MINISTRY OF EDUCATION

FIJI MATHEMATICS YEAR

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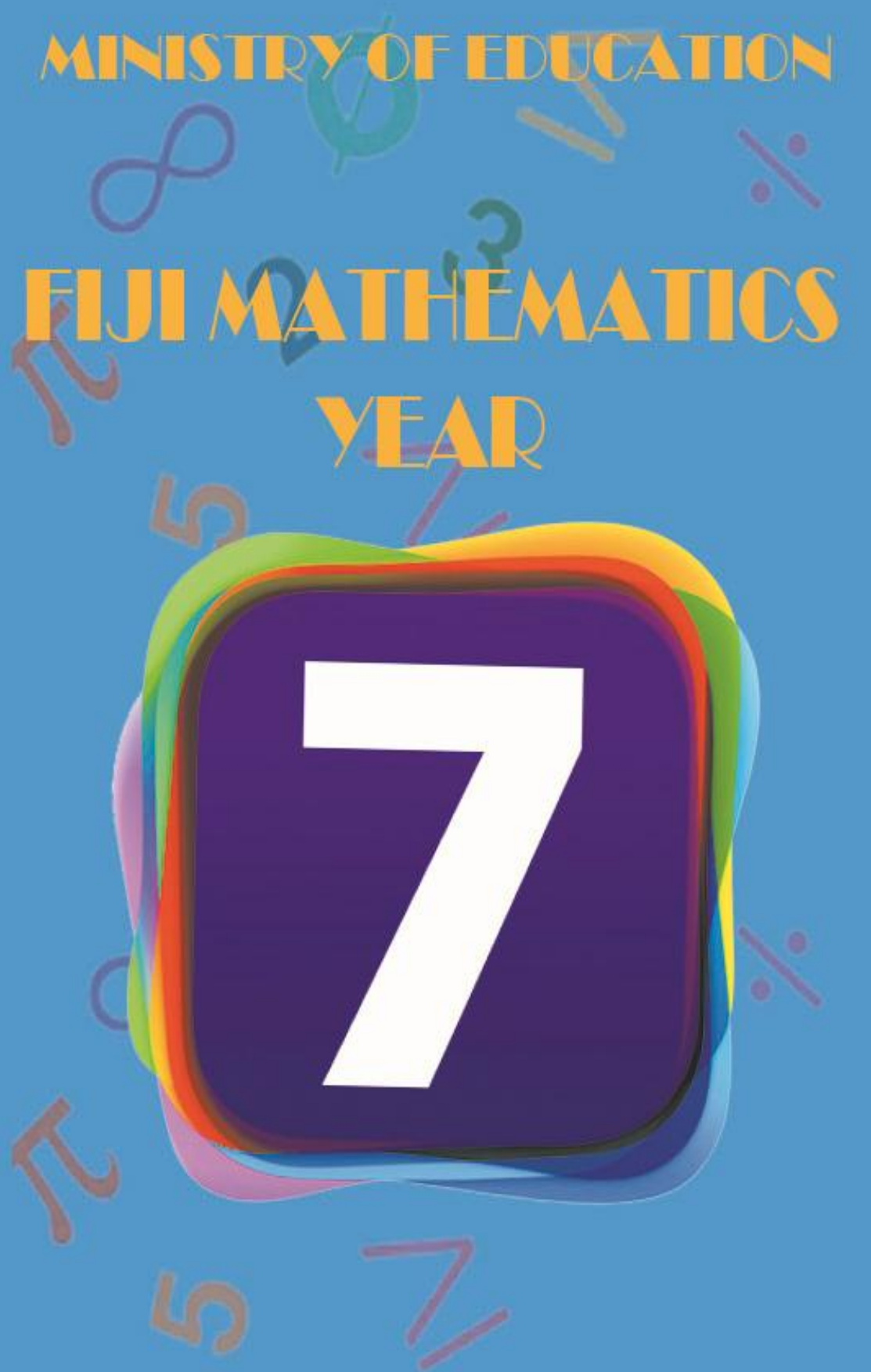
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STRAND 1

NUMBER & NUMERATION

STRAND	M 1: NUMBER AND NUMERATION
Sub-strand	M 1.1: Whole Numbers and Operations

Ordering Numbers

Achievement Indicator

❖ *Order and compare four to six digit numbers.*

Numbers have an order or arrangement. The order may be **ascending** (getting larger in value) or **descending** (becoming smaller in value)

Exercise 1.1A

1. Arrange the following numbers in ascending order.

(a) 8,136   6,770   1,076   7,134   9,362   1,298

(b) 51,178   84,657   63,502   25,340   79,783   36,007

(c) 772,919   642,426   446,223   103,158   756,078   972,562

(d) 57,012   883,570   2,015   9,381   909,524   60,007

2. Arrange the following numbers in descending order.

(a) 1,234   9,199   8,876   7,328   2,795   6,584

(b) 8,824   56,259   98 ,81   76,415   98,909   19,189

(c) 990,263   878,109   42,065   281,648   885,943   329,501

(d) 11,282   774,949   8,784   25,907   5,793   326,358

3. Record all the ages (years and months) of student in your class and arrange them in ascending order from the youngest child to the oldest.

