South Sudan

ALP
2

Mathematics

Learner's Book Level 2

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FOREWORD

I am delighted to write the foreword for this book. The Ministry of General Education and Instruction (MoGE&I) has developed the Accelerated Learning Programme (ALP) textbooks based on the National Curriculum of South Sudan.

The textbook was written to help learners develop the background knowledge and understanding in the subject. It is intended largely to serve as a source of knowledge and understanding of the subject concerned, but not to be considered as a summary of what learners ought to study.

The National Curriculum is a competency based and learner-centered that aims to meet the educational needs and aspirations of the people of South Sudan. Its aims are manifold: (a) Good citizenship (b) successful lifelong learners, (c) creative, active and productive individuals; and (d) Environmentally responsible members of our society.
This textbook was designed by subject panelists to promote the learners'attainment of the following competencies; critical and creative thinking, communication, cooperation, culture and identity.

No one can write a book of this kind without support from colleagues, friends and family. Therefore, I am pleased to register my thanks to Dr Kuyok Abol Kuyok, the Undersecretary of the Ministry, who emphasized the importance of Alternative Education System (AES) and approved the development of its textbooks.

I also want to record my thanks toUstaz Omot Okony Olok, the Director General for Curriculum Development Centre (CDC) and Ustaz Shadrack Chol Stephen, the Director General for Alternative Education Systems (AES) who worked tirelessly with thesubject panelists to develop the textbooks.

Lastly, but not least, my greatest thanks and appreciation must go to the Global Partnership for Education (GPE) and UNICEF-South Sudan for without their support and partnership this textbook would not have seen light.

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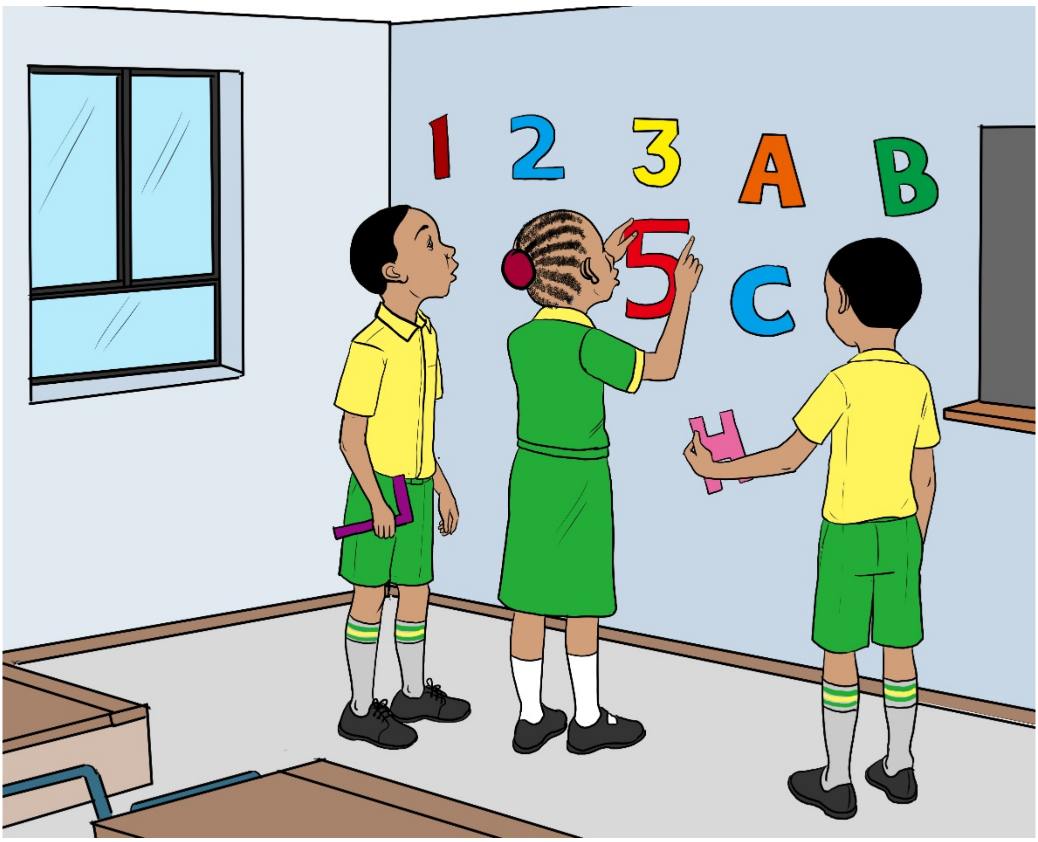
UNIT 1 NUMBERS

In level 1, we studied numbers up to three digits. In this unit we shall learn numbers up to five digits.

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

Where do you use reading and writing numbers?

In pairs look at the picture below. Are you able to do what the learners below are doing?



Activity 1

Individually, write the numbers for the following names.

- **a.** One thousand, one hundred and sixty-six.
- **b.** Two thousand four hundred and forty-nine.
- **c.** Seven hundred and ninety-five
- **d.** Three hundred and sixty-eight.
- **e.** Nine thousand five hundred and two.
- **f.** Six thousand three hundred and fifteen.
- **g.** Four thousand one hundred and fifty.
- **h.** Six hundred and fifty-six.
- **i.** Seven thousand eight hundred and seventy-four.
- **j.** Five thousand six hundred.

Activity 2

In groups, write the number name for the following numbers on manila paper. Hang your work for the class to see. In numeric order the highest and the lowest.

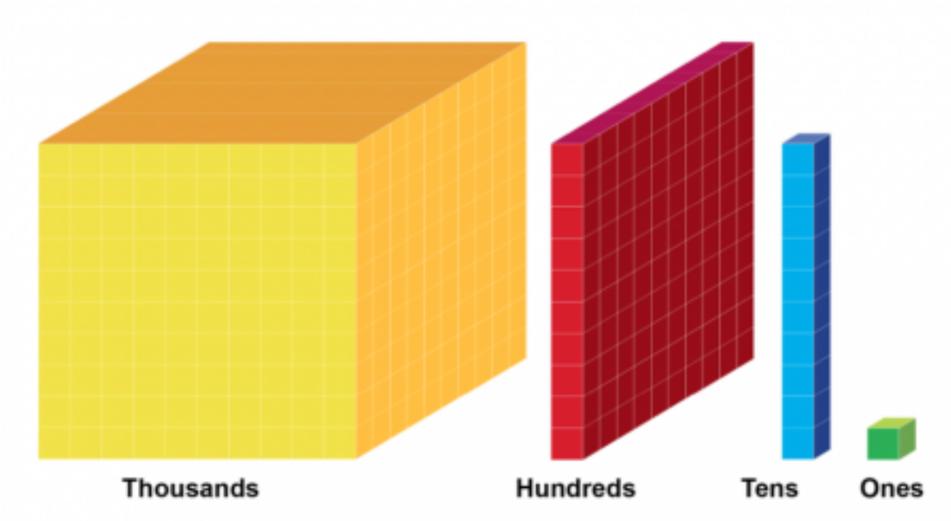
a) 892
b) 1122
c) 5642
d) 7890
e) 3651
f) 1040
g) 4110
h) 7456
i) 1503
j) 1233
k) 4561
l) 9810
m) 8504
n) 3176
o) 2044
p) 2018

Add the numbers f, g, h, and i

1.2 Place value

Digits have different values because they occupy different positions in a number.

Place value is the position of a digit on a number.



Activity 1

Place Value Game

Materials: Large digits printed on paper.

How to play

1. You will all have one digit card from 0 – 9
2. In your group, use your cards to make a number.
3. Record all the different combinations of numbers you can make.
4. Share one number you have made, holding your digit cars together.

To write numbers in word you must compare the digits.
Each digit represents a specific order of number depending on its position.

Example 1.

1. Write 3647 in words.

Using place values and total values.

Thousands	hundreds	tens	ones
3	4	6	7

3467 = Three thousand, four hundred and sixty seven.

2. Write 23456 in words.

The place value of each digit is as follows:

Ten thousand	thousands	hundreds	tens	ones
2	3	4	5	6

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

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

Activity 2.

In groups of three, choose a number, write it in words, tell your partner what the digits are. Choose a number and write it in words. Tell your partner what the digits are.

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

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

Example 2.

In the number **47892** you need to identify the different place values so as to write it in words.
To identify which number is in the "ones" "tens" "hundreds" etc. start from the digit in the furthest right side.

In this case: 47892

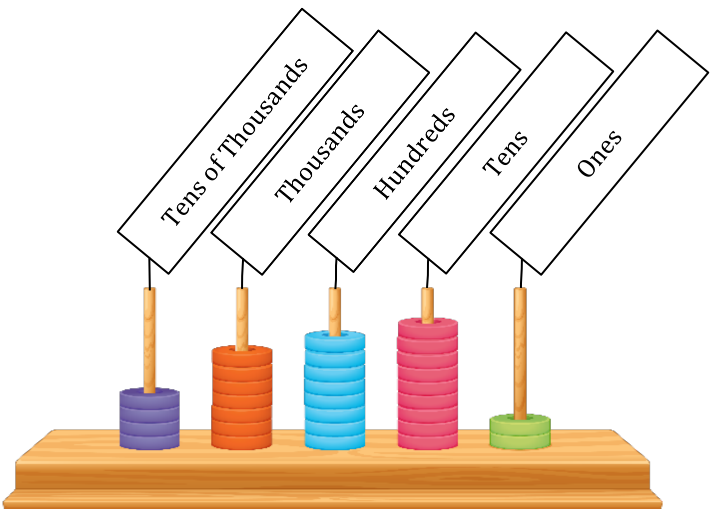
2 ➡ Ones.

9 ➡ Tens.

8 ➡ Hundreds.

7 ➡ Thousands.

4 ➡ Tens of thousands.



Write the figures below in words.

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

EXERCISE 1.

Individually.

1. Write the following in words.

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

2. From the sentences below write in numeral.

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

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

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

3. Write the following numbers in words

   a) 2783 c) 32741

   b) 13540

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

   a) 1427 c) 25789

   b) 30728 d) 15672

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

   a) 2654(4) c) 72346(4) e) 86542(5)

   b) 98647(9) d) 83562(3)

Work in pairs

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

   a) 46231 b) 39654 c) 866 d) 80387

   e) 74589 f) 70000 g) 25623 h) 99784

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

   a) 57691 b) 79841 c) 1869 d) 50927

   e) 94641 f) 59243 g) 6293 h) 69342

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

   a) $6\underline{4}516$ b) $9720\underline{1}$ c) $16\underline{0}37$ d) $\underline{9}7165$

   e) $\underline{1}0000$ f) $\underline{9}9999$ g) $8792\underline{3}$ h) $672\underline{4}5$

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

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

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

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

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

14. What is the sum in the place value of the 4^{th} and 2^{nd} digits in 34261? How would you work out this?
15. What is the difference in the place value of the 5^{th} and 3^{rd} digits in 82046? How would you work out this?

1.3 Compare and order numbers up to 5 digits

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

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

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

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

For Example:

$4263 > 4193$

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

$7826 < 9014$

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

$1407 < 1423$

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

Example 3.

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

Solution

1359, 5931, 9531, 3951

So from the largest to the smallest.

9531, 5931, 3951, 1359

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

Solution

86531, 13568

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

13568, 86531

Activity 5.

In pairs, make zero to nine number cards.

How can you organize the numbers? Who can make the smallest number? Who can make the largest number?

EXERCISE 2.

Work in pairs and discuss your reasoning;

1. Using the digits given below, form two different numerals of 5 digits then arrange them from the smallest to the largest.
   a) 3, 5, 2, 1, 0   b) 8, 3. 5, 9, 7   c) 1, 6, 4, 8, 2
   d) 2, 9, 8, 1, 6   e) 7, 5, 6, 4, 1
2. Use the digits given to form three different numbers of 4 digits, then arrange them from the largest to the smallest.
   a) 7, 1, 3, 2, 0   b) 3, 0, 1, 4, 6   c) 8, 7, 3, 9, 2
   d) 9, 5, 6, 7, 8   e) 8, 2, 1, 5, 4
3. Arrange the numbers below from the smallest to the largest.
   Tell your partner what you would do first and why?
   a) 88641, 71404, 88461, 88146
   b) 76879, 76798, 76978, 76789
   c) 67143, 67431, 67341, 67413
   d) 56948, 56489, 56849, 56984
   e) 94247, 94427, 94274, 94742
4. Arrange these numbers below from the largest to the smallest.
   a) 72896, 72689, 72986, 72869
   b) 75974, 75479, 75749, 75947
   c) 84256, 84526, 84625, 84265
   d) 97358, 97385, 97583, 97835
   e) 91354, 91534, 91543, 91453
5. A maize miller produced 56849 bags of maize in January, 65948 in February and 56894 in March. Arrange the production of the bags of the maize meal from the smallest to the largest in the three months. Tell tour partner how you would do this.

6. Western Bahr el Ghazal state has a population of 358692 people, Lakes state has 782504, while Unity state has 645465. Arrange the population of the three states from the largest to the smallest population.
7. In South Sudan, learners planted 98649 trees in the year 2014, 96582 in the year 2015, 98846 in the year 2016 and 89813 in the year 2017. Arrange the numbers of trees planted from the smallest to the largest.

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

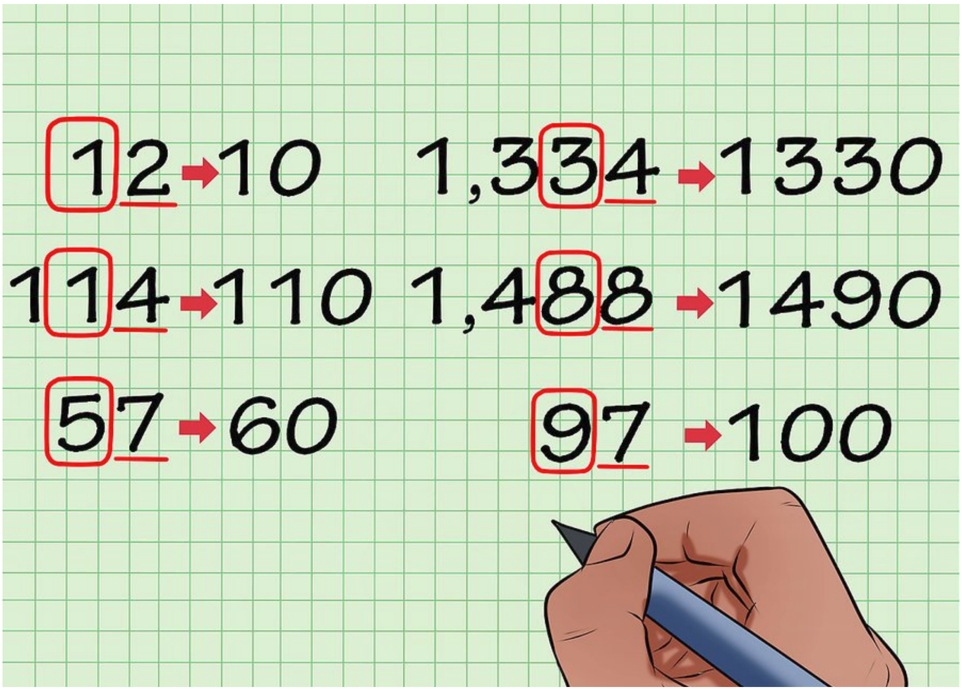
1.4 Rounding off numbers to the nearest thousands

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

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

How to round off numbers.

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



Example 4.

1. Round off 7421 to the nearest thousands.

Solution

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

2. Round off 8697 to the nearest thousands.

Solution

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

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

36178

8 → Ones

7 → Tens

1 → Hundreds

6 → Thousands

3 → Tens of thousands

After identifying the different place values, check the number that comes immediately after the thousands position.
In this case the number is one (1) so add a zero into the digit in the thousands position.
If the number is between (0) and (4) add a zero (0) to the digit in the thousands position.
If the number is (5) and above add one (1) to the digit in the thousands position.

Example 5.

(a) 36178

36178 thus = 36000

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

(b) 57812

57812 Thus =58000

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

(c) 96574

96574 Thus =97000

Activity 6.

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

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

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

EXERCISE 3.

1. Round off the following numbers to the nearest thousands.
   (a) 58 712 (d) 15 062
   (b) 72 162 (e) 90 762
2. Add the numbers below then round them off to the nearest thousands. Explain how you would do this.
   (A) 25 812+404 (D) 39 418+600
   (B) 82 167+523 (E) 91 276+723

1.5 Divisibility test for 2, 5 and 10

Have you ever wondered why some numbers will divide evenly (without a remainder) into a number, while others will not?

The Divisibility Rules help us to determine if a number will divide into another number without actually having to divide. There is a divisibility rule for every number. However, some of the rules are easier to use than others. For the rest, it might just be simpler to actually divide.

The Rule for 2: Any whole number that ends in 0, 2, 4, 6, or 8 will be divisible by 2.

Activity 7

Look at the following numbers.
12, 20, 44, 66, 78, 110, 104, 308, 406, 500, 842, 976, 1204, 6348.

1. Are they divisible by 2?
2. How can you determine this?

The Rule for 5: Number that are divisible by 5 must end in 5 or 0.

Activity 8

Look at the numbers below.
15, 30, 45, 75, 90, 110, 15, 265, 345, 650, 925, 1225, 1750, 1900, 6550, 8755, 9500.

1. Are they divisible by 5?
2. How can you determine this?

The Rule for 10: Numbers that are divisible by 10 need to be even and divisible by 5, because the prime factors of 10 are 5 and 2. This means that for a number to be divisible by 10, the last digit must be a 0.

Activity 9

Look at the numbers below.
Example; 40, 100, 300, 900, 1200, 1500, 1900, 2500, 4550, 9850, 9700.

