal point.

$$\frac{0.75}{1} = \frac{75}{100} \quad (\times 100 \text{ top and bottom})$$

Simplify the fraction

$$\frac{75}{100} = \frac{15}{20} = \frac{3}{4} \quad (\div 5 \text{ top and bottom, then } \div 5 \text{ top and bottom})$$

Answer $= \frac{3}{4}$

Activity 9:

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

1. 0.625
2. 2.35
3. 0.333

Exercise 8.

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

a) 0.2 b) 0.04 c) 0.27 d) 1.25 e) 5.62

f) 2.1 g) 0.75 h) 0.48 i) 1.7 j) 8.21

Convert fraction into a decimal

1. Find a number you can multiply by the bottom of the fraction to make it 10, 100 or 1,000.

2. Multiply both top and bottom by that number.

3. Then write down just the top number, putting the decimal point in the correct spot (one space from the right hand side for every zero in the bottom number).

Example 17.

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

We can multiply 4 by 25 to become 100

Multiply top and bottom by 25:

$$\frac{3}{4} \overset{\times 25}{=} \frac{75}{100}$$

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

Answer = 0.75

Activity 10:

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

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

Exercise 9.

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

a) $\frac{3}{10}$ b) $\frac{13}{20}$ c) $\frac{7}{10}$ d) $\frac{9}{40}$ e) $\frac{9}{25}$ f) $\frac{1}{5}$

g) $\frac{7}{8}$ h) $\frac{18}{52}$ i) $\frac{12}{33}$ j) $\frac{8}{22}$ k) $\frac{9}{74}$ l) $\frac{10}{36}$

Unit Revision Exercise

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

2) Workout the following

a) 3456 + 1313 b) 280 + 519 c) 5067 + 994

3) Work out the following.

a) 6748 - 3425 b) 8953 - 247 c) 9125 - 4192

4) Work out the following (— = divide)

a) $\frac{4824}{3}$ b) $\frac{1458}{9}$ c) $\frac{4080}{4}$

5) Write the following numbers in words.

a) 19 241 b) 102 340 c) 241 124

6) Write the following in numbers.

a) Twenty thousand seven hundred and twenty nine.

b) One hundred and ten thousand two hundred and fifty two.

c) Nine hundred thousand three hundred.

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

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

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

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

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

326, 811, 179, 928, 657

UNIT 2 MEASUREMENT

2.1 Convert metres into kilometres and vice versa

Activity 1:

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

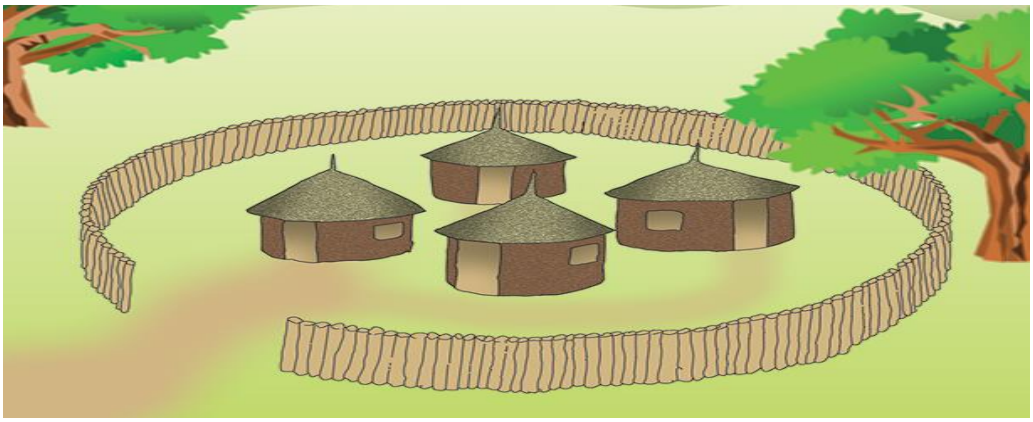
Metres are usually smaller than kilometres, they are used to represent a certain length which is normally shorter compared to kilometres.

An example can be the 1 metre chalk board ruler.

The chalk board ruler consists of 100cm

Thus 1 metre= 100 cm

1Km = 1000metres



The difference between the huts in this compound can be measured in metres.

A km is longer than a metre and is mostly used to represent the distance of a place. For example, the distance between two different towns is approximately 40KM.

Example 1.

The distance between two different towns is 750M.

Convert 750M to Km

1Km = 1000M

? = 750m

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

Answer= 0.75Km

1 millimetre [mm]	
1 centimetre [cm]	10 mm
1 metre [m]	100 cm
1 kilometre [km]	1000 m

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

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

1 Kilometre = 1000M

Example 2.

Convert 7.5 Km into metres

1Km = 1000m

7.5km =?

7.5×1000=7 500

Answer = 7500metres.

Activity 1:

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

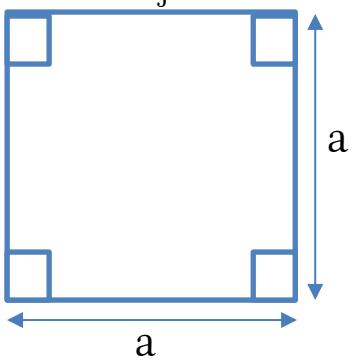
Exercise 1.

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

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

2.2 Calculating area of a rectangle and square

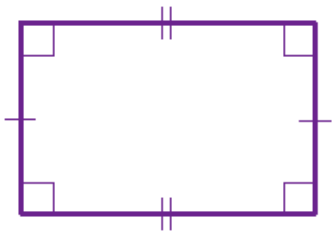
A square is a four equal sided object. Each internal angel is 90°.



Area of a square = side length squared.

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

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



□ *means "right angle"*

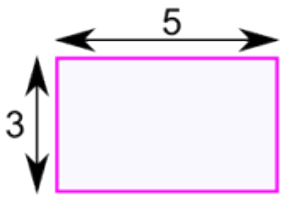
| *and* || *show equal sides*

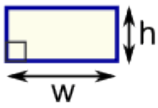
Each internal angle is 90°.

Opposite sides are parallel and equal in length.

Example 3.

What is the area of the rectangle?





Area = w × h
w = width
h = height

We know Area = width multiplied by height:

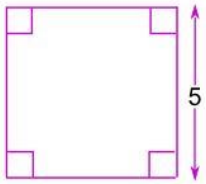
Area = w x h

The area is =<u>15 units square</u>

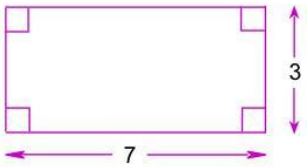
Activity 2:

In groups, calculate;

1. What is the area of the square?



2. Calculate the area of the rectangle below.



Exercise 2.

1. The area of a square is 16 cm^2. What is the length and width? Discuss your answer.

2. The area of a rectangle is 45 cm^2. If its length is 9 cm, then what is the width?

3. A rectangle with length 10m and width 4m are cut into squares. What is the maximum possible area of a square? Explain your answer?

4. The area of a square is 16 mm^2. What is the measurement of one side?

5. The length of a rectangle is 12 cm and its width is 5 cm smaller. The area of the rectangle is? Explain your answer.

6. How many squares with the side of 2 cm cover the surface of a rectangle with a length of 24 cm and a width of 8 cm?

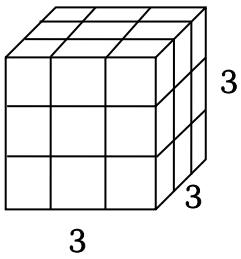
2.3 Calculate volume of a cube and cuboid

Facts about a cube

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

Finding the volume of cubes

Example 4.



Volume = base area x height

= (3 x 3) x 3

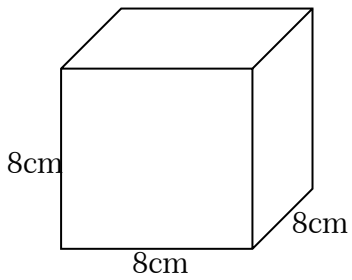
= 27 cubic units

Volume= Length (L) ^{3}

If the length is 4 then then volume = (4) ^{3}

This is also equivalent to 4×4×4=64

Example 5.

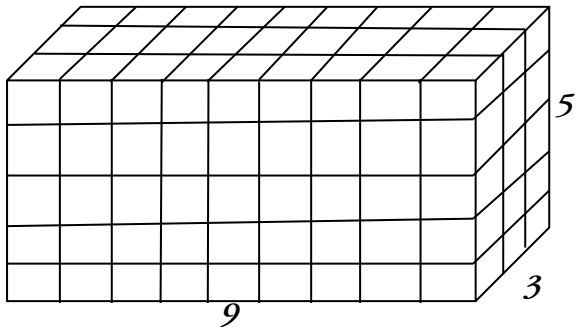


Volume = base area x height

= (8cm x 8cm) x 8cm = 512cm^3

Finding the volume of cuboids

Example 6.



Volume = base area ×height

= (9× 3) × 5

= 27× 5 = <u>135 cubic units</u>

A cuboid is a box shaped object.

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

The volume of a cuboid is found using the formula:

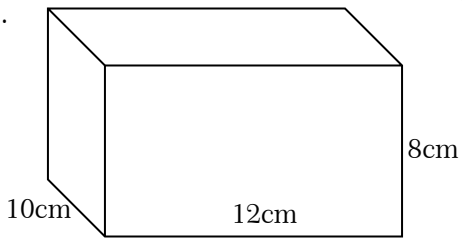
Volume = Length × Width × Height

This can also be represented as:

V = l × w × h or V = lwh

Example 7.