4. Measure the heights of children in your class and record them in descending order from the tallest to shortest.

Partitioning Numbers

Achievement Indicator

❖ *Break up four to six digit numbers into two to six sets of numbers*

Break up the following numbers into two to six digit numbers.

Example: 324 133 = 320 000 + 4 000 + 100 + 33

Exercise 1.1B

1.   Break up the following numbers into three digit numbers.

(a)   9,318   (b)   89,302

(c)   65,101   (d)   910,635

2.   Break up the numbers into four digit numbers.

a)   57,928   b)   791,204

c)   905,342   d)   132,063

3.   Complete the set of numbers below.

a)   1,645   = _____ + _____

b)   9,651   = _____ + _____ + _____

c)   27,864   = _____ + _____ + _____ + _____

d)   527,340 = _____ + _____ + _____ + _____ + _____

e)   670,014 = _____ + _____ + _____ + _____ + _____ + _____

4.   Write down the total value of the following numbers.

a)   45,000 + 8,000 + 700 + 67

b)   800,000 + 76,000 + 5,600 + 100 + 49

c)   753,000 + 8,100 + 300 + 81

d)   6,000,000 + 300,000 + 7,200 + 200 + 50 + 6

5.   Break these numbers into two, three, four and five digit numbers.

a)   370,916

b)   2,528,391

c)   1,047,023

d)   34,983,216

Partitioning and Place Value of Numbers

Achievement Indicator

❖ Partition numbers and show place values

Break up the numbers and show the place values of each number

Example: 1,234 = 1 thousand, 2 hundreds,   3 tens and 4 ones

= 1,000   + 200   + 30   + 4

Exercise 1.1C

1.   Complete the table below

		Million	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
a	9,034							
b	45,378							
c	510,072							
d	30,601							
e	909,099							

2.   Write down these numbers in words.

a)   8,923 =_____

b)   46,970=_____

c)   38,415=_____

d)   990,809=_____

e)   671,032=_____

3.   Write these numbers in numerals.

a)   Three hundred and forty two thousand, six hundred and seventy eight.

b)   One hundred and six thousand, four hundred and two.

c)   Two million, five hundred and three thousand, and seven.

d)   Forty nine thousand, eight hundred and twenty four.

e)   nine million, six hundred and fifty thousand, four hundred and nine.

Additions, subtractions, multiplications and division of numbers

Achievement Indicator
   ❖ *Additions, subtractions, multiplications and division of numbers*

<u>Exercise 1.1 D</u>

ADDITION AND SUBTRACTION OF NUMBERS

Achievement Indicators
   ❖ *Use mathematical operations on number facts up to six digit numbers.*
   ❖ *Show opposite operations using flow charts.*

Exercise 1.3A

1. a) 9,622 + 480 + 7,5012 + 415,313
   b) 423 + 560,930 + 25,632 + 2,395
   c) 899,622 + 38,406 + 8,073 + 473
   d) 331,966 + 73,459 + 48,732 + 836

2. a) 78,434 – 894
   b) 876,426 – 67,4089
   c) 984,321 – 67,543 – 3,901 – 257
   d) 740,318 – 2,819 – 49,375 – 90,124

3. a) 6,752 + 89,058 – 39,874
   b) 1,289,076 – 57,832 + 40,257 – 243
   c) 91,032 – 32,678 + 583,061
   d) 421 + 306,725 – 19,450 + 8,437

4. There were 2,325 hockey fans in the arena for the game Friday night. On Saturday there were 3,127 fans that showed up for that game and on Sunday half the fans who came on Friday watched the game. What was the total number of hockey fans that came to watch the game?

5. The flight attendant flew 6,268 miles on her first trip, and then she flew 4,555 miles on her second trip 3,421 in her third trip and 489 in her last trip. What was the total number of miles she flew in those two trips?

6. In 2009, 1,052 visitors from Australia visited Fiji in January and that is double the number of visitors from New Zealand and a quarter of that number came from China. How many tourist visited Fiji in January?

7. Tomasi deposited $12, 000 in the bank. After 1year, he withdrew one fifth of the money, and in the second year he withdrew half of the remaining balance. How much money is left in the bank?

8. There are 86,400 seconds in one day. How many seconds are there in
   - i) half a day?
   - ii) one third of a day?
   - iii) one quarter of a day?
9. The total number of votes cast in in three electorates was 754,819. If in one of these electorates 211,302 votes were cast an in another 284,967 were cast, how many were cast in the third electorate