1. Are they divisible by 10?
2. How can you determine this?

In dividing numbers such as $8 \div 2$, 2 is called a divisor.
A divisor that goes into a number and divides a number in an exact number of times is called a factor.
Example; $10 \div 3 = 3$ rem 1
$8 \div 2 = 2$
2 is a factor or divisor and 3 is the divisor of 10

1.6 Multiples and factors of whole numbers

Multiples are what we get after multiplying a number by an integer.
Factors are numbers that we can multiply to get another number.

Example 6.

Identify the first five multiples of 7. Think of your multiplication facts.

$7 \times 1 = 7$

$7 \times 2 = 14$

$7 \times 3 = 21$

$7 \times 4 = 28$

$7 \times 5 = 35$

The first five multiples of 7 are:

7, 14, 21, 28, 35

You can determine multiples of numbers by skip counting. Think of multiplication facts to help you. Count up to find the multiples of these numbers:

4	4, 8, 12, 16, <u>20</u>, <u>24</u>, <u>28</u>
9	9, 18, 27, <u>36</u>, <u>45</u>, <u>54</u>
12	12, 24, 36, 48, <u>60</u>, <u>72</u>, <u>84</u>

EXERCISE 4.

Work in pairs; How are you going to work out these. Which methods would you use? How would you check the answer?

1. The number 22 bus comes to James' bus stop every 12 minutes. The number 27 arrives every 8 minutes. In how many minutes will both buses arrive at the stop together?
2. Bonnie rotates the tyres of her truck every 8000 km and changes the oil every 5000 km. She will rotate the tyres and change the oil at the same time after how many kilometres?

Factors of numbers

1 X 3 = 3 so 1 and 3 are factors of 3.

2 X 5 = 10, 2 and 5 are factors of 10

What are the factors of 12?

1 and 12 2 and 6 3 and 4

When you multiply all this pairs you get 12.

Note: A number can have many factors

In multiplication there several rules that applies.

(a) Multiplication property of zero (0)

Any number multiplied by zero (0) is always zero (0)

Example 7.

A) $2 \times 0 = 0$ this means $0 + 0 = 0$

B) $5 \times 0 = 0$ or $0 + 0 + 0 + 0 + 0 = 0$

C) $7 \times 0 = 0$ or $0 + 0 + 0 + 0 + 0 + 0 + 0 = 0$

(b) Multiplication property of (1)

Any number multiplied by 1 is = to its self.

Example 8.

A) $1 \times 1 = 1$ C) $1 \times 4 = 4$ E) $1 \times 7 = 7$

B) $1 \times 2 = 2$ D) $1 \times 5 = 5$ F) $1 \times 3 = 3$

One (1) is also found in the first row of each multiplication table

$1 \times 1 = 1$	$1 \times 4 = 4$	$1 \times 7 = 7$
$1 \times 2 = 2$	$1 \times 5 = 5$	$1 \times 8 = 8$
$1 \times 3 = 3$	$1 \times 6 = 6$	$1 \times 9 = 9$

(c) Multiplication of a number by ten (10)

When it comes to multiplication of numbers by 10 simply mean you add or place one zero in the right side of the number.

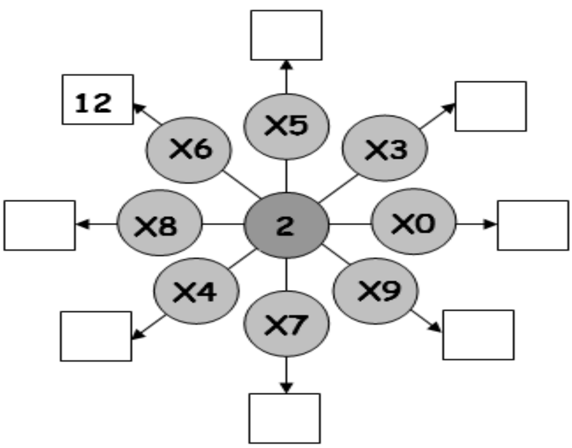
Example 9.

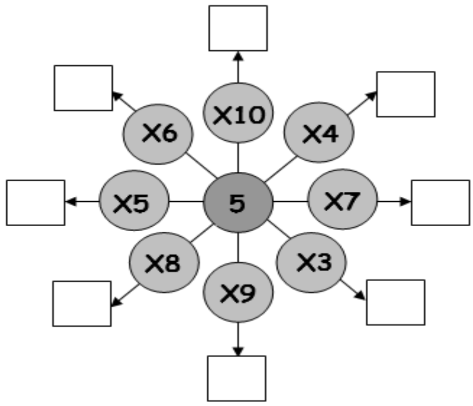
(A) 3×10 (B) 15×10 (C) 70×10

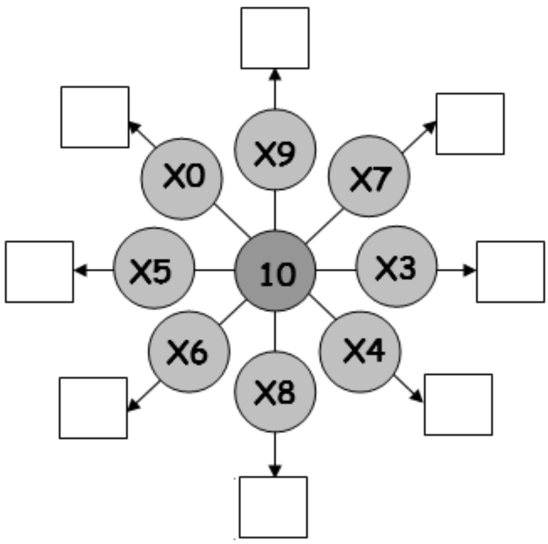
$3 \times 1\underline{0} = 30$ $15 \times 1\underline{0} = 150$ $70 \times 1\underline{0} = 700$

Multiplication ×2, ×5, ×10

Complete the puzzles. In the first puzzle 2×6 has been done for you.







Write down the first 10 multiples of 2

2 **4** _ _ _ _ _ _ _ _

Write down the first 10 multiples of 5

5 **10** _ _ _ _ _ _ _ _

Write down the first 10 multiples of 10

10 **20** _ _ _ _ _ _ _ _

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

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

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

Multiplication table of 6, 7, 8 and 9

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

Activity 10.

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

(A) 7×6=42 (B) 4×8=32 (C) 6×6=36

EXERCISE 5.

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

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

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

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

2. John and his nine friends were each given five sweets, how many sweets did they have in total? Discuss how you worked it out.
3. A teacher at St. Kizito Primary School asked the learners to contribute ten SSP each, if the class has a population of nine learners in total, how much was the total if all the learners brought their contributions? How would you work out this question? Discuss your answer.
4. What is?

   A) $44 \times 100 =$ B) $59 \times 10 =$ (C) $7 \times 8 =$
5. List the factors of these numbers. Discuss your answers. How can you check if your answer is correct.

   a) 36 b) 27 c) 50 d) 30
6. List the first ten multiples of these numbers and discuss how you chose answer.

   a) 6 b) 10 c) 25 d) 35

1.7 Comparing simple equivalent fractions

Activity 11

1. In pairs, make circular paper cut-out, fold and cut it to get two halves.
2. In pairs, practice making halves using rectangular paper.
3. Draw a line to divide the shapes into two and colour one half.
4. In pairs, practice making halves using lemons or oranges.

1.8 Addition and subtraction of fractions

A fraction is a part of a whole.

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

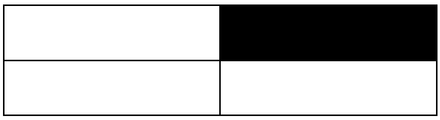
Example 10.

$$\frac{3}{4}$$

Numerator

Denominator

It is used to represent a certain portion of a whole.



The rectangle has four parts.

One part is shaded. The fraction of the shaded part is ¼.

EXERCISE 6.

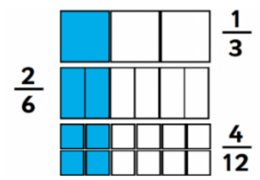
Work in pairs;

Ask your partner to name the numerator and the denominator of each fraction.

1. $\frac{2}{3}$
2. $\frac{1}{7}$
3. $\frac{7}{9}$
4. $\frac{2}{4}$

Equivalent fractions

This divides a whole into equal parts.



In the above diagram the first image has been divided into three equal parts while the same in image has been divided into six equal parts and into twelve equal parts for the last image.

The fractions $\frac{1}{3}$ $\frac{2}{6}$ and $\frac{4}{12}$ are equivalent fractions

To identify if a fraction is equivalent divide or multiple both the top and the bottom with the same number.

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

Example 11.

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

$\frac{1}{2}$

=

$\frac{2}{4}$

=

$\frac{4}{8}$

$$\frac{1}{2} \overset{\times 2}{\underset{\times 2}{=}} \frac{2}{4} \overset{\times 2}{\underset{\times 2}{=}} \frac{4}{8}$$

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

$$\frac{6}{12} \overset{\div 2}{\underset{\div 2}{=}} \frac{3}{6} \overset{\div 3}{\underset{\div 3}{=}} \frac{1}{2}$$

Activity 12.

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

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

Addition of fractions

Key Point

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

Example 12.

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

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

EXERCISE 6.

Add

a. $\frac{2}{7}+\frac{3}{7}=$

b. $\frac{1}{8}+\frac{1}{8}+\frac{1}{8}=$

c. $\frac{1}{4}+\frac{1}{4}=$

d. $\frac{2}{9}+\frac{5}{9}=$

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

f. $\frac{1}{5}+\frac{1}{5}+\frac{1}{5}=$

g. $\frac{1}{10}+\frac{5}{10}=$

h. $\frac{1}{12}+\frac{4}{12}+\frac{2}{12}=$

i. $\frac{1}{2}+\frac{1}{2}=-or\ -$

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

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

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

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

Subtraction of fractions

Key Point

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

Example 13.

Subtract;

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

EXERCISE 7.

1. Write the missing numbers to complete the fraction.

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

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

2. Subtract the following fractions

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

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

1.9 Ratio

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

A ratio says how much of one there is compared to another thing.
In ratio a number is used to express the relation of another number.
It is used to show how much one thing is compared to another.

Example 14.

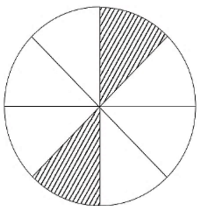
A student uses 3 cups of flour and 1 cup of water to prepare asida.
The ratio of flour to water is 3:1
The ratio of water to flour is 1:3

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

The ratio of girls to boys is 3:2

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

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



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

Example 15.

There are three green mangoes to one yellow one thus the ratio of green to yellow is 3:1
To separate the values in ratio you can use;

A) ":" 3:1

B) The word "to" 3 to 1

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

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

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

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

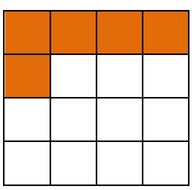
Activity 13.

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

EXERCISE 8.

Work as a whole class;

1. A girl mixes 3 glasses of water with 1 cups of milk to make tea.
   i) What is the ratio of milk to water?
   ii) What is the ratio of water to milk?
   iii) What is the fraction of milk in the mixture?
2. In a school, mathematics text books are 80 while English text books are 70.
   i) What is the ratio of the mathematics text books to English text books?
   ii) What is the fraction of the English text books in the school.
3. Out of 12 pens, 4pens are blue while the rest are black, what is the ratio of the black to blue pens?
4. A class seven science teacher asked her students to go out and collect samples of leaves and stems for their science project, out of 32 students 11 collected leaves, 9 did not collect anything while the rest collected stems, what is the ratio of stems to leaves that were collected?
5. Using the diagram below;



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

(B) Write the answer as a fraction.

1.10 Percentages (%)

This is a part as represented per hundred.

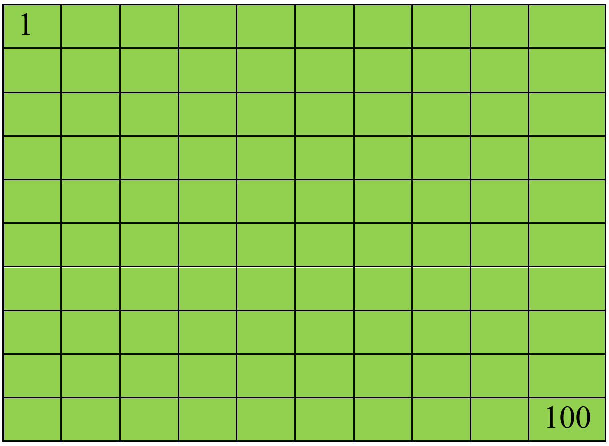
100 percent is a representation of a whole 100.

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

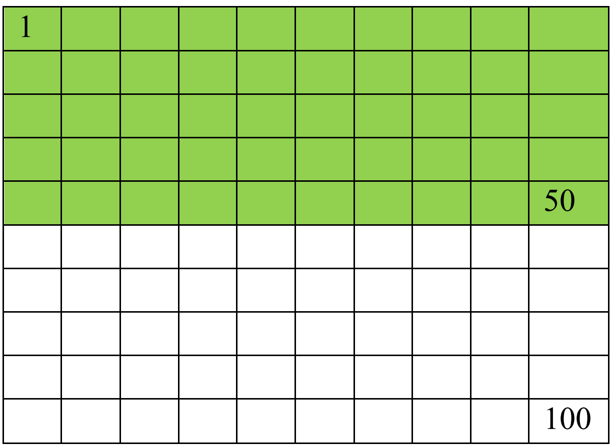
40% means $\frac{40}{100}$ 100% means whole.

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

Example 16.

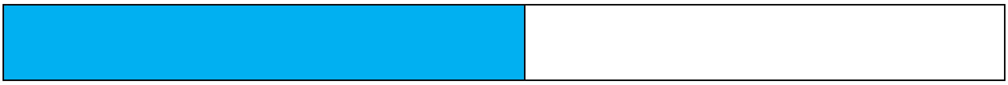


The table on the left has a hundred small squares which are all painted green thus the diagram is 100% painted.



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

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



A half can be written;

As a percentage 50%

As a decimal 0.5

As a fraction $\frac{1}{2}$

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

Percent	Decimal	Fraction
25%	0.25	$\frac{1}{4}$
50%	0.5	$\frac{1}{2}$
75%		$\frac{3}{4}$
100%	1	

Example 17.

To convert from percent to decimal divide by 100 and remove the % sign.

<u>Convert 54% to a decimal</u>

54% move the decimal point two places to the left thus 54 becomes 0.54.

To convert from decimal to percent multiple by 100 and add the % sign.

<u>Convert 0.54 to percent</u>

0.54 Just like in converting to decimals move the decimal point two places but this time to the right thus it becomes 50%.

<u>Calculate 25% of 80</u>

$$25\% = \frac{25}{100}$$

$$\frac{25}{100} \times 80 = 20$$

So 25% of 80= **20**

Activity 14.

In pairs, works out the following;

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

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

EXERCISE 9.

Work individually;

1. What does each of the following mean?

   a) 20% c) 10%

   b) 8% d) 15%

2. What is 70% of 700 oranges?
3. 15 out of 45 books are mathematics books. What percentage of mathematics books are there?
4. A student has 10 oranges. If 2 of the oranges are bad, what percentage of the oranges are bad?
5. If 50% of 200 mangos are good, how many mangos are good?
6. Express the following fractions as percentages.

   a) $\frac{2}{3}$ b) $\frac{1}{8}$ c) $\frac{4}{5}$ d) $\frac{3}{4}$ e) $\frac{7}{10}$

7. Calculate 12% of 350.

Work in pairs;

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

Percentages into fractions

To convert a percentage into a fraction, we divide the percentage by 10 0.

Example 18.

Express the following percentages as fractions

20% 15% 50% 67% 45%

Solution

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

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

EXERCISE 10.

Work individually;

1. Express the following percentages as fractions

   a. 30% b. 75% c. 90% d. 62% e. 22%

   f. 37% g. 25% h. 8% i. 12% j. 35%

   k. 15% l. 2% m. 28% n. 17% o. 4%

   p. 31% q. 40% r. 44% s. 33%

Percentages and ratios

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

Example 19.

1. convert the following percentages into ratios

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

Solution

a) 60:100=6:10=3:5(on simplification)

b) 20:100=2:10=1:5 (on simplification)

c) 52:100=26:50=18:25 (on simplification)

2. Express the following ratios as percentages.

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

Solution.

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

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

b) $\frac{2}{5} \times 100\% = 40\%$

c) $\frac{1}{2} \times 100\% = 50\%$

EXERCISE 11.

Work individually;

1. Express the following percentages as ratios
   a. 30% b. 90% c. 80% d. 72% e. 58%
2. Convert the percentages into decimals and the decimals to percentages
   a. 28% b. 0.2 c. 30% d. 0.25 e. 96%
3. Express the following ratios as percentages
   a. 1:3 b. 2:3 c. 10:13 d. 1:4 e. 1:5
4. Express the following ratios as fractions

a. 2:5 b. 7:9 c. 10:17 d. 1:4 e. 1:3

UNIT 2 MEASUREMENT

2.1 Estimate and measure

An estimate is a rough idea that we make without measuring.

Activity 1

Estimate and complete the activity in pairs.

Item	Estimate in metres
Length of your arm	
Your height	
Your teachers height	
Length of your desk/chair	
Width of your classroom	
Length of a car	
Width of school playground	

Measurement is identifying a number that shows the size or amount of something.
It can be classified under different aspects.

2.2 Length

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

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

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

Introducing centimetres and metres

The centimetre is a standard unit of length. It is helpful in measuring small distances such as length of pencils, chalk, books, etc.