1.



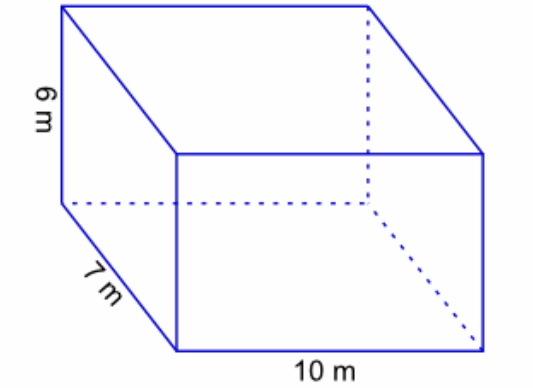
Volume = base area(L X W) × height

V = (12cm× 10cm) × 8cm

V = 120cm^2×8cm

V = 960cm^3

2. What is the volume of the cuboid below?



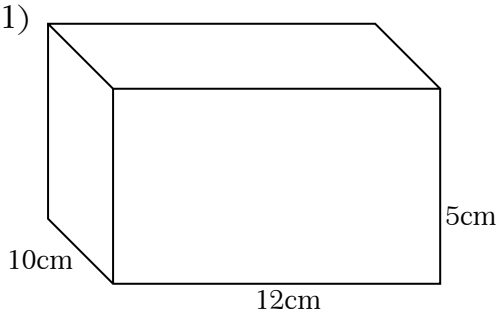
Formula = l × w × h

Thus in this case 10×7×6=420

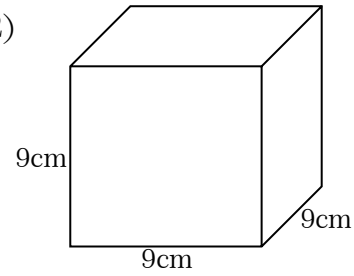
Exercise 3.

Find the volume of the following figures.

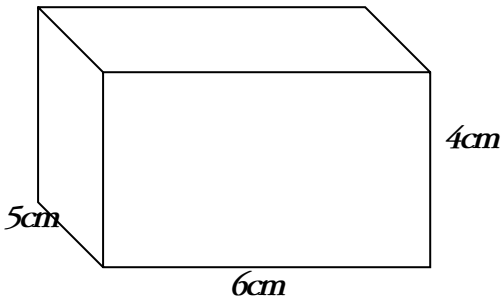
1)



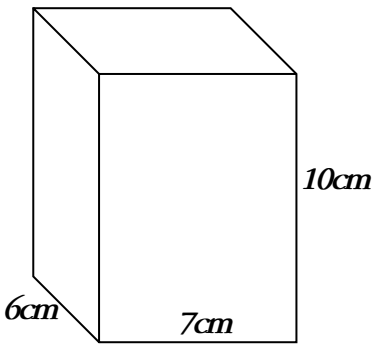
2)



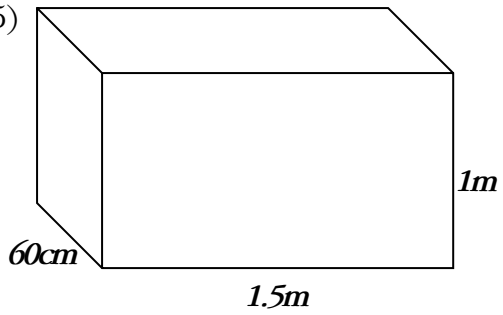
3)



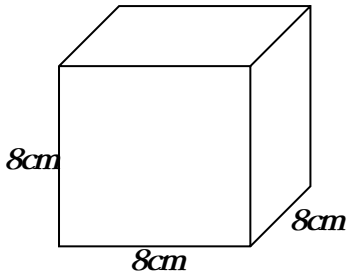
4)



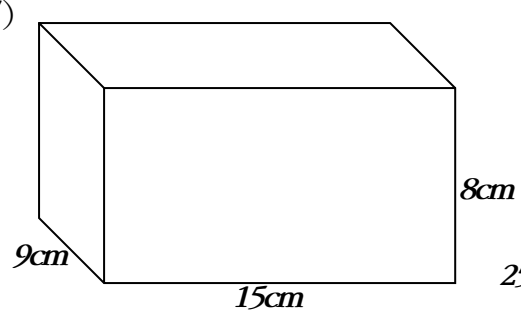
5)



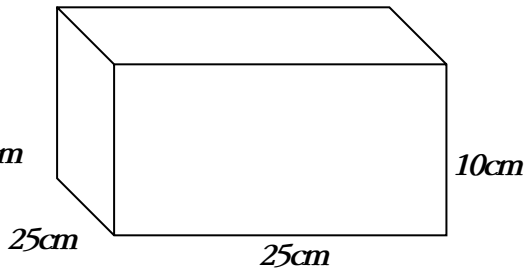
6)



7)



8)



9. A rectangular tank measures 1.2m by 0.8m by 0.5m. What is the volume in cm^3?

10. The base area of a rectangular tank is $15m^2$ and has a height of 1.5m. What is the volume of the tank in cubic metres?

11. One cube measures 8cm. Another cube measures 10cm. What is the sum in their volume in cubic centimetres?

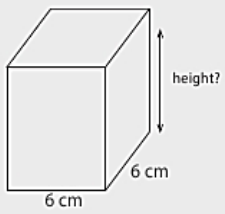
12. A rectangular container with a base area of $150m^2$ and a height of 12m. What is its volume in cubic metres?

13. A tank is a cube in shape. The height of the tank is 8.1metres. What is its volume in cubic metres?

14. A rectangular container is 80cm long, 50cm wide and 40cm. What is the volume in cm^3?

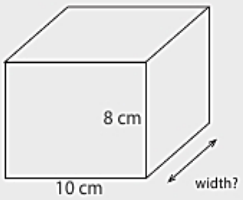
15. A cube shaped tank is 5.5m. What is its volume in cubic metres?

Calculate the length of the unknown edges.



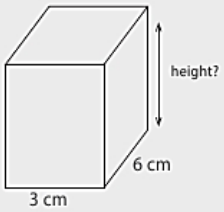
Volume: 288 cm^3

Height: _____ cm



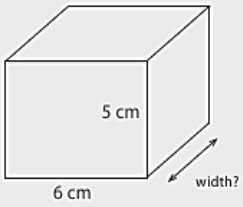
Volume: 720 cm^3

Width: _____ cm



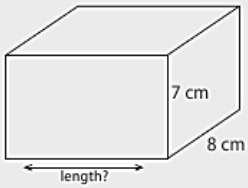
Volume: 180 cm^3

Height: _____ cm



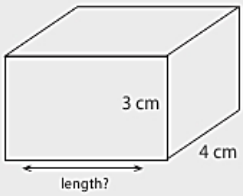
Volume: 210 cm^3

Width: _____ cm



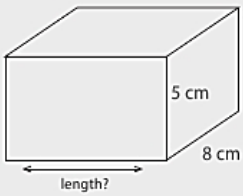
Volume: 560 cm^3

Length: _____ cm



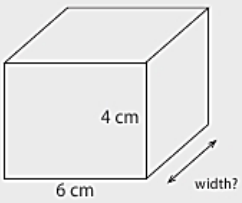
Volume: 72 cm^3

Length: _____ cm



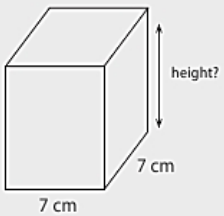
Volume: 360 cm^3

Length: _____ cm



Volume: 120 cm^3

Width: _____ cm



Volume: 343 cm^3

Height: _____ cm

2.4 Time

Time is the indefinite continued progress of existence and events.

Time can be expressed in hours, minutes or seconds.

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

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

Example 7.

What is the time?

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

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

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

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

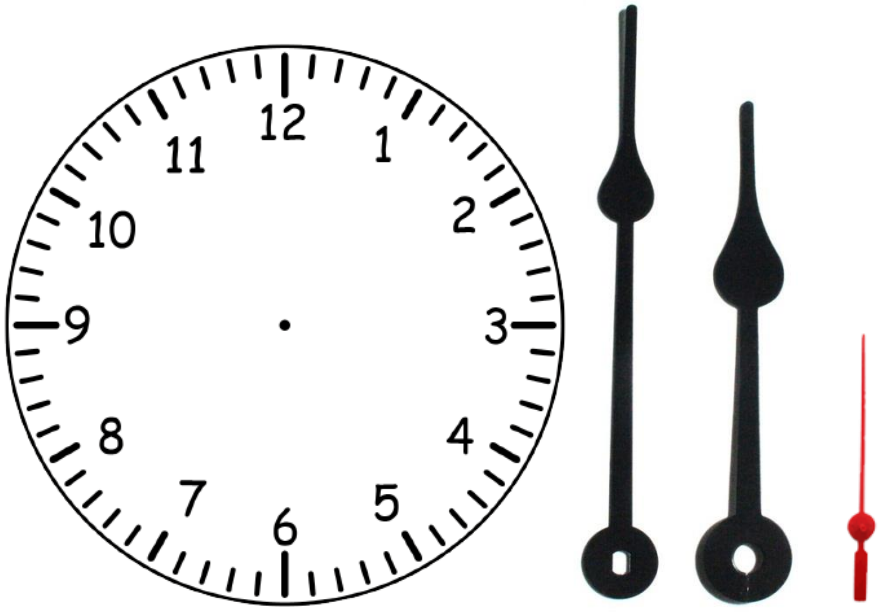
The second hand is usually the thinnest and usually at the top of the other two, in this case it is at 7 which is 35 seconds.

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

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

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

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



Activity 3:

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

Example 8.

Conversion of hours into minutes and second

1. Convert 2 hours into minutes

1hour = 60minutes or 60 minutes = 1hour
1 minute = 60 seconds
1 hour = 60 × 60 seconds = 3600 seconds.
So, 2 hours = 2 × 60

= 120 minutes

2. Convert 2 hours to minutes and seconds.

2hours = ____ minutes= _____seconds
= 2 × 60minutes
= 120minutes
120minutes × 60 seconds

= 7200 seconds

3. Convert 360 minutes to hours

60min = 1hr

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

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

Exercise 4.

Change the following hours to minutes.

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

Change the following minutes to hours.

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

Change the following to seconds.

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

Change the following to minutes.

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

Change the following into minutes and seconds.

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

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

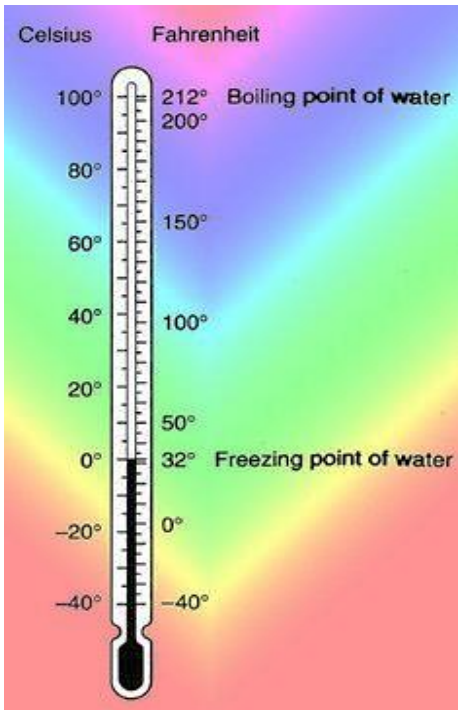
A period in a class lasts 45mins. If there are 7 periods in a day, how many hours and minutes do pupils spend in the periods?

2.5 Measure temperature of objects in Celsius or Fahrenheit

Temperature is how hot or cold something is.

Temperature can be measured in Celsius or Fahrenheit.

They both describe temperature.



Thermometer

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

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

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

$$°C = \frac{(°F - 32) \times 5}{9}$$

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

$$°F = \frac{°C \times 9}{5} + 32$$

Activity 4:

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

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

Exercise 5.

1. Convert the following Celsius to Fahrenheit. What operations are you going to use?
    a. 24^0
    b. 19^0
    c. 46^0
    d. 37^0

2. Convert the following Fahrenheit to Celsius. What method will you use and why?
    a. 168^0
    b. 72^0
    c. 143^0
    d. 200^0

2.6 Money

Profit and loss in business.

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

Profit

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

Example 9.

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

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

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

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

Loss

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

Example 10.

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

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

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

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

Exercise 5.

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

Currencies within particular regions

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

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

Activity 5:

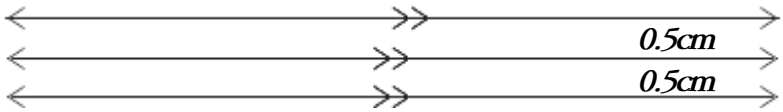
With the guidance of the teacher, visit any exchange bureau and ask how they exchange the currencies. Which currencies do they change? What is the exchange rate? Does the exchange rate change?

UNIT 3 GEOMETRY

Angles properties of parallel and perpendicular lines

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

Example:

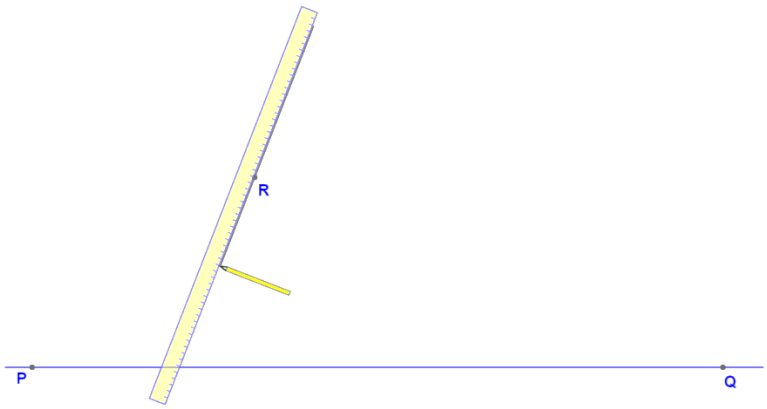


The distance or gaps between the lines will remain the same throughout.

3.1 Constructing parallel lines

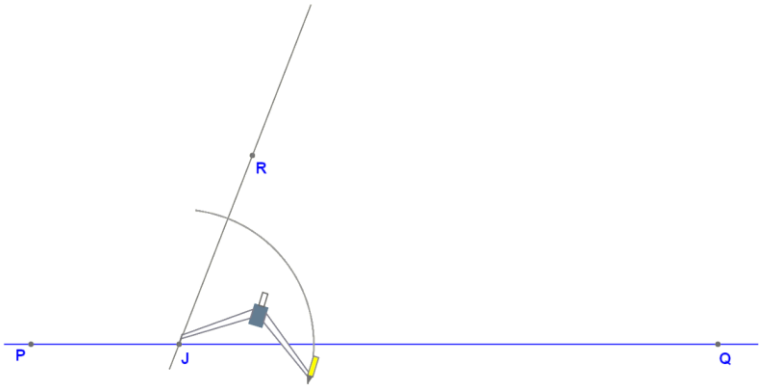
We need a ruler and pair of compass.

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

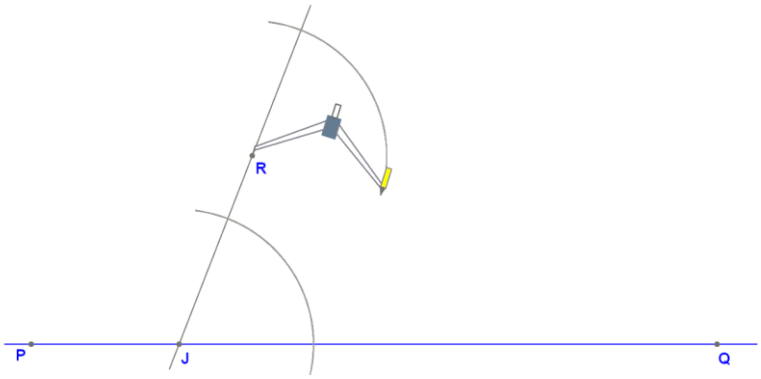


This is simply a straight line which passes through *R* and intersects with given line.

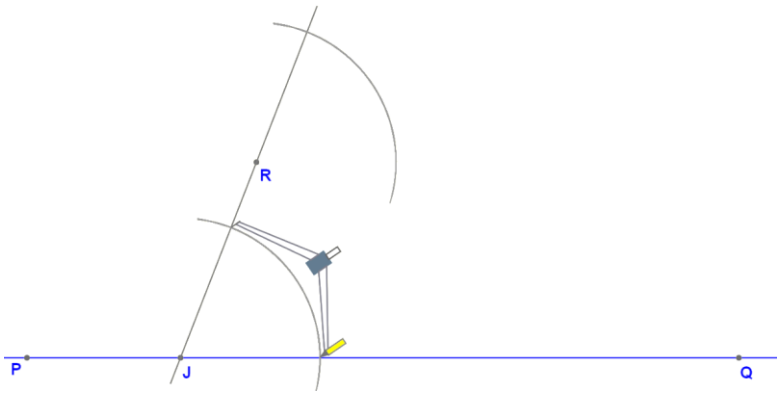
2. Using the compass, mark the angle formed by the transversal



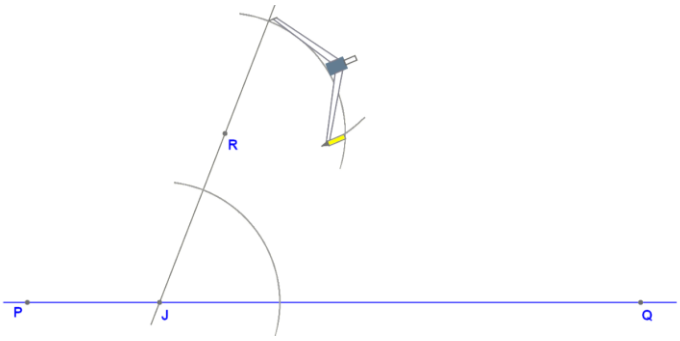
3. Using the same distance on the compass, construct a copy of the angle formed by the transversal at point R



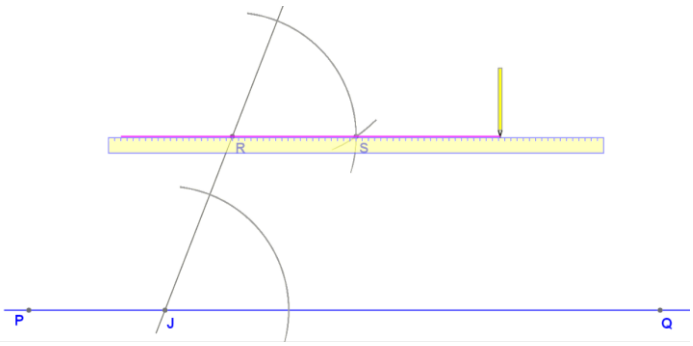
4. Measure the curve using a compass.