Look at this line AB: A B

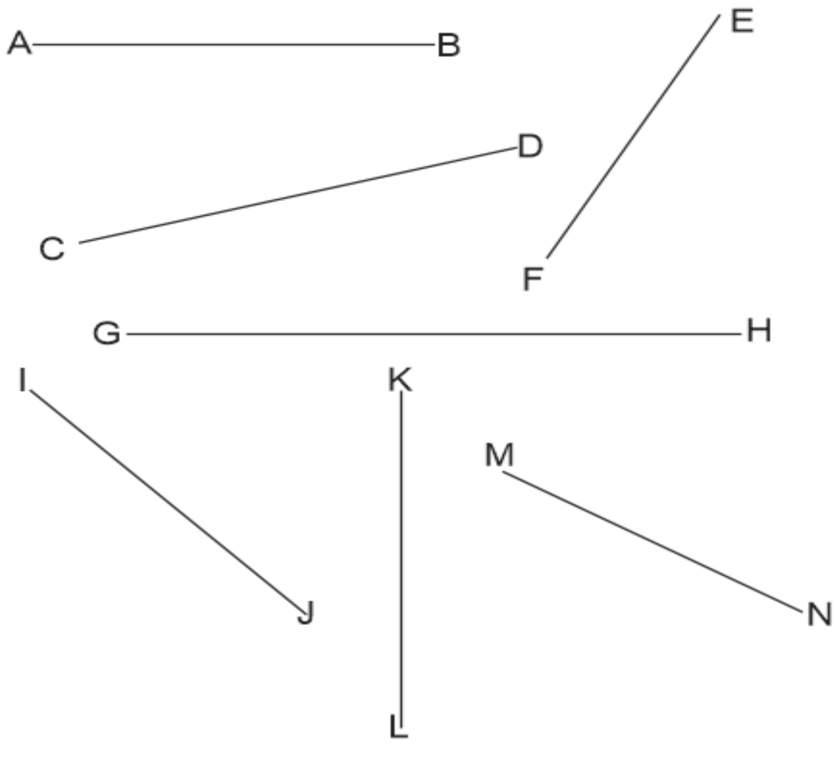
This is a length of 1 [1 cm] centimetre.

The centimetre is written as **cm**

Activity 2

Estimate the lines below.

Using a 15 cm ruler, measure the length of the following lines, to the nearest cm. Work in pairs.



Activity 3

Work in pairs. Fill in the table with the measurements from Activity 2.

Line	Estimate length	Exact length
AB		
CD		
EF		
GH		
IJ		
KL		
MN		

Activity 4.

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

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

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

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

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

Conversion of units of length (cm and m)

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

Example 1.

Use a 1metre ruler to convert the following;

1. Convert 10 cm into m

Solution

100 cm =1m

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

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

2. Convert 70cm into m

Solution

100cm=1m

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

3. Convert 250cm into m.

Solution

100cm=1m

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

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

1. Convert 100m into cm

Solution

100cm =1m

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

2. Convert 2.7 m into cm

Solution

100cm = 1m

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

EXERCISE 1.

Work individually;

1. Convert from cm into m.

a) 20cm	c) 57cm	e) 500cm
b) 420cm	d) 3 709cm	f) 6 050cm

2. Convert into cm.

a) 2m	c) 3.7m	e) 1.4m
b) 5m	d) 20m	f) 400m

3. How many metres are there in 2 000 centimetres?
4. My sister walks 1 000cm every day. How many metres does she walk in a day? How would you work out?
5. Electricity was connected to two houses. One at 102m and the other 70m away. How long was the wire in metres?
6. A water pipe is branched into two houses. One is 10.5m and the other is 7m long. How many centimetres are the two pipes?

Activity 5.

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

2.5 Addition and subtraction involving metres and centimetres

Adding metres and centimetres

Activity 6.

In pairs, study the following examples carefully.

Example 2

Add 60 cm and 60 cm

60 cm + 60 cm
= 60 cm + 40 cm + 20 cm
= 100 cm + 20 cm
= 1 m 20 cm

Example 3

Add 2 m 36 cm and 1 m 36 cm

	2 m	36 cm
+	1 m	36 cm
	3 m	72 cm

Example 4

Add 4 m 76 cm and 3 m 34 cm.

	4 m	76 cm
+	3 m	24 cm
	8 m	10cm

Note:
76 cm + 34 cm
= 100 cm + 10 cm
= 1 m 10 cm

Activity 7

In pairs, add the following:

1. 50 cm + 50 cm
2. 36 cm + 74 cm
3. 75 cm + 43 cm
4. 48 cm + 45 cm
5. 52 cm + 84 cm

Activity 8

In pairs, add the following:

1.
```
   6 m   28 cm
 + 3 m   44 cm
```

2.
```
   7 m   60 cm
 + 2 m   18 cm
```

3.
```
   7 m   48 cm
 + 1 m   26 cm
```

4.
```
   6 m   38 cm
 + 2 m   28 cm
```

5.
```
   5 m   29 cm
 + 4 m   30 cm
```

Subtract metres and centimetres

Activity 9

In pairs, study the following examples.

Example 5

Subtract 5 m 28 cm from 9 m 48 cm.

```
   9 m   48 cm
 - 5 m   28 cm
   4 m   20 cm
```

Example 6

Subtract 5 m 63 cm from 7 m 54 cm.

```
   7 m   54 cm
 - 5 m   63 cm
```

Convert 7 m 54 cm to 6 m 154 cm since 63 cm cannot be removed from 54 cm.

1 m   92 cm

Activity 10

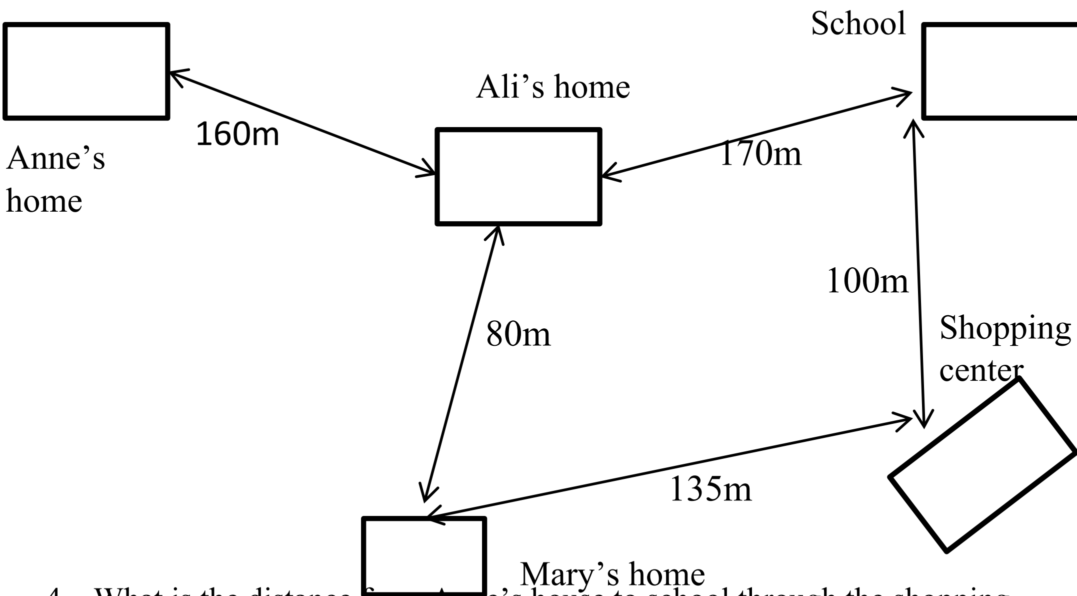
In groups, subtract the following.

1.	8 m 60 cm		4.	6 m	38 cm
	- 4 m 50 cm			- 3 m	16 cm
2.	3 m 65 cm		5.	5 m	27 cm
	- 2 m 57 cm			- 3 m	18 cm
3.	8 m 65 cm		6.	2 m	86 cm
	- 2 m 45 cm			- 1 m	99 cm

Activity 11

In groups, solve the following problems. Explain how you arrive at your answers. Show your working out.

1. A stick of 3 m 45 cm long is joined to another. The total length of the sticks is 5 m 85 cm. What is the length of the second stick?
2. A table 3 m 25 cm long is joined to another 2 m 75 cm long. What is the total length of the new table?
3. A woman sold 25 m 70 cm of ribbon on Monday and 35 m 20 cm on Tuesday. How much ribbon did she sell altogether?

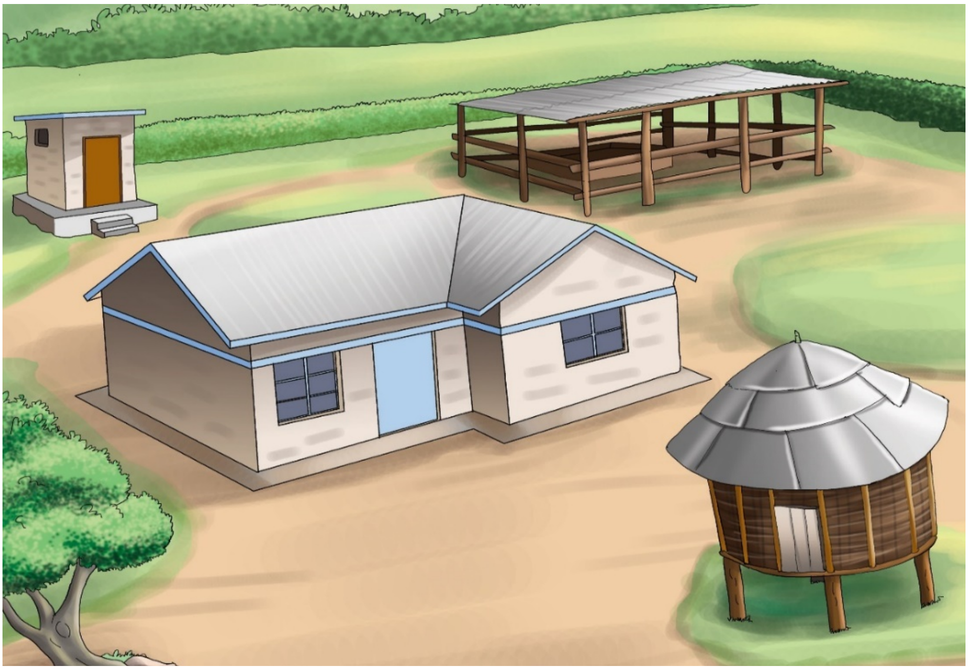


4. What is the distance from Anne's house to school through the shopping centre?
5. Mary can go to school through two ways: Ali's house and through the shopping centre. Which is the shortest and by how many metres.
6. Othow is 168cm tall. His sister is 132 cm. How short is the sister?
7. The length of a barbed wire all round a homestead and the gate is 20 m. The length of the gate is 2 m. What is the length of the fence?
8. A pipe 12 m 45 cm long was cut off from another pipe 20 m 56 cm long. How much pipe is left?

2.3 Area

Area is the amount of space the shape takes.

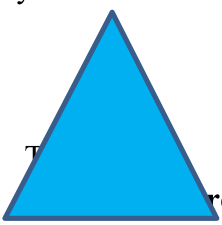
In pairs, look at the picture below. Which areas in the school compound or home can be measured? Explain why you choose those areas. Did you notice different shapes in this picture.



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

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

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



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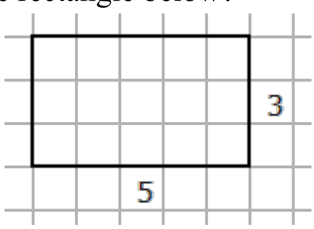
Area is measured in squares (or square units).

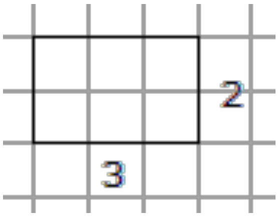
How many squares are in the rectangle below?



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

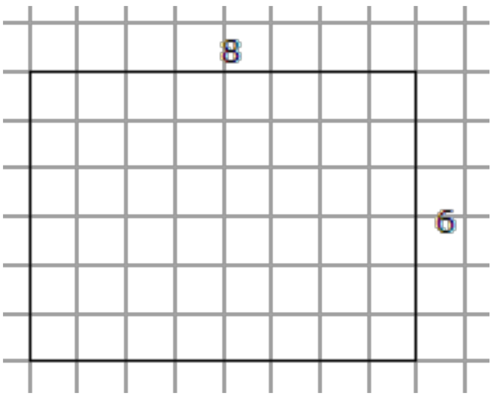
The area of a rectangle is = length × width.

Examples of calculating the area of a rectangle.



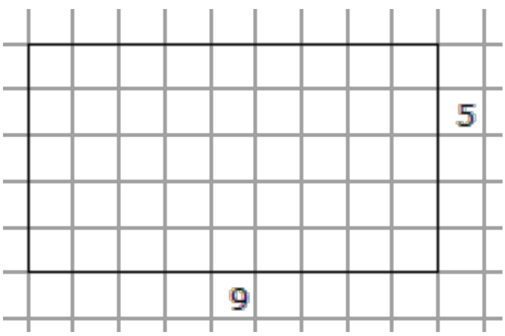
Area = Length x Width.

Area = 3 × 2 = 6 square units.



Area = Length x Width.

Area = 8 × 6 = 48 square units.



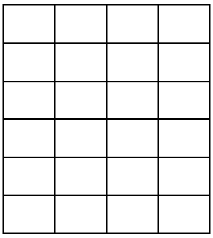
Area = Length x Width.

Area = 9 × 5 = 45 square units.

EXERCISE 2.

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

a.



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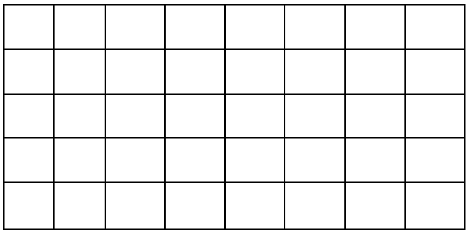

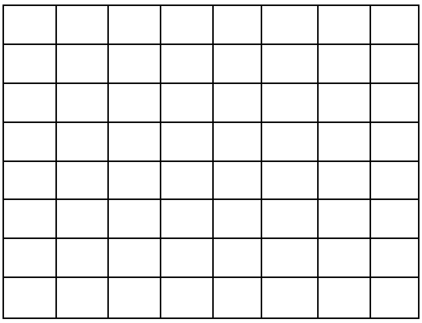

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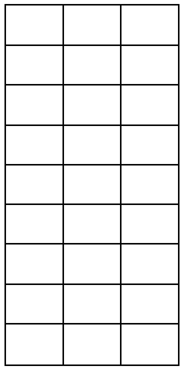
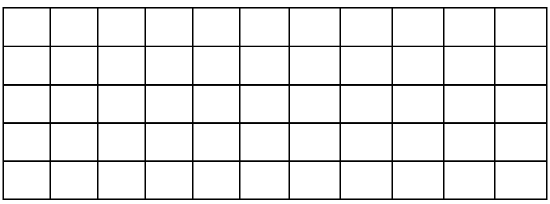
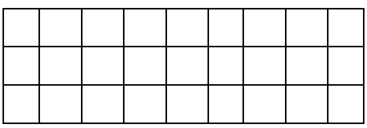


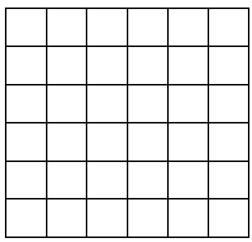
d.

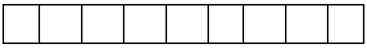
e.





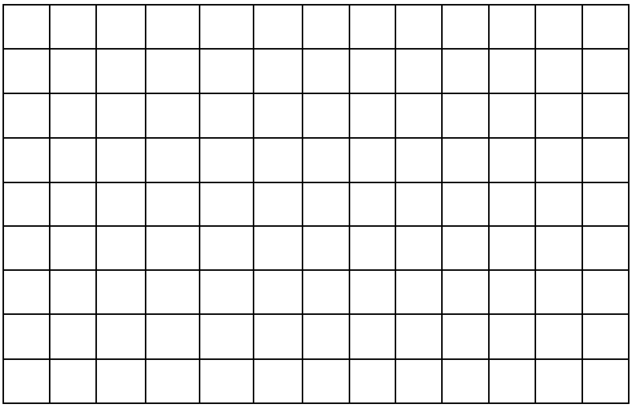
g.



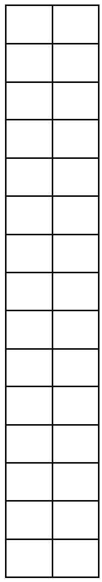
f. 

h.

i.



j.



Units for measuring area

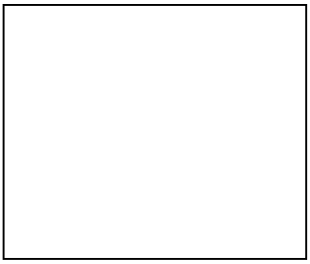
We measure area using squares. We use different sizes of squares depending on how big or small an area is.

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

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

We can say “63 millimeters squared” or “63 square millimeters”

Area of a Square



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

This figure is a shape of a square. All sides are equal. The area of a square is length of a side x length of a side.

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

A = length × length

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

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

Example 7.

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

   <u>Solution</u>

   Area=length × length

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

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

   <u>Solution</u>

   AREA=length × length

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

EXERCISE 3.