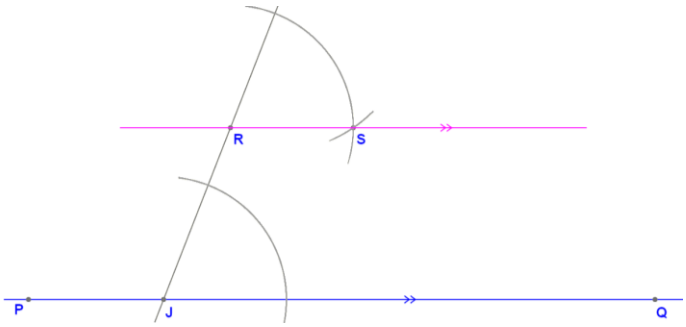
5. Using the same distance mark on the copied arc.



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



7. Done. Line RS is parallel to line PQ



Activity 1:

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

Uses of parallel lines

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

3.2 Construct angles.

Constructing a 60° Angle

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

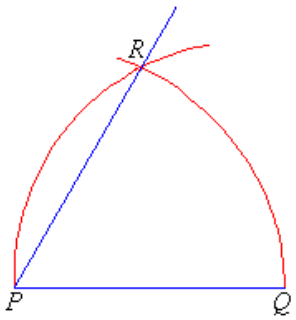
This suggests that to construct a 60° angle we need to construct an equilateral triangle as described below.

Step 1: Draw the arm *PQ*.

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

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

Step 4: Join *P* to *R*. the angle *QPR* is 60^0



Activity 2:

In pairs, draw a 60^0 angle.

Constructing a 30° Angle

We know that:

$\frac{1}{2}$ of $60° = 30°$

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

Step 1: Draw the arm PQ.

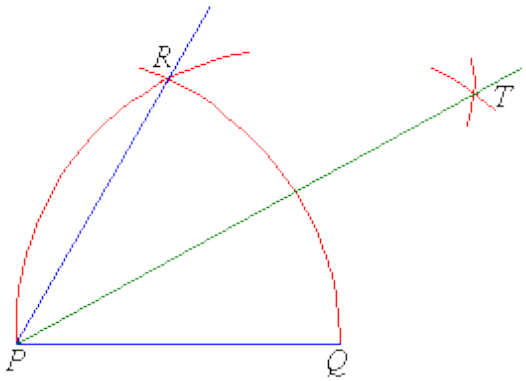
Step 2: Place the point of the compass at P and draw an arc that passes through Q.

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

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

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

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



Activity 3:

In pairs, draw a 30^0 angle.

Constructing an angle of 90º.

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

Step 1: Draw the arm *PA*.

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

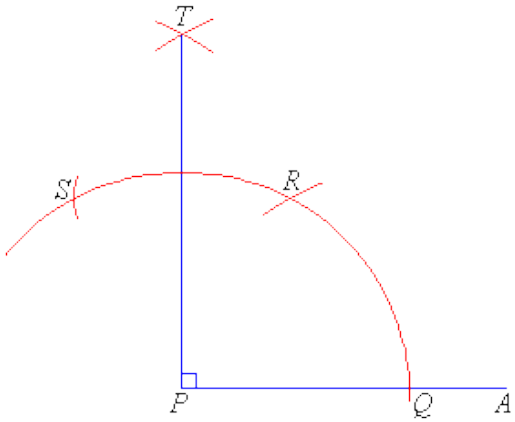
Step 3: Place the point of the compass at *Q* and draw an arc of radius *PQ* that cuts the arc drawn in Step 2 at *R*.

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

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

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

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

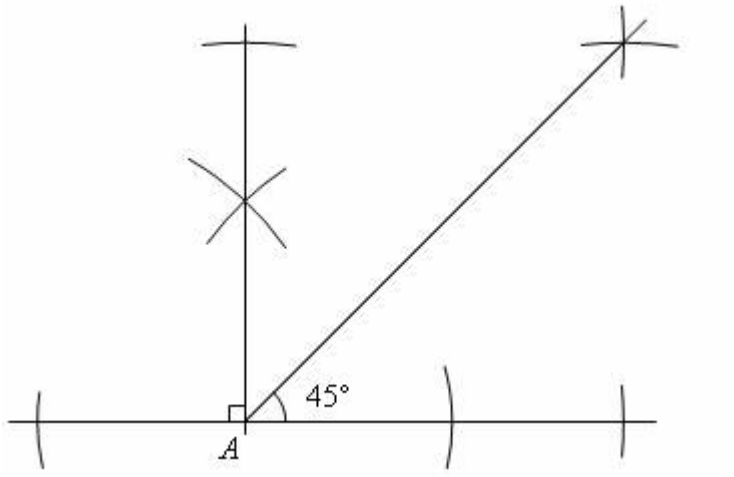


Activity 4:

In pairs, draw a 90^0 angle.

Constructing an angle of 45º

Bisect the angle of 90º



Measure angles

Activity 5:

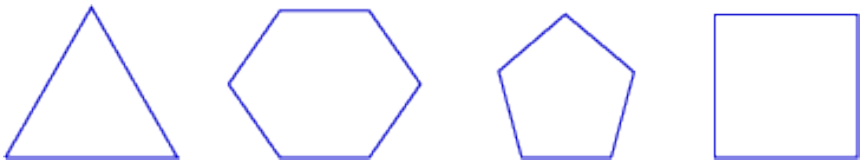
In pairs, bisect a 90^0 angle.

3.3 Line of Symmetry

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

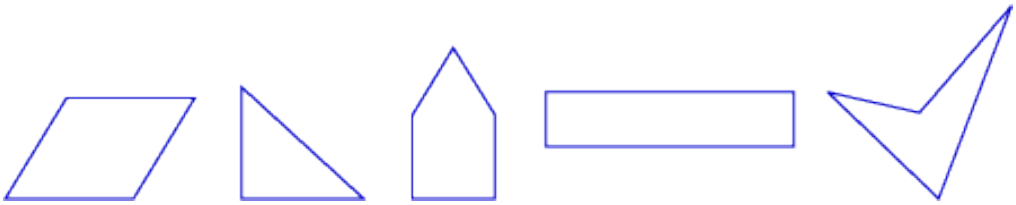
Regular polygons have sides that are all the same length and angles that are all the same size.

These polygons are regular:



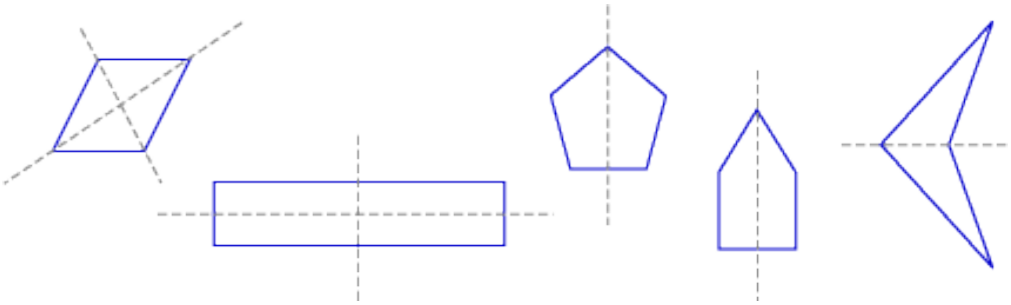
The polygons below are not regular.

Such polygons are referred to as irregular.



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

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

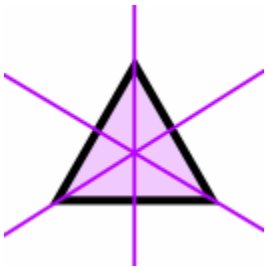


These polygons do not have line symmetry:

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

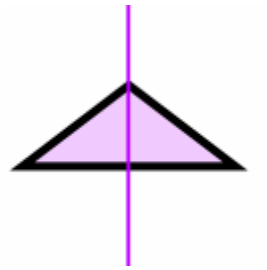
Example 1.

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



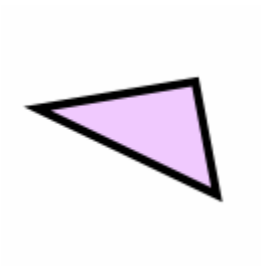
Equilateral Triangle
(all sides equal,
all angles equal)

3 Lines of Symmetry



Isosceles Triangle
(two sides equal,
two angles equal)

1 Line of Symmetry



Scalene Triangle
(no sides equal,
no angles equal)

No Lines of Symmetry

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

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

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

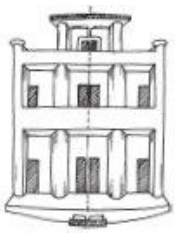
The reflection in this lake also has symmetry, but in this case:

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

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

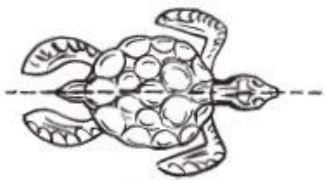
Artists, professionals, designers of clothing or jewelry, car manufacturers, architects and many others make use of the idea of symmetry.

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



Architecture

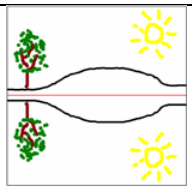
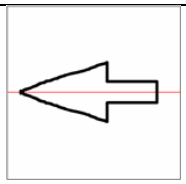
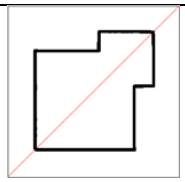
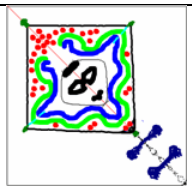
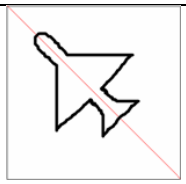
Engineering



Nature

Example 2.