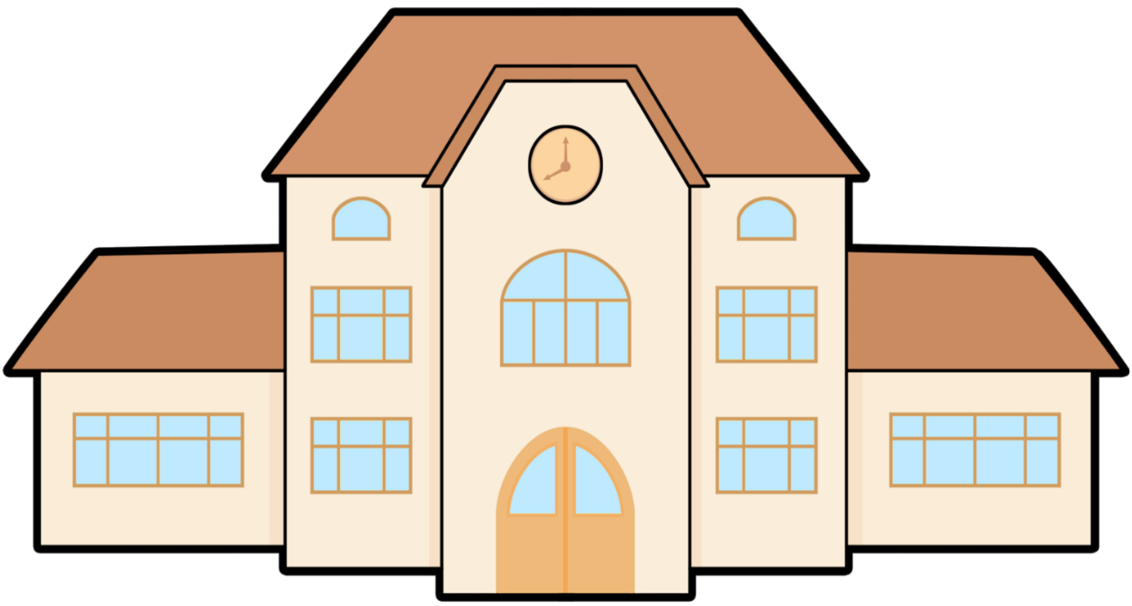
Work individually;

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

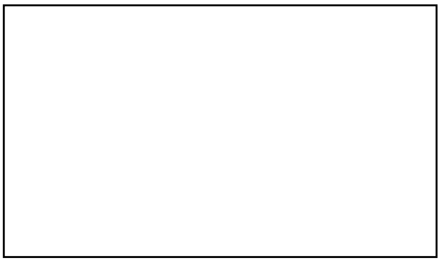
Area of a rectangle

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

In pairs, look at the picture below.



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



Area of a rectangle =length × width

A=L×W

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

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

Example 8.

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

   <u>Solution</u>

   Area = length × width

   A =70cm × 50cm = $3500cm^2$

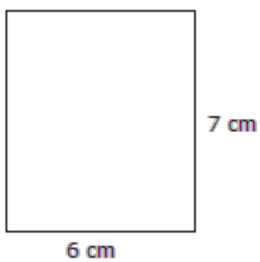
2. Work out the area of a rectangular room which measures 4m by 6m

   <u>Solution</u>

   Area = length × width

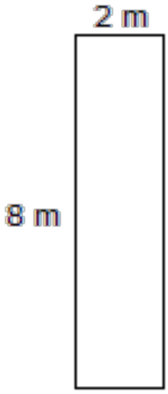
   A = 2m × 3m = $6m^2$

More Examples of Calculating Area of Rectangles



Area = Length × Width

Area = 7 cm × 6 cm = 42 cm^2



Area = Length × Width

Area = 8 m × 2 m = 16 m^2

EXERCISE 4.

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

Activity 12.

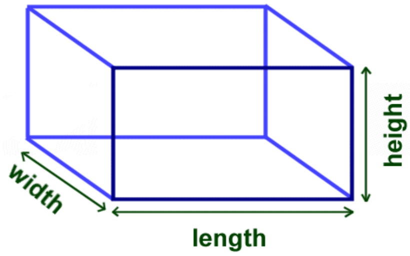
In groups, take a walk in the school environment.

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

2.4 Volume and Capacity

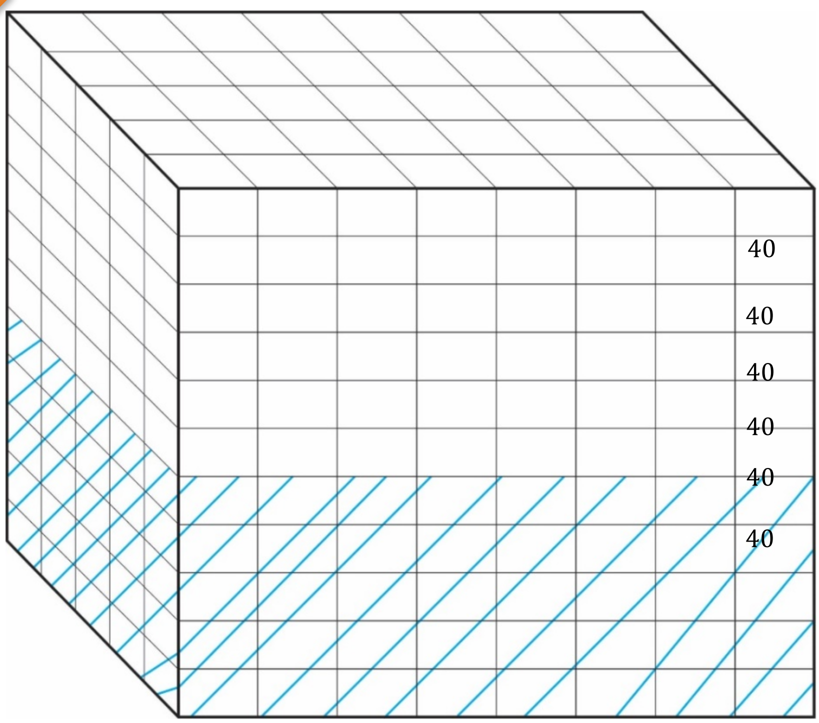
Volume

Volume is the measure of the amount of space inside of a solid figure, like a cube, ball, cylinder or pyramid.
The units are always "cubic", that is, the number of little element cubes that fit inside the figure.
To get the volume of an object, multiple the length by the width by the height of the object.



Volume= **L**× **W**× **H**

Example 9.



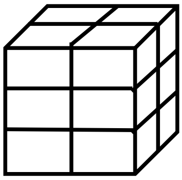
There are 6 layers of 40 cubes each.

$$40 + 40 + 40 + 40 + 40 + 40$$
$$= 240 \text{ cubic units}$$
$$\text{Volume} = 40 \times 11$$
$$= 440 \text{ cubic units.}$$

EXERCISE 5.

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

a.)



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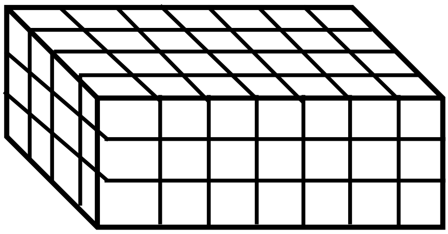

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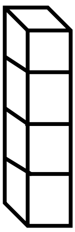
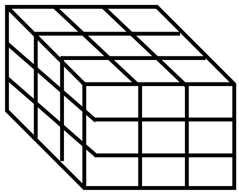
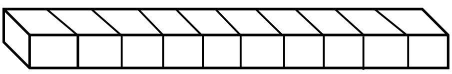


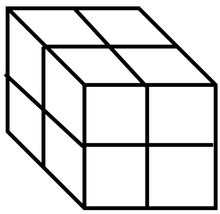
d.)



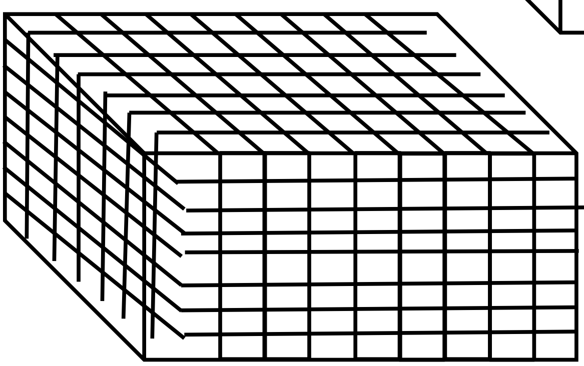
e.)



f.



g.



Capacity

This is the quantity a container can hold.
Capacity is measured in litres.

Activity 13.

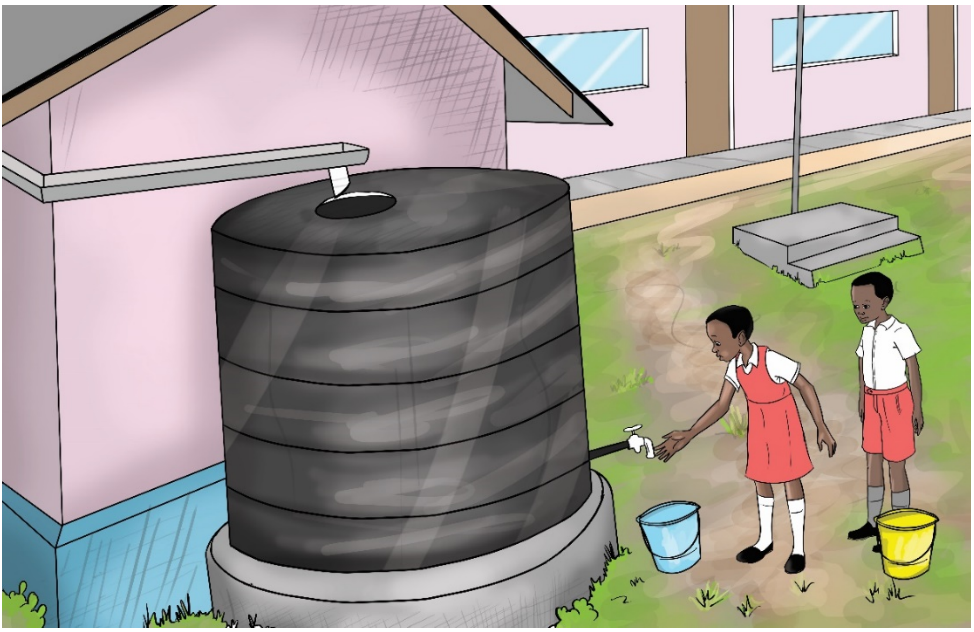
In pairs, use $\frac{1}{2}$ litre, $\frac{1}{4}$ litre, and 1 litre to fill the containers of 3litres and 5 litres.

Estimate and then measure.

In pairs;

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

In groups, look at the picture below.



Do you have water tanks at school or at home?
Compare the container learners want to use to collect water.
Approximate the amount of water does the containers hold.

EXERCISE 6.

Work individually;

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

Activity 14

Conversion of UnitsS

maller divisions of litre are decilitres, centilitres and millilitres.

Study the following table.

Units of measurement

10 millilitres (ml) = 1 centilitre (cl)

10 centilitres (cl) = 1 decilitre (dl)

10 decilitres (dl) = 1 litre

When converting from ml to l	**÷ by 1000**
When converting from l to ml	**x by 1000**

Activity 15

Calculate and fill in the missing numbers

MILLILITRES	LITRES
2,000 ml	
	7.2 L
4,900 ml	
	9.4 L
10,000 ml	

When converting from cl to L	**÷ by 100**
When converting from L to cl	**x by 100**

Activity 16

Calculate and fill in the missing numbers

Centilitres	LITRES
340cl	
	3 L
550cl	
	7.4 L
800cl	

When converting from cl to L	**÷ by 100**
When converting from L to cl	**x by 100**

Activity 17

Convert the following from centilitres (cl) to litres (l).
I need to multiply by ________________

1. 1.00L _______________cl
2. 3.5L _______________cl
3. 4.9l _______________cl

4Litres or 330cl. Which is bigger and why? Explain your working out.

Tell your partner what you have learnt about converting ml to l and cl to l.

2.5 Weight

Weight refers to how heavy or light an object is.
The kilogram (kg) is the standard unit of weight.
The kilogram (kg) is used as a unit when weighing heavy objects. For smaller or litres objects, we use the unit gram (g).
The weight of I litre of water is 1 kilogram.
There are 100 grams in 1 kilogram.
1 kg = 1000 g
$\frac{1}{2}$ kg = 500 g
$\frac{1}{4}$ kg = 250 g
We use grams to weigh smaller or little/ light objects or things. There are 1000g in 1 kg

Activity 18

Look at the following pictures. What is happening? Talk in groups.

Activity 19

Estimate the weight of the following.

1. Stones of different sizes.
2. Text books of different subjects.
3. Your own weight.

Activity 20

Visit a nearby market. What do the sellers use to weigh different commodities? It their method of measuring accurate? Why do you think that? With a partner, record your findings and present them to the whole class.

Addition and subtraction

Examples

4 kg + 6 kg = 10 kg

45kg + 64 kg= 109 kg

104 kg + 9 kg, 98kg – 43 kg

104	98
+ 9	-43

113 55 kg

The common units of measurement are:

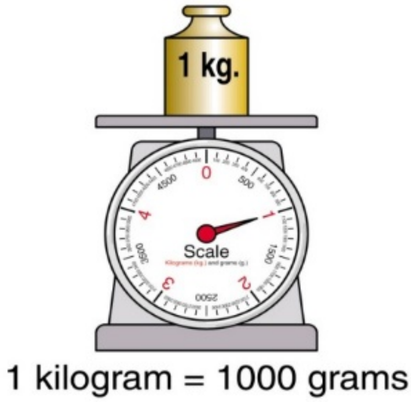
Grams (g)

Kilograms (kg)

Grams are the smallest unit of measurement.

One kilogram = 1000 grams

A paperclip or a sewing needle weighs about 1 gram.



1000 paper clips makes 1 kilogram.

Kilogram is the second unit of measuring weight.

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

Activity 21.

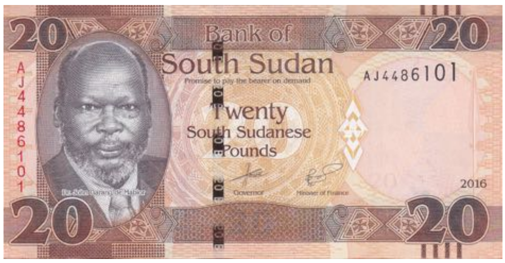
In groups, collect objects of different shapes and sizes like pencil, stone, textbook, dictionary, cabbage, etc. Estimate the weight of each object and record in the table below.

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

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

2.5 Money

The official currency in our country is the **South Sudanese Pound**.
It is available in different denominations. Look at these six notes.
They are in (1, 5, 10, 20, 25, 50 and 100 pounds) and they are in the form of banknotes.



Buying and selling

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

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

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

EXERCISE 7.

Work individually; Show you working out

1. Makur had SSP 100. If he wanted a change of SSP 10 notes, how many such notes did he get?
2. Emma had SSP 50 note. She required SSP 20 notes, how many notes did she get?
3. John had 2 –100 notes. If he wanted SSP 25 notes, how many such notes did he get?
4. Douglas had 5-one hundred South Sudanese Pound notes. How many 20 south Sudanese pound notes did he get?

5. Mary had 150 South Sudanese Pounds how many five South Sudanese Pounds would she get?
6. How many 10 South Sudanese Pound notes can one get from a 200 South Sudanese Pounds?
7. Teresia had 5- one hundred South Sudanese Pounds notes, how many fifty notes did she get from getting change?
8. How many 50 notes can you get from 1000 South Sudanese Pounds?
10. Samson was sent by his mother to get change of 50 South Sudanese Pound note. How many five South Sudanese Pound notes did he get?

Profit

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

Example 10.

A trader bought an exercise book at SSP20 and later sold it at SSP30. In this case SSP30 is the selling price while SSP20 is the buying price.
The trader has made a profit of SSP10 since the selling price is more than the buying price.

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

Loss

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

Example 11.

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

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

EXERCISE 8.

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

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

OUR SHOP

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

PRICE LIST

SSP. 100

SSP. 80

SSP.250

SSP. 300

SSP. 280

SSP. 250

SSP. 140 SSP. 50 SSP. 240

EXERCISE 9.

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

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

2.6 Time

Units of time

- 1 week = 7 days
- 1 day = 24 hours
- 1 hour = 60 minutes

Example

1. How many days are there in 3 weeks?

$$3 \times 7 = 21 \text{ days}$$

2. How many weeks are equivalent to 63 days?

$$63 \div 7 = 9\, weeks$$

Activity 22

In pairs, work out the answers correctly.

1. I stayed in a hotel for 2 weeks and 3 days. I then moved to another one for 3 weeks, how long was my stay in the two hotels?
2. In the April holiday, I spent 12 days in Nairobi, 10 days in Cape Town and another 3 days in Paris, How long was the holiday?
3. What is the time interval from 10:00am to 11:30am?

How have you worked this out?

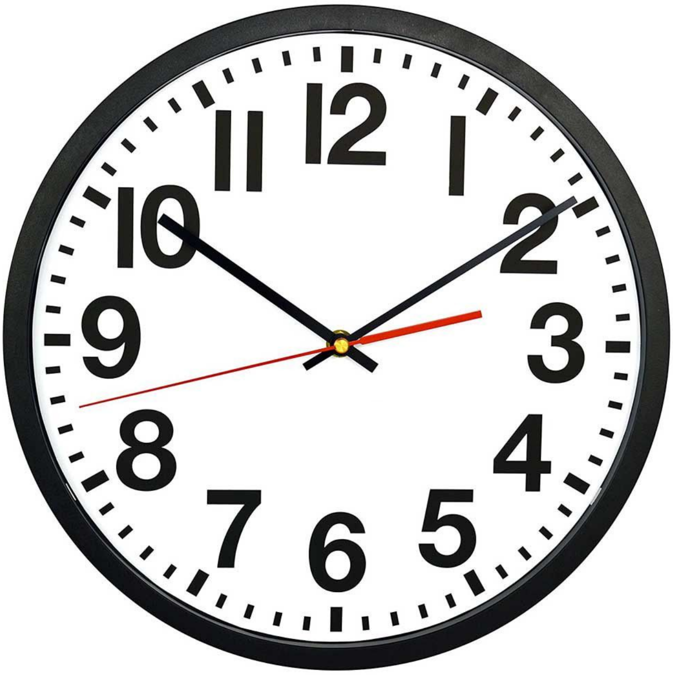
Activity 23

We know that hours, minutes and seconds are the units, we use to measure the time.

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

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

Work in pairs.



1. What does the long hand of a clock show?
2. What does the short hand of a clock show?
3. What does the long and thin hand of a clock which moves faster show?
4. How many seconds are there in 10 minutes?
5. How many seconds are there in half an hour?
6. How many minutes are there in three hours?
7. How many hours are there in two days?
8. How many days are there in 5 weeks?
9. How many weeks are there in two years?
10. How many months are there in one and a half years?

1 hour = 60 minutes.	**60 minutes =1 hour**
1 minute = 60 seconds.	**60 seconds =1 minute**

Activity 24

If 1 hour is 60 minutes, how many minutes is 3 hours? Show your working.

Activity 25

If you took 520 minutes to travel to your school. How many hours did it take you to get to school?

Activity 26

1 minute is made up of 60 seconds.

Convert into seconds: Work in groups.

1. 1 hours 24 seconds
2. 20 minutes 45 seconds
3. 18 minutes 28 seconds
4. 2 hours 12 seconds
5. 36 minutes 17 seconds
6. 15 hours 19 seconds

How did you arrive at your answers?

Activity 27

Use a.m. or p.m. Work in groups.

1. 7:35 in the morning
2. 6:45 in the evening
3. 2:20 midnight
4. 4:35 in the evening
5. 8:48 in the morning
6. 12:50 afternoon
7. 5:05 in the evening
8. 11:27 at night
9. 8:36 in the morning
10. 9:17 at night

Activity 28

What was the time before 6 hours? Work out in groups.

1. 3:20 a.m.
2. 5:45 p.m.
3. 9:15 a.m.
4. 12 midnight

5. 12 noon

6. 2:15 p.m.

How did you arrive at your answers?

Activity 29

What will be the time after 4 hours? Work out in groups.

1. 5:40 a.m.

2. 8:30 p.m.

3. 1:25 a.m.

4. 5:20 a.m.

5. 3:05 p.m.

6. 2:30 p.m.

How did you arrive at your answers?

24 Hour Clock" or " 12 (AM/PM) systems

There are two main ways to show the time: "24 Hour Clock" or "AM/PM".
24 Hour Clock**:** the time is shown as how many hours and minutes since midnight.
AM/PM (or "12 Hour Clock"): the day is split into:
The 12 Hours running from Midnight to Noon (the **AM** hours), and
The other 12 Hours running from Noon to Midnight (the **PM** hours).

Converting 12 hour clock to 24 clock

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

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

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

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

11:20 AM = 11:20

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

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

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

Converting 24 hour clock into 12 hour clock

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

0:10 = 12:10 AM

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

1:15 = 1:15 AM

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

12:10 = 12:10 PM

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

14:55 = 2:55 PM.

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

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

EXERCISE 10.

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

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

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

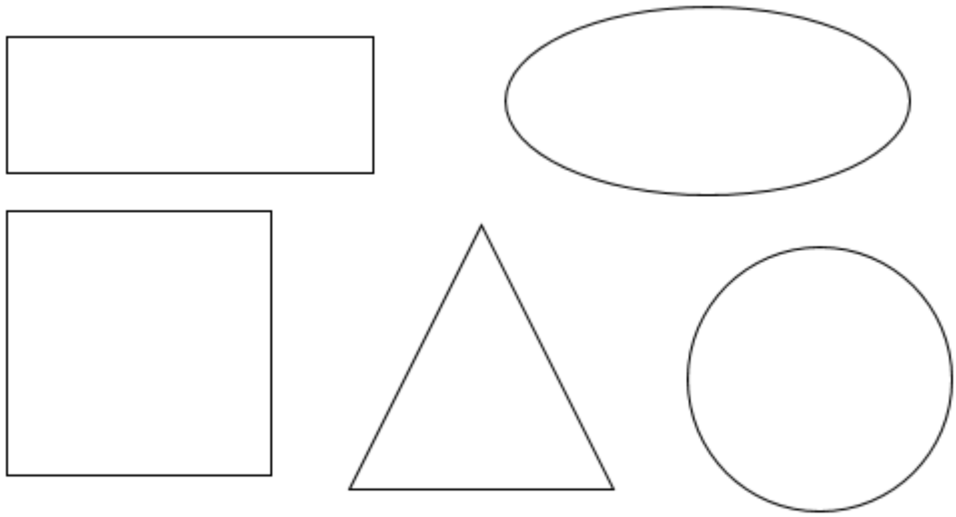
1)	13:41 =	2)	17:50 =	3)	04:32 =
4)	12:36 =	5)	23:25 =	6)	08:53 =
7)	00:51 =	8)	19:08 =	9)	15:39 =

UNIT 3 GEOMETRY

We are familiar with the following shapes from primary 2:

1. Rectangles
2. Squares
3. Triangles
4. Ovals
5. Circles.

Where have you seen these? Tell your partner.



Activity 1: In pairs

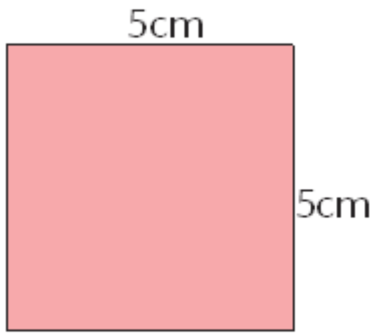
Your teacher will take you outside the classroom to find objects which have the shapes as the ones listed above.
You can also check the objects in the classroom. For example: table, books, desk etc. Draw the objects that you find in the environment and compare them with the shapes they resemble.

Sketching and drawing shapes accurately .

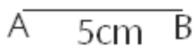
Activity 2: Work in pairs.

Square

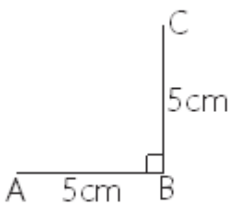
A square is a quadrilateral with four right angles and four congruent/ equal sides. It is very easy to draw.
Draw a square measuring 5cm by 5cm. Follow the steps and draw in your exercise book.



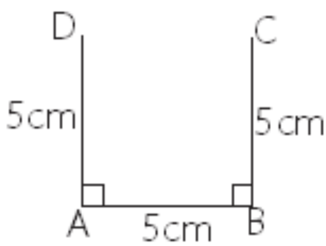
1. Draw a line using a ruler measuring 5cm, which is one side of the square. Label the line AB.



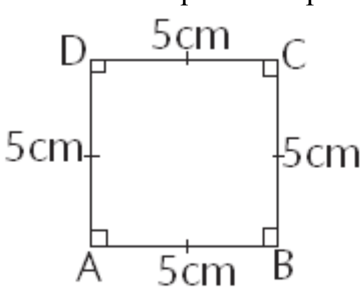
2. Considering the side drawn in the previous step as one of the arms, construct a right angle on one end of it. Label it C



Repeat the previous step on the other arm of the line.



4. Join the points C and D to make the square complete.

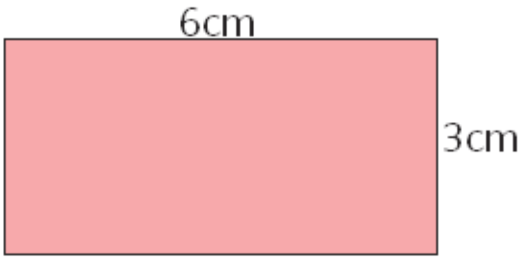


5. We have drawn a perfect square which is 5cm by 5cm.
All the sides are equal and the angles are equal too.

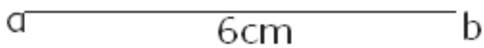
Activity 3: Work in pairs.

Rectangle

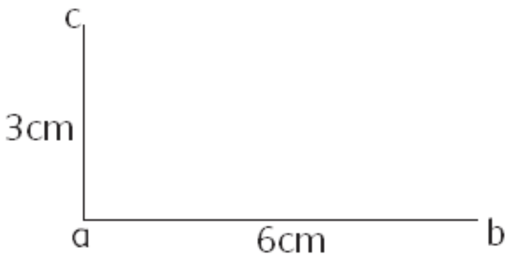
A rectangle is a plane figure with four straight sides and four right angles, especially one with unequal adjacent sides, in contrast to a square.
Draw a rectangle measuring 6cm by 3cm.



1. Draw a line using a ruler measuring 6cm, which is one side of the rectangle. Label then line ab

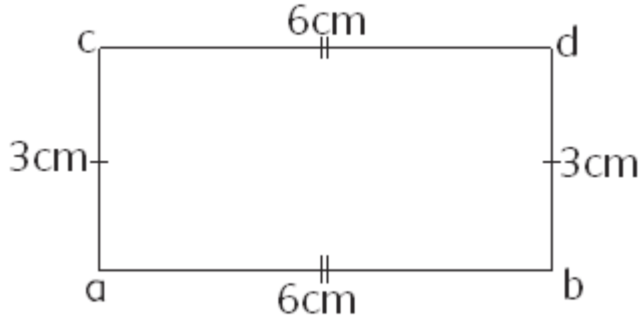


2. Considering the side drawn in the previous step as one of the arms, construct a right angle at one end of it and the line measuring 3cm. Label it c.



3. Repeat the previous step on the other side of the line. Label it d.

4. Join the points c and d to make the square complete.



5. We have drawn a rectangle measuring 6cm by 3cm.
6. A rectangle has 2 of its sides equal and all the angles are right angles.
7. Follow the above steps and draw a rectangle in your exercise book.

Activity 4: Work in pairs.

Triangle

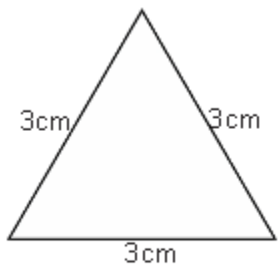
A triangle is a plane figure with three straight sides and three angles.

There are various types of triangles.

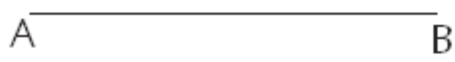
In this level we are going to study about:

1. Equilateral triangle.
2. Right angled triangle.
3. Isosceles triangle.
4. Scalene triangle.

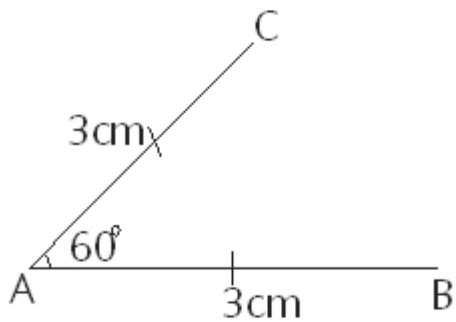
Draw an equilateral triangle measuring 3cm by 3cm by 3cm.



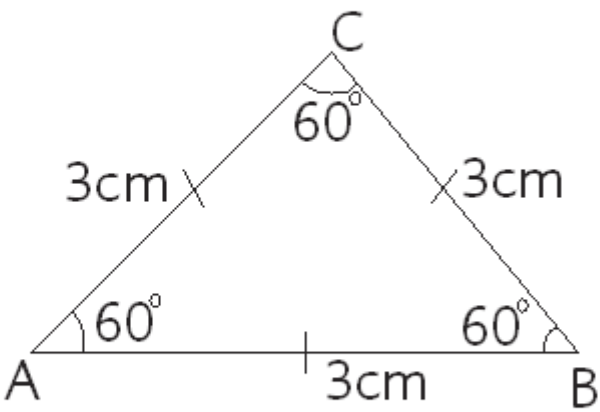
1. Lay your ruler on the paper, then trace a pencil along the straight edge. This line segment will form one side of your equilateral triangle, which means that you will need to draw two more lines of exactly the same length, each reaching toward a point at a 60° angle from the first line. Label it AB.



2. Draw another line from one of the points. Estimate an angle of 60. Label the line C.



3. From the other point B, draw another line to meet at C.



4. We have drawn an equilateral triangle with all sides equal and all angles equal.
5. Draw the equilateral triangle in your exercise book following the above steps.

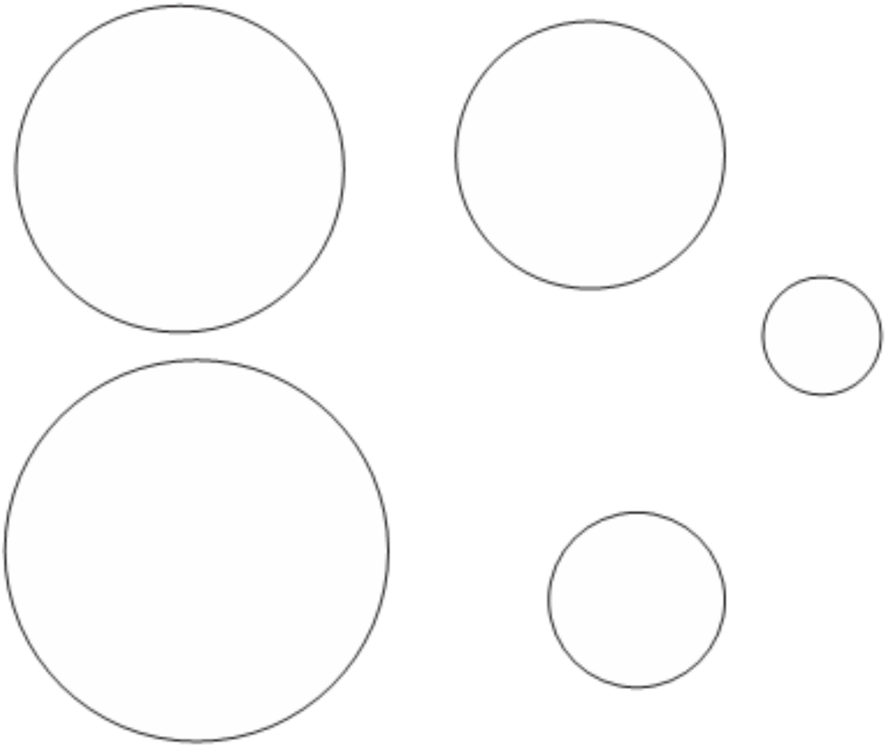
Activity 5: Work in pairs.

Circle

A circle is a round plane figure whose boundary (the circumference) consists of points of the same distance from a fixed point (the centre).

1. Draw an accurate circle.

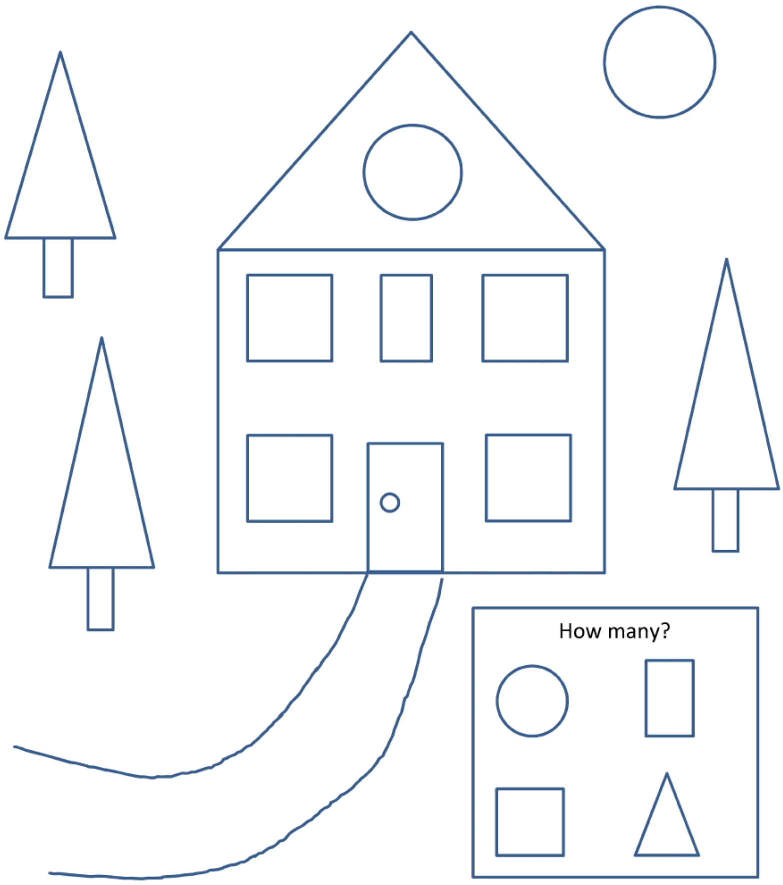
2. The teacher will provide with various round objects which you can use to draw a perfect circle.
3. For example, a glass of water for a bigger circle, a coin, a bottle, a cup etc.
4. Draw different sizes of circles. Like the ones below.



Activity 6

Work in groups.

1. Count the shapes in the diagram on the following page.



1. How many triangles?
2. How many rectangles?
3. How many squares?

Activity 7: Individually

1. Draw the following geometric shapes accurately as instructed.
    a. A rectangle measuring 4cm by 7cm.
    b. A square of length 5cm.
    c. A triangle measuring 4cm by 5cm by 3cm

3.1 Properties of Geometric shapes

Activity 8: Work in pairs.

Guess my shape game

Guess who I am. I am thinking of a shape, it has 43 right angles opposite sides are equal and the perimeter is 12 cm

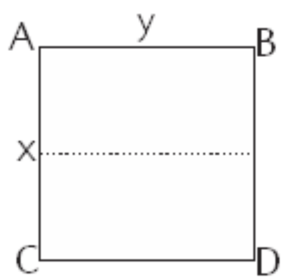
Activity 9: Work in pairs.

Make a fact book showing properties of a square, rectangle, triangle and a circle.

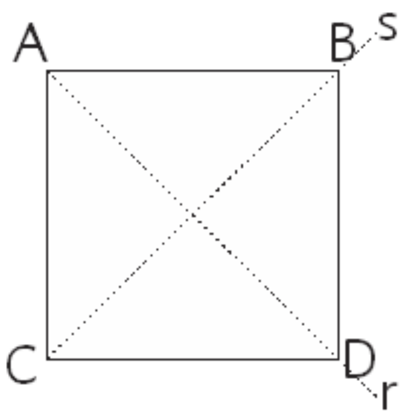
Activity 10: Work in pairs.