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

Sample Artwork	Example Shape
	
	
	

Activity 6:

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

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

Exercise 1.

1. Construct parallel lines of;

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

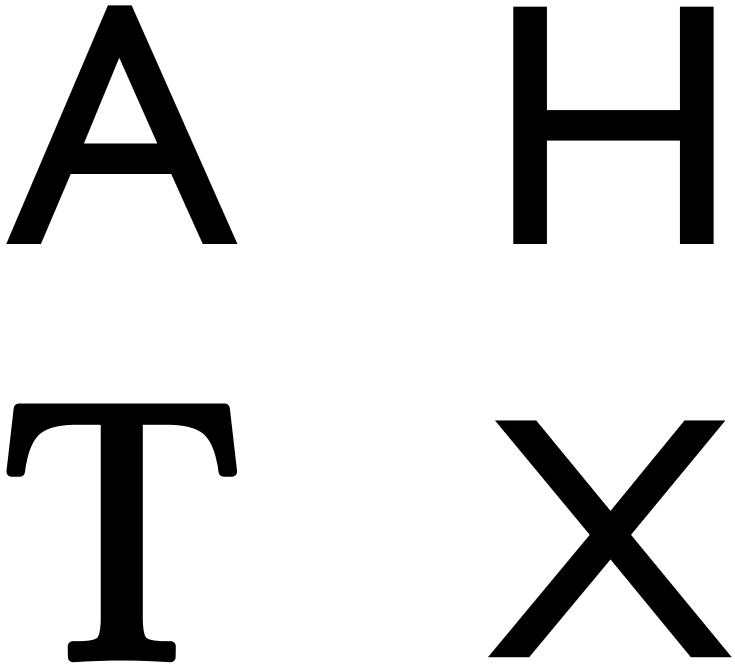
What method would you use and why?

2. Construct the following angles

a) 60^0
b) Bisect 60^0
c) 90^0
d) Bisect 90^0

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

3. How many lines of symmetry are there?



What did you notice when checking your answers?

UNIT 4 ALGEBRA

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

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

Simplify the expression below;

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

Solution
Collecting the like terms together, we have

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

4.1 Purpose of Algebraic equations

What do you think is the purpose of algebra?

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

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

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

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

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

Solving Algebraic equations

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

Example 1.

Solve the equation below.

$$x - 4 = 0$$

Solution

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

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

$$x - 4 + 4 = 0 + 4$$
$$x = 4.$$

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

$$x + 5 = 0$$

Solution

$$x + 5 - 5 = 0 - 5$$
$$x = -5$$

Addition Problems

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

Example 2.

Solve the equation below.

$$x + 7 = -5$$

Solution

$x + 7 = -5$ The 7 is added to the x.

$-7 \quad -7$ Subtract 7 from both sides to get rid of it.

$x = -12$ Our solution

Then we get our solution, $x = -12$.

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

$$\begin{array}{r} 4 + x = 8 \\ -4 \quad -4 \\ \hline x = 4 \end{array} \qquad \begin{array}{r} 7 = x + 9 \\ -9 \quad -9 \\ \hline -2 = x \end{array}$$

Activity 1:

Solve the following equation.

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

How are you going to tackle this?

Subtraction Problems

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

Example 3.

$x - 5 = 4$	The 5 is negative, or subtracted from x
$+5 \quad +5$	Add 5 to both sides
$x = 9$	Our Solution!

Then we get our solution x = 9.

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

Example 4.

Solve the equations below.

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

Solution

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

Activity 2:

Solve the following equation.

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

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

Multiplication Problems

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

Example 5.

1. Solve $\frac{x}{5} = -3$

$5 \times \frac{x}{5} = -3 \times 5$ Multiply both sides by 5

$x = -15$ Our Solution

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

Example 6.

1. Solve $\frac{x}{-7} = -2$

$-7 \times \frac{x}{-7} = -2 \times -7$ Multiply both sides by -7

$x = 14$

2. Solve $\frac{x}{8} = 5$

$8 \times \frac{x}{8} = 5 \times 8$ Multiply both sides by 8

$x = 40$

Activity 3:

Solve the following equation.

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

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

Division Problems

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

Example 7.

Solve $4x = 20$

$$\frac{4x}{4} = \frac{20}{4}$$ Divide both sides by 4

$x = 5$ Our solution

We get our solution $x = 5$

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

Example 8.

Solve $-5x = 30$

$$\frac{-5x}{-5} = \frac{30}{-5}$$ Divide both sides by -5

$x = -6$ Our Solution

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

Activity 4:

Solve the following equation.

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

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

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

Activity 5:

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

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

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

Exercise 1.

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

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

4.2 Formation of algebraic equations and solving

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

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

In groups, Play the matching game.

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

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

Example 11.

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

Solution

Let the number of cows be x

Therefore, goats= $3x$

Total=40 animals

$$3x + x = 40$$

$$4x = 40$$

$$X = 10$$

Therefore he has 10 cows

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

Solution

Perimetre of a rectangle=2L+2W
=2(L+W)
Let the width be w
Therefore length is w+3
50=2(w+3+w)
50=2(2w+3)
50=4w+6
4w=50-6
4W=44
W=11
Therefore the length= $w + 3 = 11 + 3 = 14cm$
Width= $11cm$

Note; more means we add.
Less means we subtract.

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

Solution

Tom has SSP x
Mary = $(x - 200)$
Total = SSP1000

$$x + x - 200 = 1000$$
$$2x - 200 = 1000$$
$$2x = 1200$$
$$x = \text{SSP}600$$

Therefore Tom has SSP600.

Activity 7:

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

1. The number of mathematics text books in a school is 4 times the number of science text books. If the total number of the books in the school are 200, how many English text books are in the school?

2. Deng has SSP150 more than Paul. Paul has twice the amount Jane has. If the total amount they have altogether is SSP1200, how much does Paul have?

Exercise 2.

1. The length of a classroom is 8 m more than the width. Give that the area of the classroom is 80m, what is the length of the classroom?

2. Peter is 3 years younger than his dad. If the sum of their ages is 40 years, what is the age of peter? How old was the father 3 years ago?
3. The number of chairs at home is four times the number of tables. If the sum of the chairs and table is 10, how many tables are there?

4. In a class, the number of boys is three times the number of girls. If the difference between the number of boys and girls is 20, how many girls are there? (hint: difference means subtract)

5. A gardener is wanting to plant some trees. She plants p mangoes. She plants 5 more oranges than she does mangoes.

    a. Find an expression for the number of oranges that the gardener had planted.

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

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

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

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

Summary

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

UNIT 5 STATISTICS

Statistics involves collecting, organizing and analyzing data.

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

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

5.1 Why data is collected

Activity 1:

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

Which methods are used in collecting data in our country?

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

Methods of collecting data

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

ii) **Interview method**-involves presentation of oral verbal stimuli and reply in terms of oral-verbal responses.
It can be structured or unstructured.
Structured involves use of pre-determined questions and of highly standard techniques of recording.
Unstructured do not follow a system of pre-determined questions and is characterized by flexibility of approach to questioning.

iii) **Questionnaire**
This is a set of specific questions which should be answered by a respondent or the person giving data.

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

Steps in collecting data

Step 1: Identify issues for collecting data.
Step 2: Select issues and set goals.
Step 3: Plan an approach and methods

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

What sources of data should be used to collect information?

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

- Interviews and focus groups.
- Observed data.

Step 4: Collect data.
Step 5: Analyze and interpret data.
Step 6: Act on result.

Activity 2:

With the guide of the teacher, in pairs:

i. Prepare a structured and an unstructured interview that will be presented to class 6 pupils on why learners perform well in Mathematics and what they think should be done to improve the performance in the subject.

ii. Prepare a questionnaire that will help you answer the question on the negative impact of internet on learners.

Exercise 1.

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

5.2 Representation of data

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

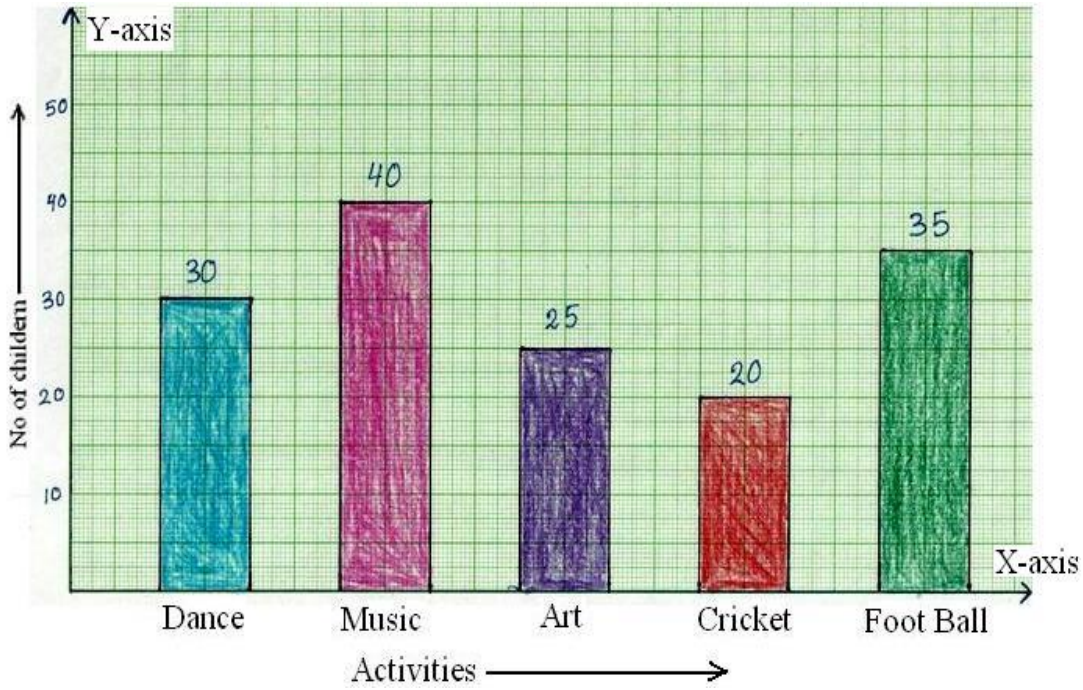
i) Bar graphs
ii) Line graphs
iii) Pie charts