Square

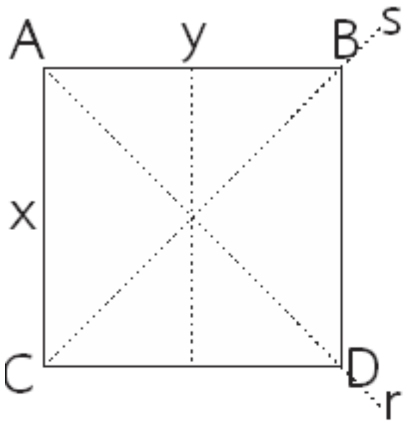
1. Make a paper cut out of a square ABCD.



2. Fold it so that corner B fits to corner A and D to C.
3. Press the fold to show the dotted line x and y.
2. Open the cut out and fold again so that A fits to D and C to B. This will give you the dotted lines s and r.



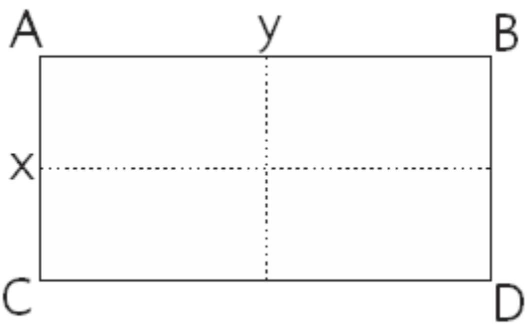
Observation: A square has 4 lines of symmetry.



Activity 9: Work in pairs.

Rectangle

1. Make a paper cut out of a rectangle ABCD.



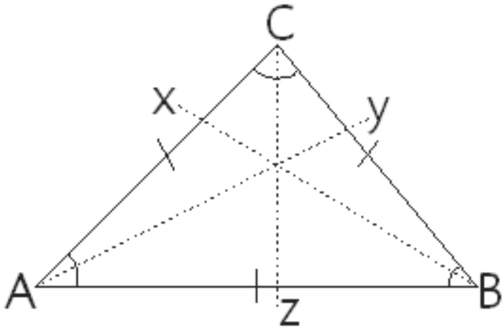
2. Fold it so that corner B fits to corner A and D to C.
3. Press the fold to show the dotted line x and y.

Observation: A rectangle has two limes of symmetry.

Activity 10: Work in pairs.

Triangle

1. Make a paper cut out of an equilateral triangle ABC.



Fold it so that corner B fits to corner A and C is the tip top.

2. Press the fold to show the dotted line z.
3. Fold it again, so that C lies at the centre of the line AB.
4. Fold it again, so that C fits to corner A and B is the tip top.

Observation: An equilateral triangle has 3 limes of symmetry.

Activity 11: Work in pairs.

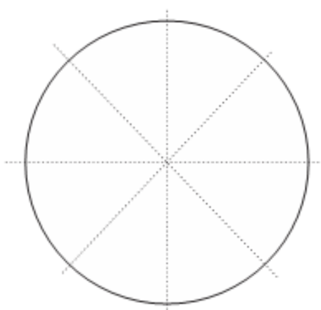
With the help of your teacher work on the other types of triangles, considering that:

1. An isosceles triangle has 1 line of symmetry.
2. A right angled triangle has no line of symmetry.
3. A scalene triangle has no line of symmetry.

Activity 12: Work in pairs.

Circle

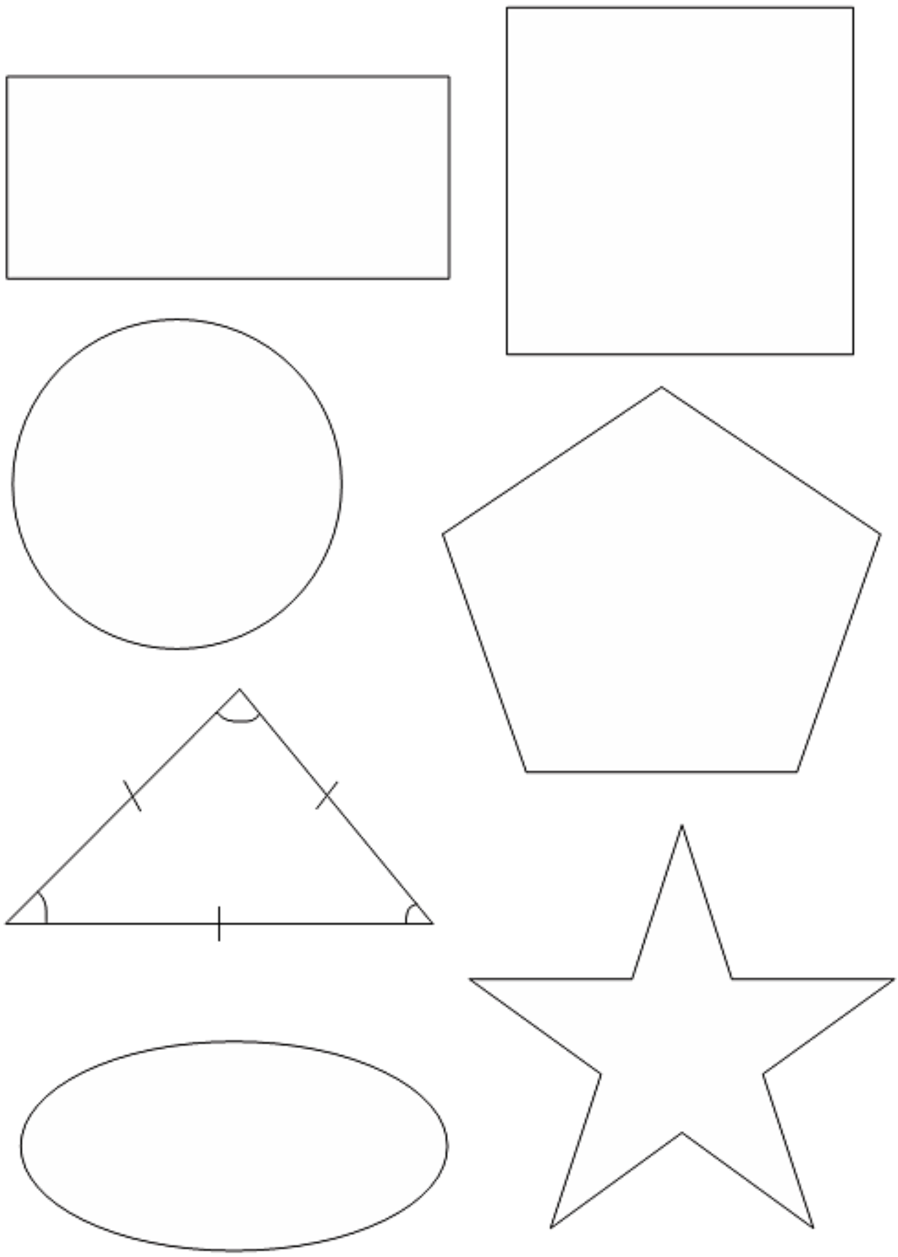
1. Make a circular cut out.
2. Fold into half.
3. Fold into as many halves as possible.



Observation: All the diameters of a circle are lines of symmetry.

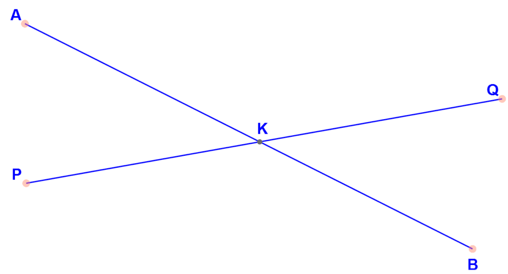
Activity 13: Work in pairs.

Draw the lines of symmetry in the following shapes.



3.2 Intersection lines

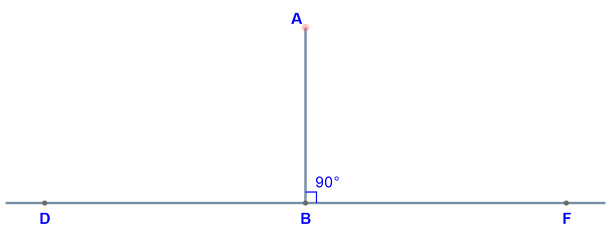
Intersection lines is a single point where two lines meet or cross each other and will not form right angles.



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

3.3 Perpendicular lines

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



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

Note: Walls of houses are perpendicular to the ground.
What else in the school compound is Perpendicular?

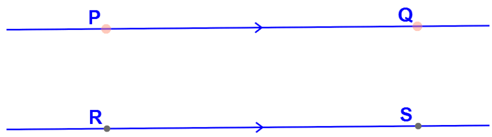
EXERCISE 1.

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

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

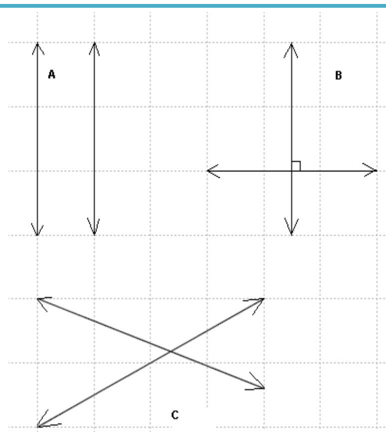
3.4 Parallel lines

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



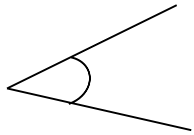
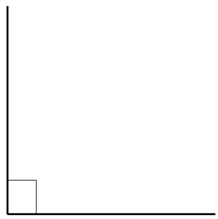
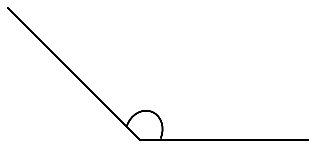
EXERCISE 2.

Which pair of lines are parallel?
Explain your answer.



3.5 Angles

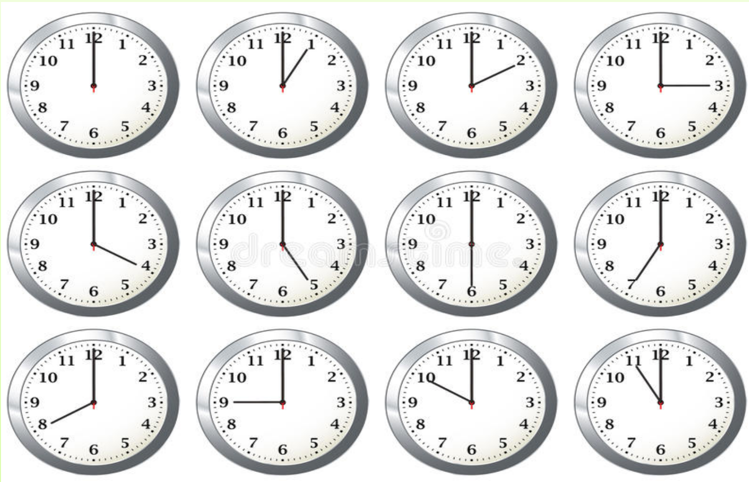
An angle is the space between two lines that meet each other.
When two lines meet at a point, an angle is formed. The two lines are called the arms of the angle.

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

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

Activity 14.

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



Application of angles

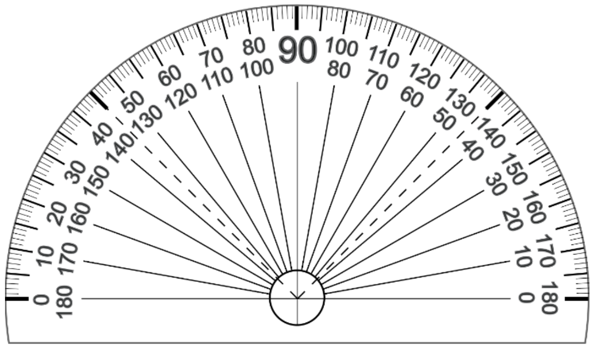
In construction we need to follow angles so that everything is stable and firm.
For example, the roof of a house has to be at least 39 degrees and at maximum 48 degrees to prevent rain water and make sure rain can slide off.
If the roof was a 180 degree angle or 0 degree angle, the water has no place but to start leaking inside a house.
People use angles to build chairs and tables.

Activity 15.

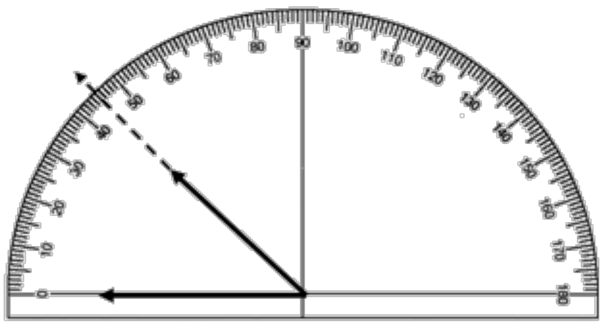
Visit a nearby carpenter, ask and observe how angles help them in their job.

3.6 Using a Protractor to measure angles

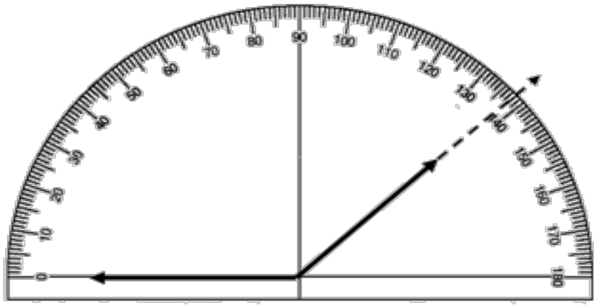
Do you see similarities between a half circle and the protractor?



Line up the line that points to zero.
Use the ruler on the curved edge to count the degrees until you reach the other line in the angle.
Now that you understand how a protractor works, let us look at a couple of angles and measure them:



Sometimes the angle will be smaller than the protractor. Use the straight edge to extend the lines to make it easier to read the measurement.
The second line on this angle points to 45, so this is a 45° angle.
Lining up the vertex of the protractor with the crossed lines, and the first line with the line pointing to zero.



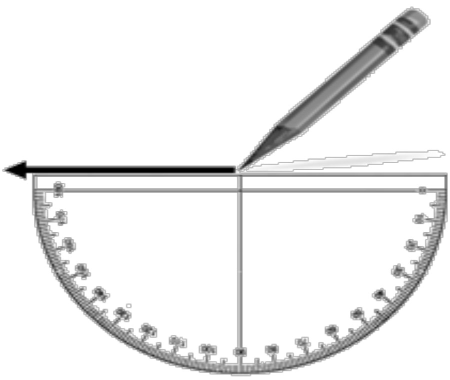
We extend the second line to clearly see that it is pointing to 138. This angle measures 138°.

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

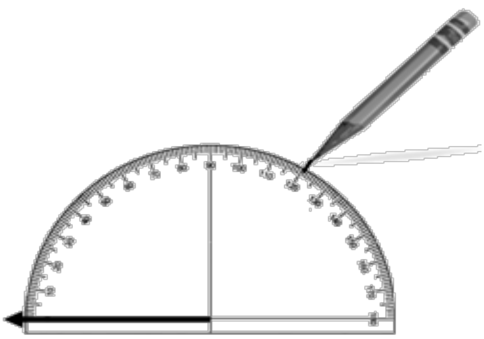
Note: line up the protractor correctly so that we can get a correct measurement.

Drawing Angles

A protractor can be used to draw angles.



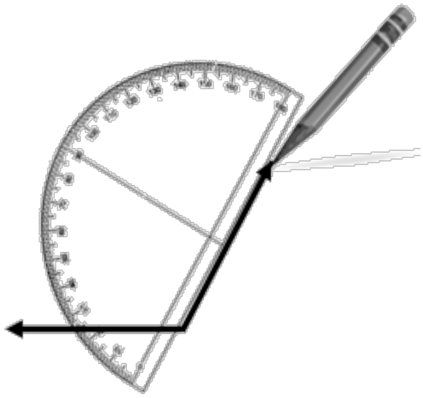
Begin by using the protractor's straight edge to draw the first ray.

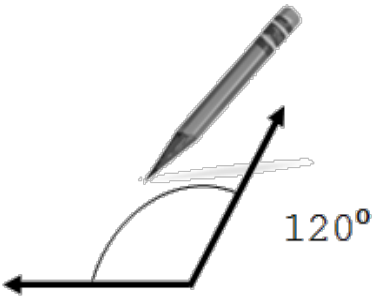


Lin
e
up the endpoint of the ray with the crossed lines on the straight edge of the protractor. Follow the numbers on the curve and make a mark by the number of the angle you want to draw.