Bar graphs

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

Steps in construction of bar graphs/column graph:

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



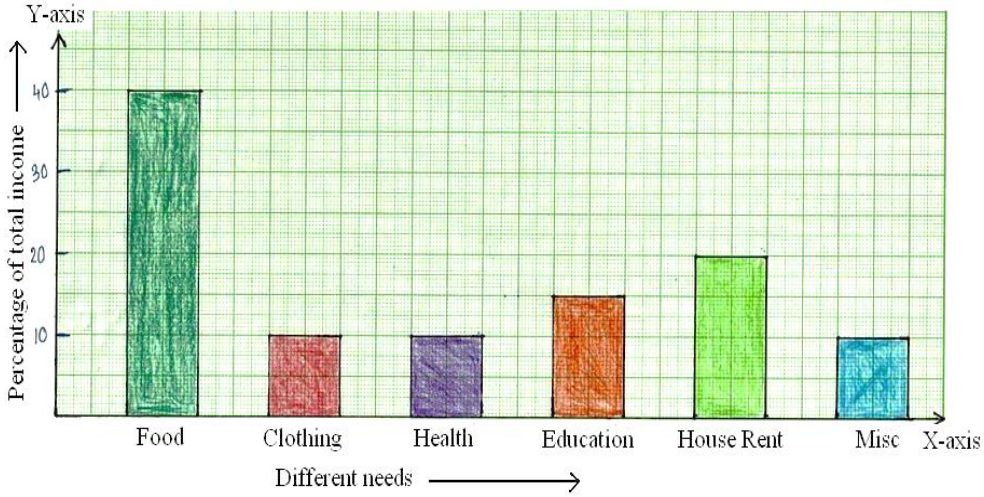
Example 1.

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

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

Represent the above data in the form of bar graph.

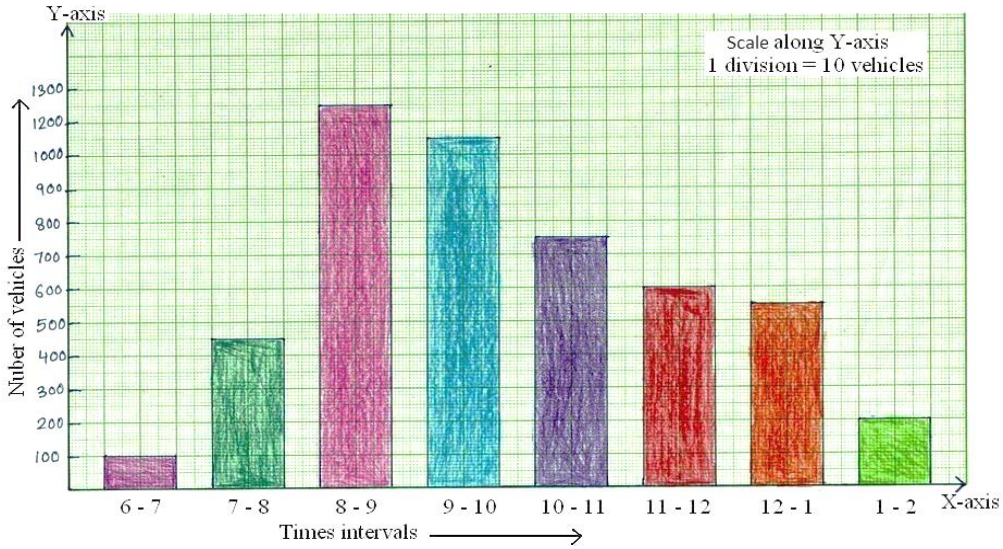
Solution



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

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

Solution



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

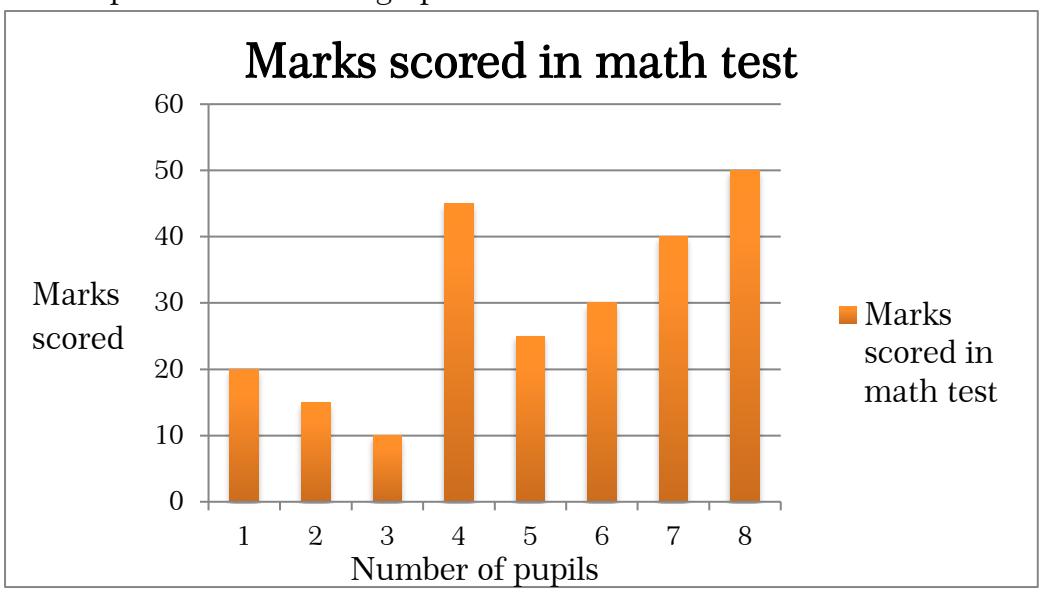
Exercise 2.

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

Data recorded in a table

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

Data represented in a bar graph.



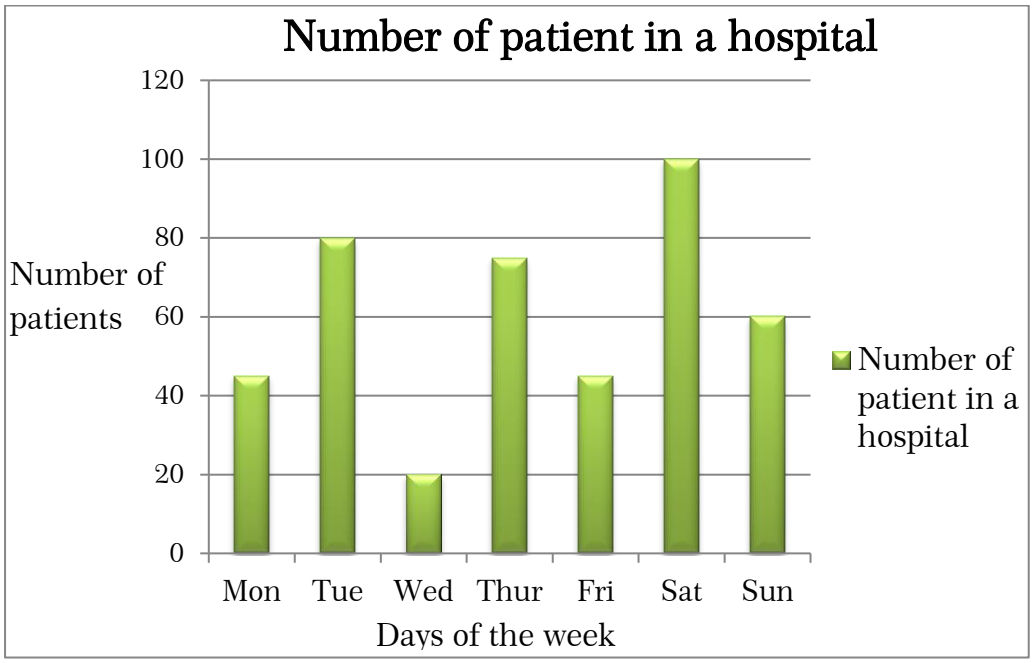
From the graph:

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

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

Data recorded in a table

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



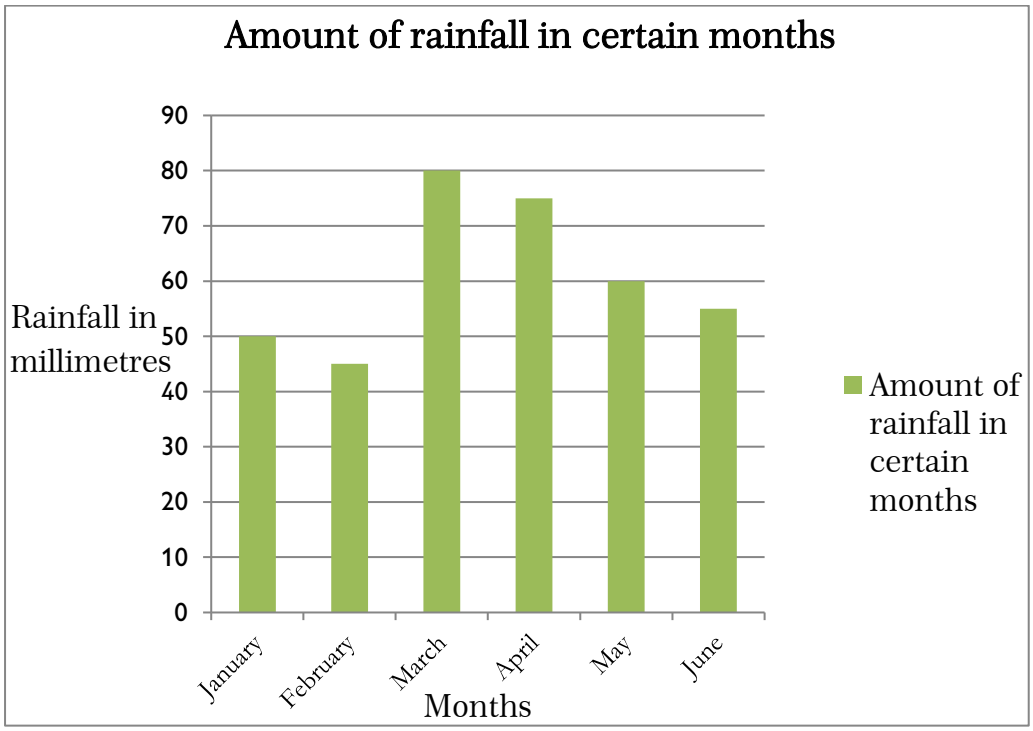
a. How many patients visited the hospital on Thursday?
b. How many less patients visited the hospital on Saturday than on Sunday?
c. On which two days did the same number of patients visit the hospital?
d. Which day did 60 patients visit the hospital?
e. How many patients visited the hospital in the last 3 days of the week?
f. On which day did the least number of patients visit the hospital?

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

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

Data is recorded in a table as shown below.

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

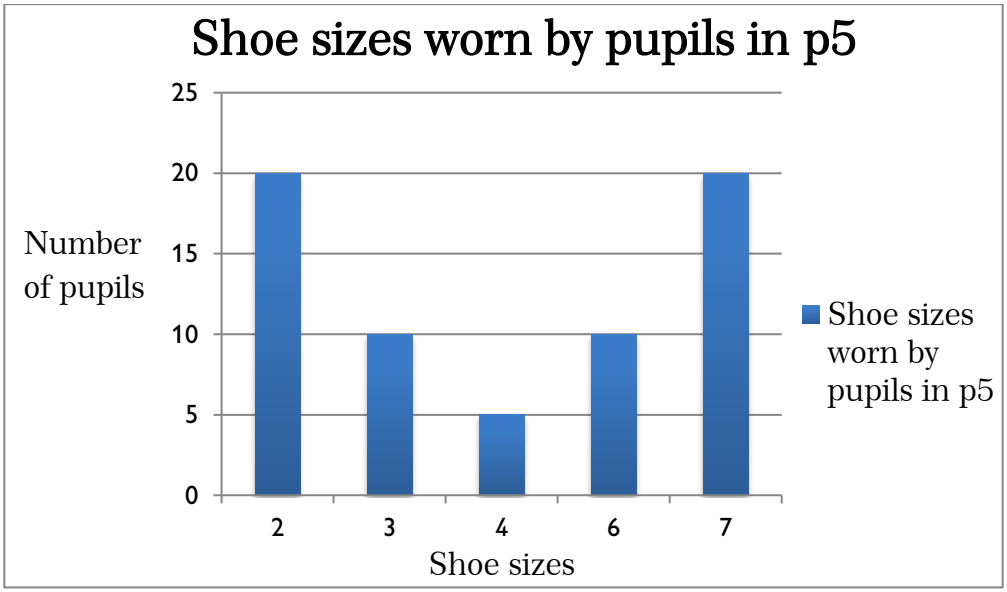


a. Which month did the district receive 45mm of rainfall?
b. Which month had the most amount of rainfall received?
c. How much less in mm was the rainfall received in the month of June than the month of May?
d. How much rainfall in mm was received in the first ½ part of the year?

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

   The data was recorded in a table as shown below.

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



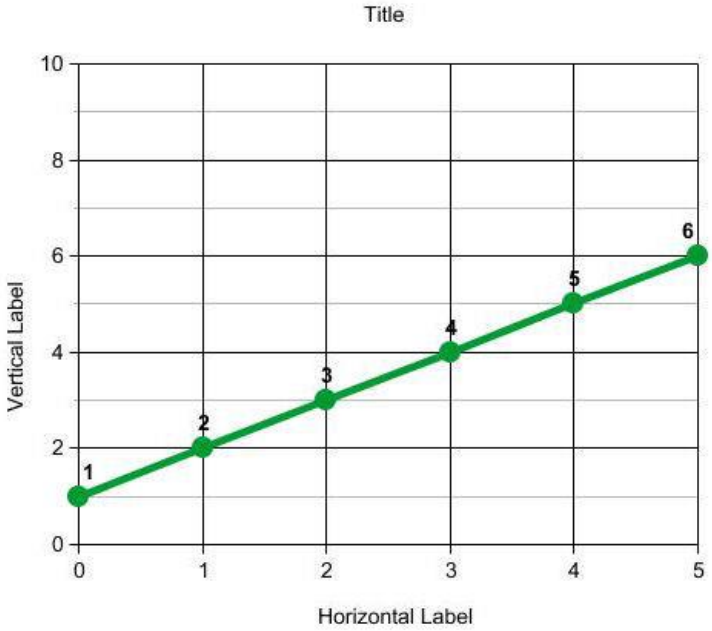
a. How many pupils chose shoe size 6?
b. What shoe size number was chosen by 20 pupils?
c. How many more pupils chose shoe size 6 than size 4?
d. What shoe size numbers were chosen by the same number of pupils?
e. Which is the least chosen shoe size?
f. How many pupils altogether chose the shoe sizes?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

Line graphs

In line graphs, data is represented using lines.

It is particularly useful when we want to show the trend of a variable over time. Time is displayed on the horizontal axis (x axis) and the variable is displayed on the vertical axis(y axis).

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



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

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

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

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

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

Example 2.

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

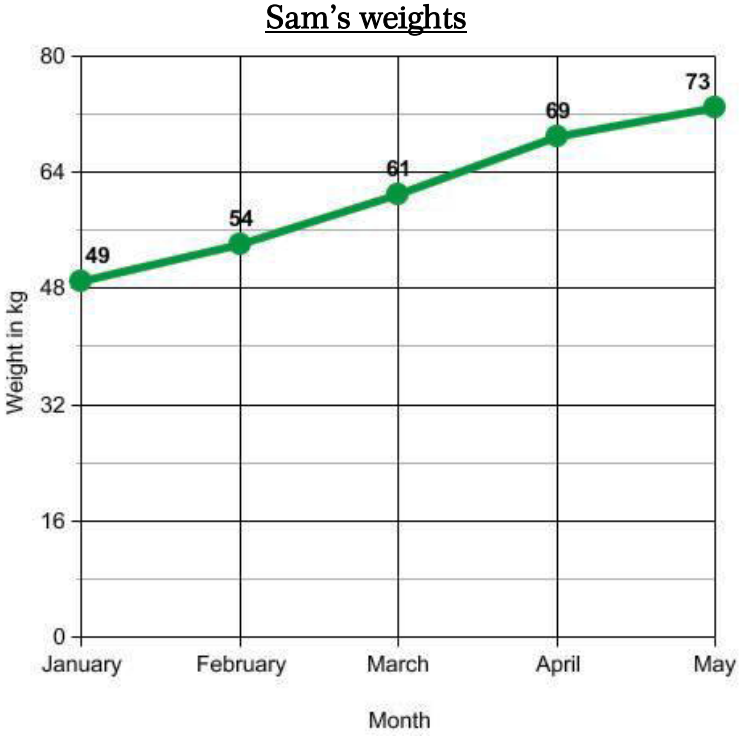
Sam's Weight	
Month	**Weight in kg**
January	49
February	54
March	61
April	69
May	73

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

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

Exercise 3.

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



QUESTION

a. What is the title of this line graph?

b. What is the range of values on the horizontal scale?

c. What is the range of values on the vertical scale?

d. How many points are in the graph?

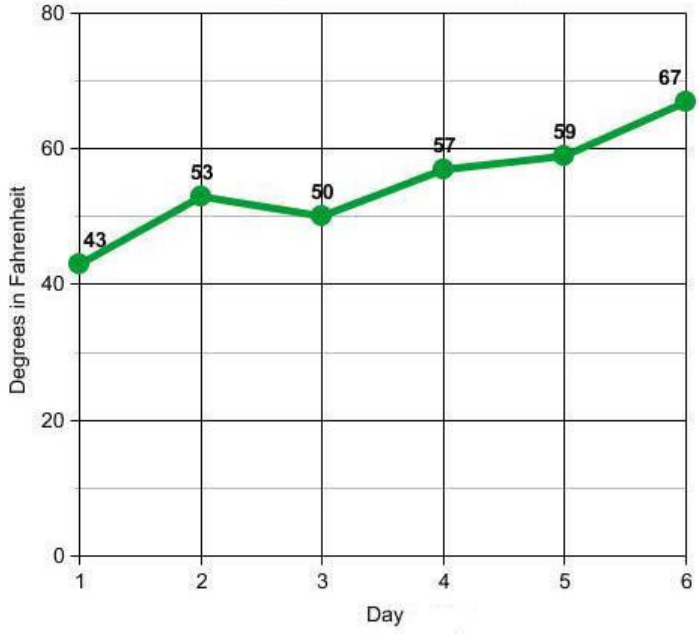
e. What was the highest value recorded?

f. What was the lowest value recorded?

g. Did Sam's weight increase or decrease over time?