3. Use the straight edge to connect the mark with the endpoint of the first ray.

4. Label the angle with the correct measurement.



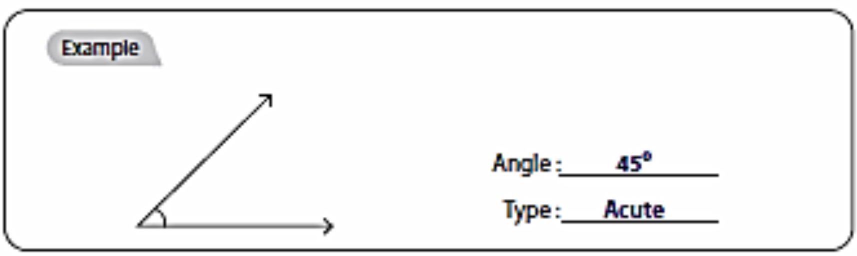


Recap

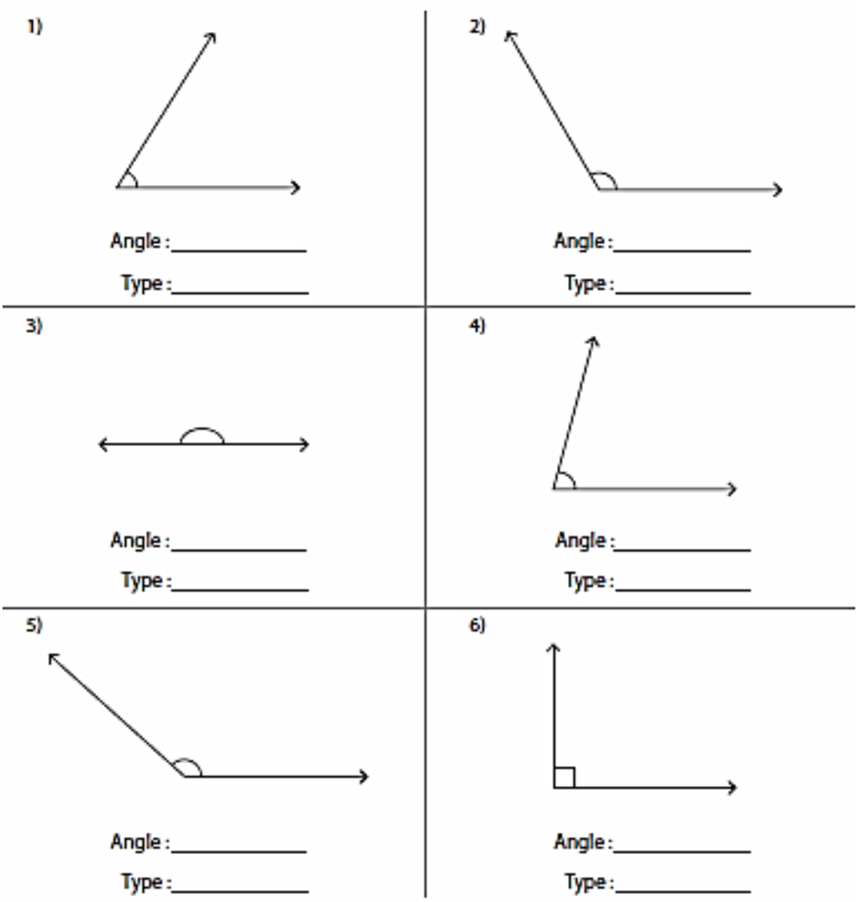
- Angles are sections of a circle.
- Angles are measured in degrees.
- There are 360° in a circle.
- Individual angles measure less than 360°
- A protractor is used to measure angles.
- A protractor can also be used to draw an angle.
- It is important to line up the protractor correctly.

EXERCISE 3.

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

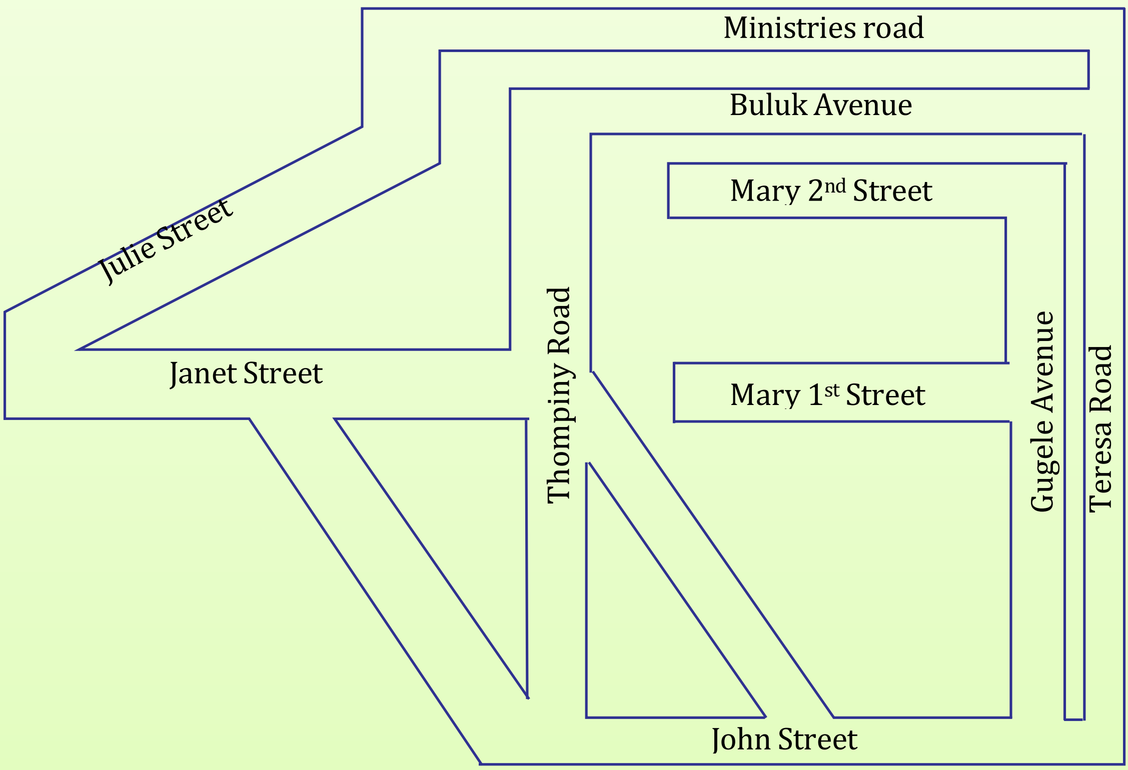


Measure each angle using a protractor. Identify the type.



Activity 16.

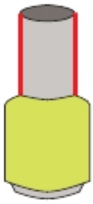
Read the map and answer the questions.



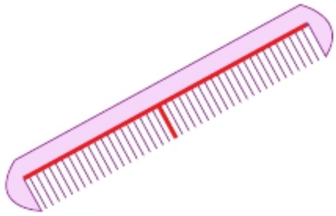
1. Write any two pairs of parallel streets.
2. Write whether Gudele Avenue is parallel or perpendicular to Mary 1st Street.
3. Name the roads that are perpendicular to John Street.
4. How many streets and avenues are perpendicular to Terasa Road?
5. Is Janet Street parallel to Julie Street? How do you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

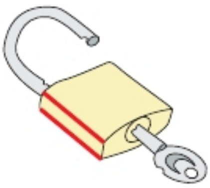
EXERCISE 4.

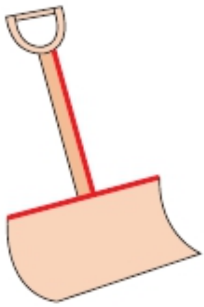
Identify the highlighted pair of lines as parallel or perpendicular in each object.

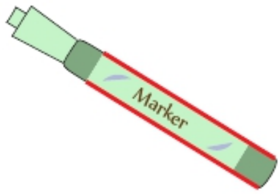
1) 

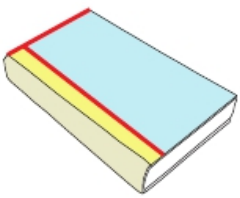
2) 

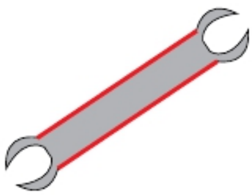
3) 

4) 

5) 

6) 

7) 

8) 

UNIT 4

ALGEBRA

4.1 Inequalities

An inequality is the relation between two expressions that are not equal, employing a sign such as “not equal to,” > “greater than,” or < “less than.”

Symbol	Words	Example
$>$	Greater than	$x > 2$
$<$	Less than	$x < 4$
$\geq$	Greater than or equal to	$x \geq 10$
$\leq$	Less than or equal to	$x \leq 3$

Greater than means that the starting number is bigger in value than the other number.

Example: $50 > 15$

This means that 50 is greater than 15.

Less than means that the starting number is smaller in value than the other number.

Example: $15 < 50$

This means 15 is less than 50.

Activity 1

In pairs, choose numbers and place them correctly in the grid below.

			$<$			

			$>$			

1. What number do you have on your right?
2. How did you decide to put your number?

Activity 2

1. Copy and write the correct inequality sign.

a) 3 ___ 2
b) 4 ___ 7
c) 30 ___ 40
d) 60 ___ 110
e) 72 ___ 40
f) 30 ___ 30
g) 45 ___ 20
h) 61 ___ 72
i) 31 ___ 20
j) 24 ___ 17

Activity 3

True or false?

a) $4 > 2 + 1$
b) $2 + 3 < 4$
c) $3 + 5 < 6$
d) $1 + 3 > 2$
e) $6 > 5 + 4$

Activity 4

1. Indicate whether true or false

a) $2 + 2 < 3 + 3$
b) $5 - 2 < 7 + 8$
c) $8 - 6 > 3 + 7$
d) $2 + 6 < 4 + 6$

2. Determine which number is greater than the other.

1. 100 and 22
2. 569 and 920
3. 17 and 77
4. 718 and 19
5. 28 and 16
6. 1000 and 918

Explain how you did it.

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

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

If you were told that $y - 7 = 5$*, you can probably see straight away that* $y = 12$. These are examples of linear equations and we'll look at them in more detail soon.

4.2 Like and unlike terms

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

For example:
(i) 3m and –7m are like terms
(ii) z and $\frac{2}{3}$z are like terms

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

For example:
(i) 9p and 9q are unlike terms
(ii) $\frac{x}{3}$and $\frac{y}{3}$ are unlike terms.

Activity 5. Look at the picture below, say what the boy is doing.

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

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

Why? Think of it like this. On a table we have 4 pencils and 2 books. We cannot add the 4 pencils to the 2 books because they are not the same kind of object.
We go get another 3 pencils and 6 books. Altogether we now have 7 pencils and 8 books. We cannot combine these quantities, since they are different types of objects.
Next, our sister comes in and grabs 5 pencils. We are left with 2 pencils and we still have the 8 books.
Similarly, with algebra, we can only add (or subtract) similar "objects", or those with the same letter raised to the same power.

4.3 Algebraic problems involving addition and subtraction

Example 1.

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

Solution.

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

Like terms

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

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

1. Simplify by collecting the like terms together.

$$x + 2x + 3x$$

   This is normal addition. We treat the unknown as an object.
   (Say x is an orange = 1 orange, 2x = 2 oranges, 3x = 3 oranges, how many oranges together = 6 oranges)
   Therefore, $x + 2x + 3x =$ **6x**.
2. Simplify $7x + 2 + 3x$
   Here, we have two different terms, one with x and the other without. Therefore, on solving, we make sure that the ones which are alike are added together then add the other part of the question.

$$7x+3x+2=\underline{\underline{\mathbf{10x+2}}}$$

3. Simplify $12x – 3 - 9x$
   Collect the like terms together.

$$12x - 9x -3 = \underline{\underline{\mathbf{3x - 3}}}$$

Unlike terms.

Unlike terms imply having different terms in a statement.

$$X + 2y \text{ (x and y are different terms).}$$

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

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

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

Simplifying Expressions of Like and Unlike Terms

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

Step 1: move the like terms together

Step 2: add or subtract their coefficients.

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

For example,

$$3x + 2y \boxed{-2x} + 6$$
$$= 3x \boxed{-2x} + 2y + 6$$
$$= x + 2y + 6$$

Example 2.

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

   Because it has been specified that the number of cows are x and goats are y.

   Total = x + y animals.

2. Simplify 2x+7y+3x-2y

   Solution

   Collect the like terms together (x terms and y terms)

   $2x + 3x + 7y - 2y = 5x + 5y$

3. Simplify $10w + 3z + 11w – z + y$

   Solution

   Collect like terms

   $10w + 11w + 3z – z + y = 21w + 2z + y$

EXERCISE 1.

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

   $2x + 8y + x + 2y + x - 3y + 5$

4.4 Formation and simplification of algebraic expressions

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

Example 3.

Write Five times a number minus three times another number as an algebraic expression.
First I need to assign letters to the 'unknown' numbers. I will call the first one 'n' and the second one 'm' so now I have:

- **Five times n minus three times m.**

(Notice I have replaced the 1st and 2nd number with 'n' and 'm').
Next I replace the words with mathematics symbols so that I have:

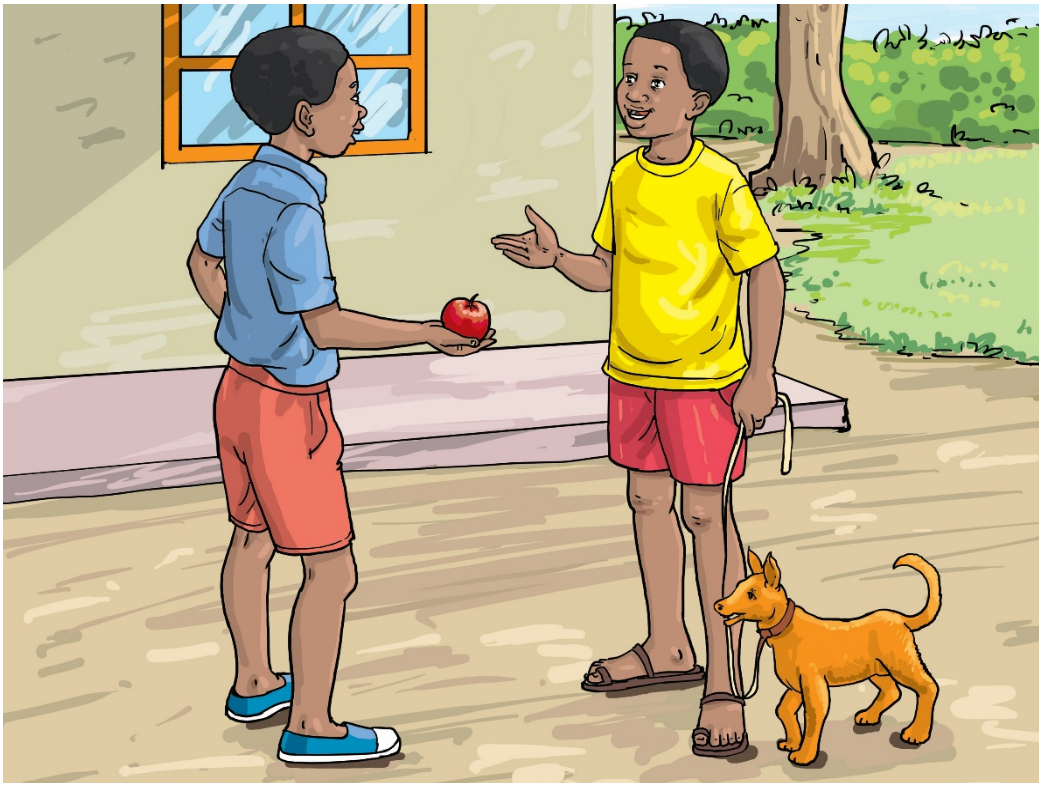
5 x n – 3 x m
5n – 3m *This is our expression (notice that we don't need the multiplication sign as it is implied).*

- **A number plus 5 all multiplied by 3 can be written** $(\boldsymbol{n}+\mathbf{5})\mathbf{3}$

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

$$\mathbf{3}(\boldsymbol{n}+\mathbf{5})$$

When writing algebraic expressions, you can choose any letter but make sure that different numbers are assigned different letters.
Look at the picture below.



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

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

Example 4.

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

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

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

Solution.

Let the wife's age be x

Man = x + 2

Sum of their ages = x + x + 2 = 2x + 2 years.

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

Solution

Note: difference means subtraction.

Let Debora's age be y

Teacher = 3y

Difference in their age = 3y – y = 2y

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

Solution

Let Mary be h cm tall.

Peter = (h + 7)cm

Sum of their height = h + h + 7 = (2h + 7)cm

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

Solution

Let Abraham's age be x years.

Hillary = 2x

Amon = x + 3 years.

Sum = x + 2x + x + 3 = 4x + 3 years.

EXERCISE 2.

Show your working out

1. Simplify, if possible.
   a. 13x + 7y – 8x + 20y
   b. 22x – 19 + 14x – 9x + 20
   c. 2x + 18y – y + 2x

d. $2a + 5b + 19a$

e. $3q + 20s – 9q + 2s – 34q$

f. $x + 7 + 6x + x – 3$

g. $10x + 14 + 9x + 3 – 8x + 6$

h. $x + 4y – 10x + 7y – x$

2. A farmer has y cows. The number of goats is 20 more than the number of cows. What is the total number of animals the farmer has?
3. The number of girls in a class is twice that of boys. What is the difference in the number of students?
4. A student scored 15 marks less in geography than mathematics. What was the total marks for the student?
   (**Hint**: less means minus, more means add)
5. Anne is 5 years older than Vivian. Find the sum of their ages four years ago?
6. Think of a number, square it and add 5. The result is 21. Find the number.(square means multiply the number by itself)

UNIT 5
STATISTICS

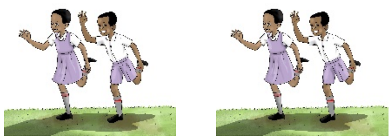
5.1 Pictographs

When some information is represented by using picture symbols, we say that the picture has been represented pictorially.

Pictorial representation is a method of representing information in a visual form. The table below show the number of leaners in a class on different days.

Monday	Tuesday	Wednesday	Thursday	Friday
20	30	10	30	10

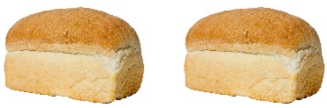
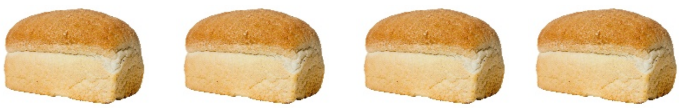
The above information can be shown by a pictograph:

Monday	
Tuesday	
Wednesday	
Thursday	
Friday	

One  **represents 10 learners.**

Activity 1

The number of loaves of bread baked by a baker in 6 days is depicted below by a pictograph.

Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	

How many loaves of bread are baked each day? Discuss with your partner.

Activity 2

Given below is a pictogram showing mangoes sold by a fruit vendor in a week.

Let  represent 10 mangoes.

Sunday	
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	

In groups, answer the following questions using the pictogram above.

1. How many mangoes were sold on each day?
2. On which day there was a maximum number of mangoes sold?

Activity 3

The pictogram below shows how many shirts sold in a week. In pairs, study the pictogram and complete the following information. Work in groups.

Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	

 = 5 shirts

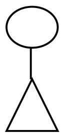
1. On which day of the week 10 shirts were sold?