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

Temperature in South Sudan



QUESTION

a. What is the title of this line graph?

b. What is the range of values on the horizontal scale?

c. What is the range of values on the vertical scale?

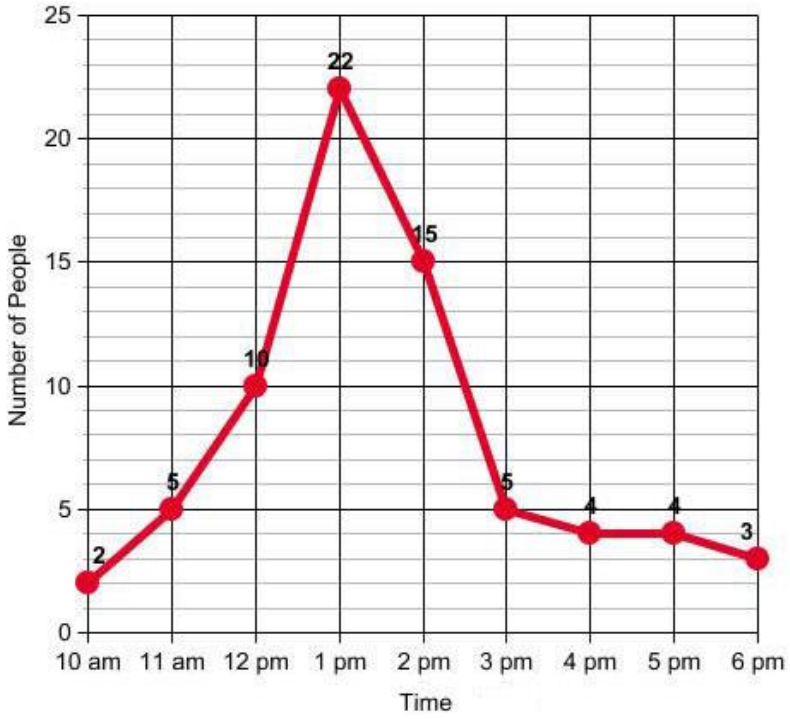
d. What was the lowest temperature recorded?

e. What was the highest temperature recorded?

f. At which day did the temperature go down?

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

People in the store



QUESTION.

a. What is the line graph about?

b. What is the busiest time of day at the store?

c. At what time does business start to slow down?

d. How many people are in the store when it opens?

e. About how many people are in the store at 2:30 pm?

f. What was the greatest number of people in the store?

g. What was the least number of people in the store?

Summary:

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

Pie charts

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

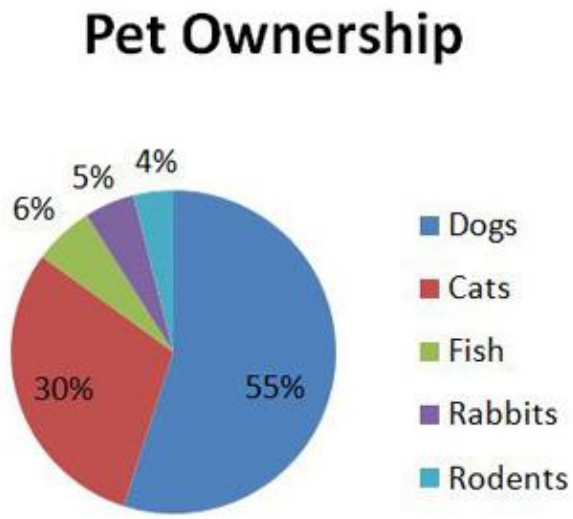
It is used to display a set of categorical data. It is a circle, which is divided into segments. Each segment represents a particular category. The area of each segment is proportional to the number of cases in that category.

To obtain the size of the sector, we take a quantity out of the total then multiply by 360^0.

Example 3.

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

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



Uses of a Pie Chart

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

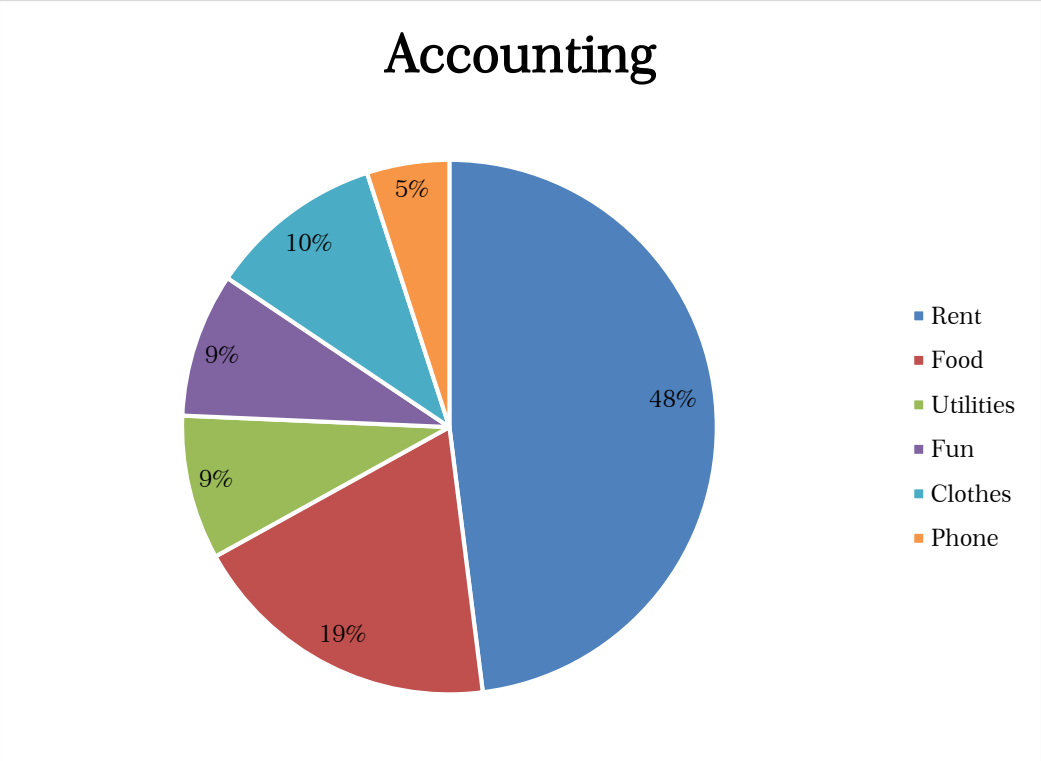
Various applications of pie charts can be found in business, school, and at home.

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

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

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

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



How to Read Pie Charts

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

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

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

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

Create Your Own

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

Example 4.

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

Solution

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

Chicken

$$\text{Angle} = \frac{no\ of\ chicken}{total\ population} \times 360$$

$$= \frac{1200}{1800} \times 360$$

$$= 240^0$$

Cows

$$\text{Angle} = \frac{200}{1800} \times 360$$
$$= 40^0$$

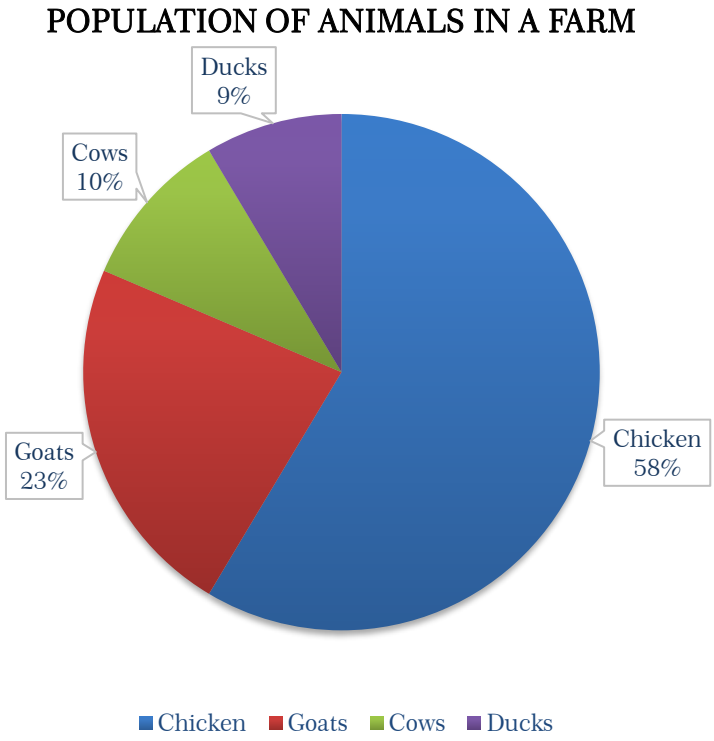
Goats

$$\text{Angle} = \frac{300}{1800} \times 360$$
$$= 60^0$$

Ducks

$$\text{Angle} = \frac{100}{1800} \times 360$$
$$= 20^0$$

<u>NOTE:</u> Having obtained the angle, we use a protractor to measure the angle.



Exercise 4.

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

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

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

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

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

   Draw a line graph to represent the information.

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

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

South Sudan

Primary Mathematics 5

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

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