2. How many shirts were sold on Tuesday?
3. Which was the day that the least shirts were sold?
4. What is the difference between the no of shirts sold on Tuesday and on Friday?

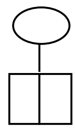
Activity 4

Work in groups.

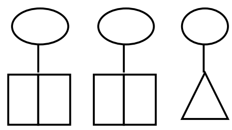
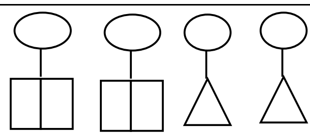
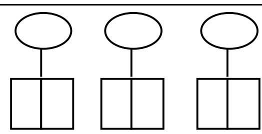
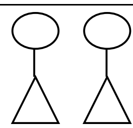
Number of boys and girls in a class.



10 Girls



10 Boys

Primary 1		
Primary 2		
Primary 3		

Use the pictograph above to answer the questions that follow.

1. How many learners are in primary 1?
2. How many girls are in primary 1?
3. How many boys are in primary 2?
4. How many girls are in primary 2?
5. What is the total number of girls in the school?
6. How many girls are in primary 3?
7. How many boys are in primary 1, 2 and 3?
8. How many girls are in primary 1, 2 and 3?

Activity 5

In pairs, draw a pictograph on a manila paper for the following data. Give a key of what each picture represents. Present your work to the class.

Number of houses built in Juba in 5 years.

Year	2013	2014	2015	2016	2017
Number of houses built	160	330	550	720	890

Activity 6

Work in groups.

Conduct a school survey about sports in your own class.

1. Prepare a table and record your results.
2. Use the data in your table to prepare a pictograph.
3. Give a key of what each picture represents.

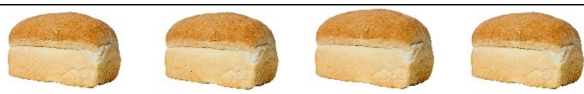
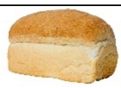
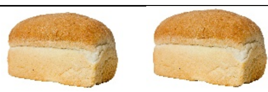
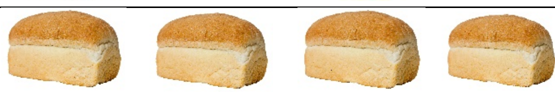
5.2 Block graphs

The information in a pictograph can be represented in a block graph.

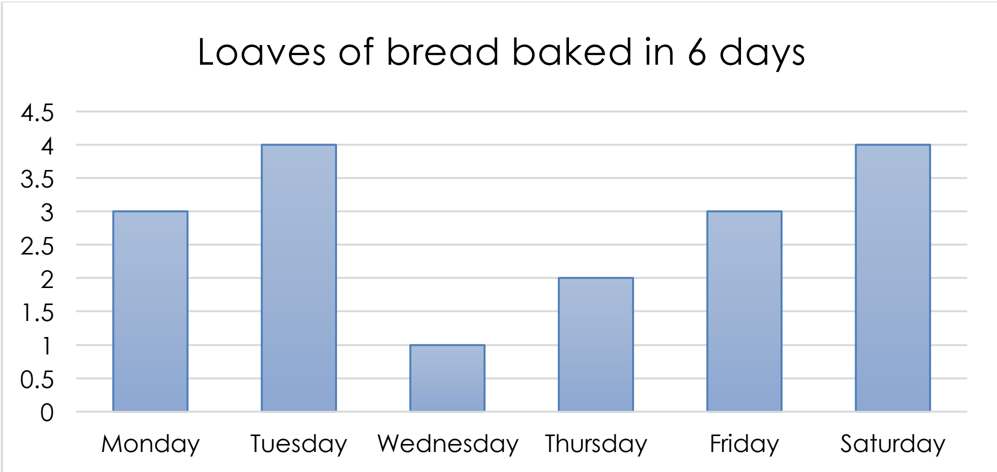
Activity 7: Class activity

Let us revisit the information provided in Activity 1.

The number of loaves of bread baked by a baker in 6 days is depicted below by a pictograph.

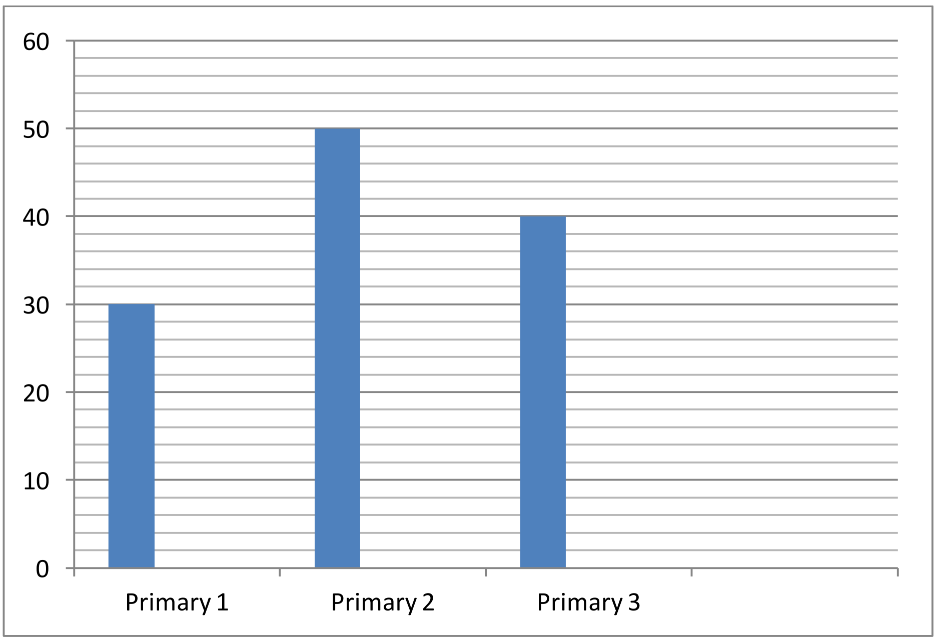
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	

This can be represented in a block graph as follows. What do you notice about the graph? Talk with your partner.



Activity 8

Graph below shows the number of pupils in a class. Together with your partner, study it and answer the questions that follow.



a) How many pupils are there in primary 1? __________

b) How many pupils are there in primary 2? __________

c) How many pupils are there in primary 3? ___________

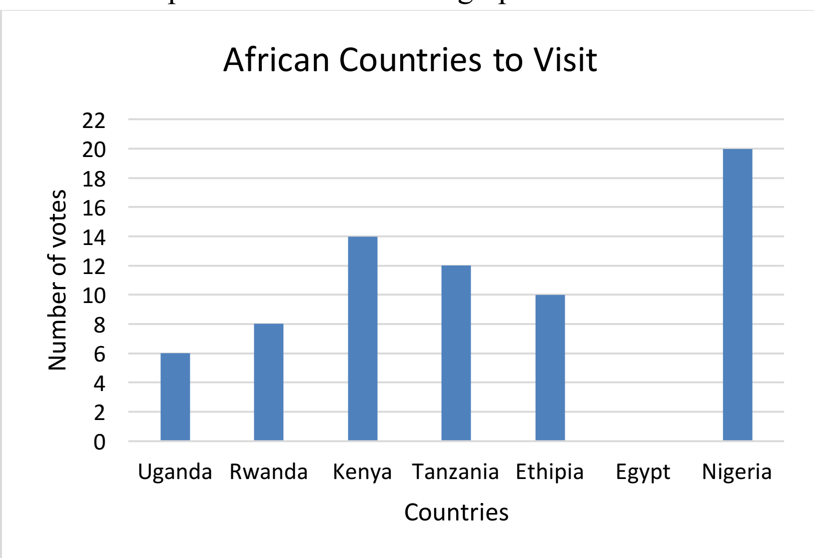
Activity 9

Work in groups.

Each child in Primary 3 selects two African countries they would like to visit.

Country	Votes
Uganda	6
Rwanda	8
Kenya	
Tanzania	12
Ethiopia	10
Egypt	16
Nigeria	

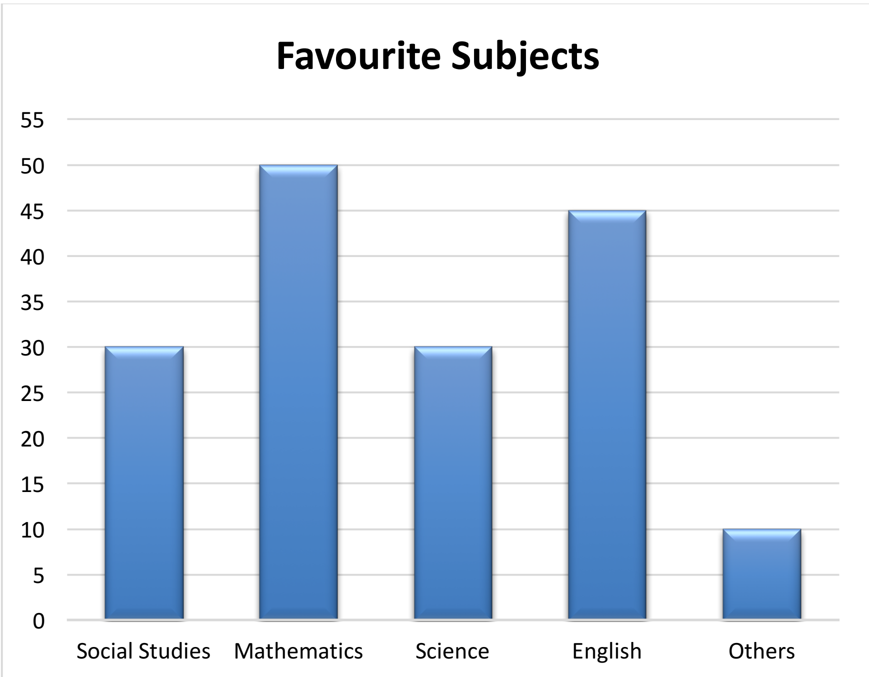
This information is represented in the block graph below.



1. Fill in the missing data in the table for Kenya and Nigeria.
2. Draw a bar to show how many votes Egypt got.
3. Which was the most popular country to visit?
4. How many more votes did Tanzania get than Rwanda?
5. How many more votes did Ethiopia get than Rwanda?

Activity 10

Mrs Ogalla, a teacher, recorded the favourite subjects of her students in the block graph below. Use the graph to answer to answer the questions. Work in pairs.



1. Which subject is the second most popular?
2. Which subject is less popular?
3. Which subject is a favourite for 50 students?
4. Which subjects have the same number of votes?
5. What unit of scale is used to display the popularity of subjects among the students?

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

Data- information in terms of measurements.

Types of data.

i) **Primary data** – This is raw data collected at a source.
When we go to the market and count the number of sellers in the market, we call it primary data.

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

5.3 Data collection

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

Methods of collecting data

How do you collect information?

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

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

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

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

Essentials of a good questionnaire

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

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

Methods of recording data

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

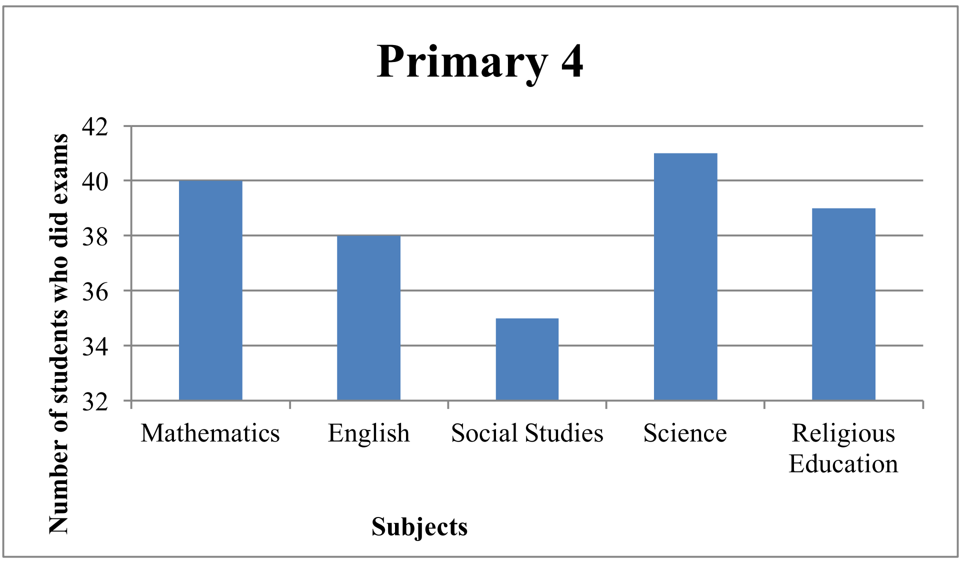
5.4 Methods of recording and representing data

Graphical method

Data can be represented using different types of graph;

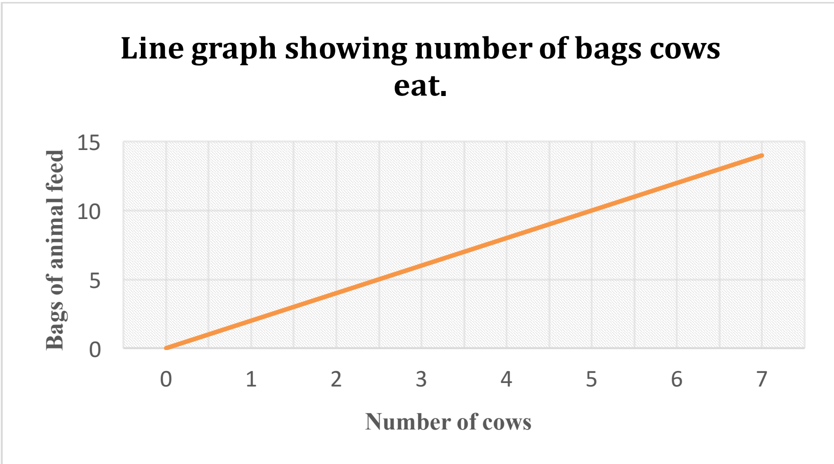
a) **Bar graph -** it is a way of summarizing asset of categorical data. It displays the data using a number of rectangles, of the same width, each of which represents a particular category.

Bar graphs can be displayed horizontally or vertically and are usually drawn with

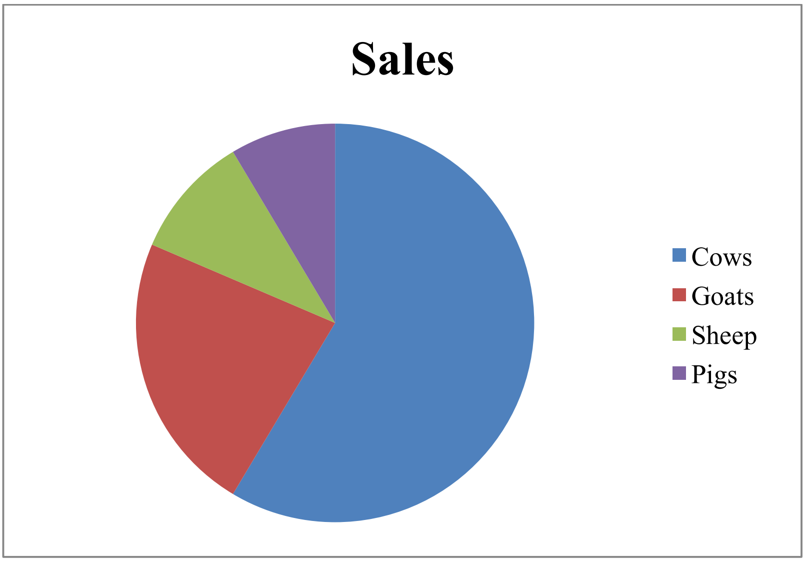


a gap between the bar (rectangles)

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



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



Activity 11.

Car Colours

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

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

Fill in the table below with the correct number of cars

Car Colour	Number of cars
Red	
White	
Blue	

3. Draw a bar graph of cars to represent the cars:

(a) How many blue cars did you see?

(b) Which colour car is the most popular in your area?

(c) Which colour car did you see the least?

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

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

Represent the information on a bar graph.

EXERCISE 1.

When I Grow Up

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

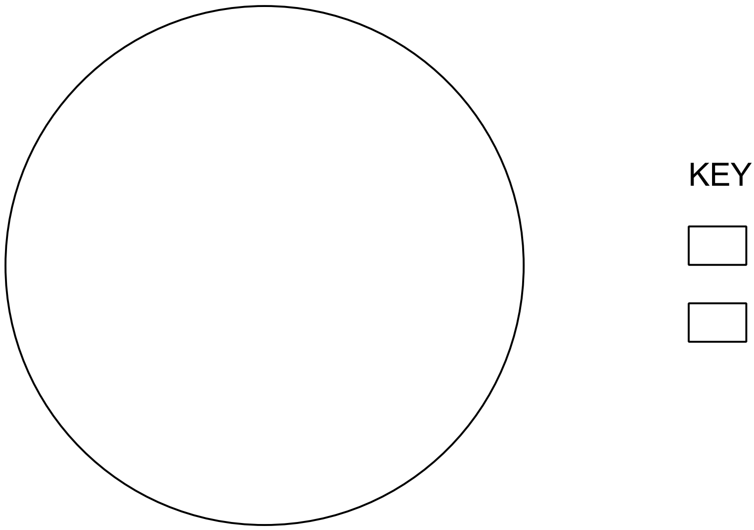
You are going to conduct a *survey* to find out what jobs your classmates would like to do when they are adults.

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

Job	Number of children

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

8. Sketch this information in a pie chart and complete the *key* to help other people to interpret your pie-chart. Compare your pie chart with that of a classmate.



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

How Many People?

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

Example 1.

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

EXERCISE 2.

1. How many people live in your household?
2. Find out how many people live in your classmates' households. Use a table to record the data.
3. Fill in all the information in the table:
   (a) What is the number of people in a household that occurs the most?

(b) How many children in your class have four people living in their household?

(c) What is the smallest number of people in a household?

(d) What is the largest number of people in a household?

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