MULTIPLICATION OF NUMBERS

Exercise 1.3B

1. a) 456 x 23   b) 8,624 x 79   c) 90,432 x 96
   d) 53,712 x 489   e) 96,371 x 142   d) 948,721 x 7 352
2. Rachna had one pair of guinea pigs. These had four baby guinea pigs, all female. Within the following six months, each female guinea pig had produced five baby guinea pigs. If no guinea pigs died, how many Rachna have at the end of those six months?
3. Each child in the Parker family had at least two brothers and one sister. What is the least number of children in the family?
4. a) I want to make a line of posts 8m long. If I place the posts 1m apart, how many posts will I need?
   b) If I were to use 24 posts and place them 2m apart, how far would they stretch?
   c) A line of posts 112m long is made with posts equally spaced. If 8 posts are used, what is the distance between posts?
5. a) Eight equally spaced posts are used as uprights in a square pen. How many posts would be placed on each side of the pen?
   b) A square pen is made using four posts on each side. How many posts were used?
6. It took 1 ½ seconds to join two pieces of Lego. How long would it take to join
7. At the start of each week, Mrs. Chand puts $400 into her cheque account. During the week she would then withdraw $300. Assuming that there is no bank fees, in which week would she have $1000 in the bank for the first time?
8. I think of a number, multiply it by 4, subtract 8 from the answer, I am left with 72. What was the number I first thought of?
9. When Dave arrived in Fiji, he has some money to help start his business. In the first three years this amount grew 10 times its original size. With this money he started a plant nursery and with a lot of hard work built up his personal wealth by a further $98 000 in a few years. If his personal wealth was now $148 000, how much did he have when he arrived in Fiji?
10. My age is 60. I was married 20 years ago and graduated 5 years after that. How old was I when I graduated?

DIVISION OF NUMBERS

Exercise 1.3C

1. a) $678 \div 9$ b) $6789 \div 12$ c) $89,452 \div 18$
   d) $87,623 \div 13$ e) $543,290 \div 14$ d) $456,328 \div 20$

2. Carl has 192 Skittles stored in boxes. If there are 12 boxes, how many Skittles must go in each box?

3. Jerry has 3,572 Skittles stored in boxes. If there are 38 boxes, how many Skittles must go in each box?

4. The school is planning a field trip. There are 1,232 students and 44 seats on each school bus. How many buses are needed to take the trip?

5. There are 1,380 students at a school. If each classroom holds 30 students, how many classrooms are needed at the school?

6. Ruth is inviting 98 friends to a party. She has 4,704 cookies. How many cookies will each friend get?

7. A teacher has 248 pieces of candy. If there are 31 students, and the candy is divided evenly, how many pieces will each student get?

8. Sandy earns $37 cleaning a home. How many homes did she clean, if she made $1,258?

9. In a library, there are 29,450 books. How many shelves will be needed if 31 books are to be put in one shelf?

10. A bakery had baked 94,104 muffins, which he needs to box up into dozens. How many boxes does she need?

11. There were a total of 110 basketball games in the season. The season is played for 11 months. How many basketball games were played each month, if each month has the same number of games?

TWO STEP EQUATIONS WORD PROBLEMS

Exercise 1.3D

1. The sum of three consecutive numbers is 126. What is the smallest of the three numbers?

2. Fred spent half of his allowance going to the movies. He washed the family car and earned 7 dollars. What is his weekly allowance if he ended with14 dollars?

3. Nancy had 179 dollars to spend on 7 books. After buying them she had 11 dollars. How much did each book cost?

4. The sum of three consecutive even numbers is 150. What is the smallest of the three numbers?

5. Keith bought 4 new baseball trading cards to add to his collection. The next day his dog ate half of his collection. There are now only 36 cards left. How many cards did Keith start with?

6. Oceanside Bike Rental Shop charges a 14 dollar fixed fee plus 9 dollars an hour for renting a bike. Mary paid 50 dollars to rent a bike. How many hours did she pay to have the bike checked out?

7. Dan bought a soft drink for 3 dollars and 7 candy bars. He spent a total of 17 dollars. How much did each candy bar cost?

8. On Monday, 521 students went on a trip to the zoo. All 9buses were filled and 8 students had to travel in cars. How many students were in each bus?

9. The sum of three consecutive odd numbers is 171. What is the smallest of the three numbers?

10. Joan sold half of her comic books and then bought 8 more. She now has 14. How many did she begin with?

Factors

Achievement Indicator

❖ **List factors, prime, composite, square and triangular numbers and their properties.**

What is a "Factor"?
Factors are numbers you multiply together to get another number:

2   x   3   =   6

Factor   Factor   Product

In the problem 2 x 3 = 6, 2 and 3 are <u>factors</u> and 12 is the product. Factors are either <u>composite numbers</u> or <u>prime numbers</u> (except that 0 and 1 are neither prime nor composite). There can be many factors of a number.
Example: All the factors of **12** are 2 × 6 =12, but also 3 × 4 =12, and of course 1×12= 12.

So **1, 2, 3, 4, 6 and 12** are factors of 12

Highest Common Factor [H.C.F.]

The highest number that divides exactly into two or more numbers.
For example: Find the highest common factor of 12 and 16
1.   Find the factors of both numbers
2.   Circle the common factors
3.   Choose *the Highest Common Factor for*
12   and 16

Factors of 12: ①, ②, 3, ④, 6, 12
Factors of 16: ①, ②, ④, 8, 16
Common Factors

Exercise 1.1E

1.   Find the HCF of 6 and 8.
    (a)   List the factors of 6.
    (b)   List the factors of 8.
    (c)   List the common factors.
    (d)   What is the HCF?

2.   Find the HCF of 15 and 20.
    (a)   List the factors of 15.
    (b)   List the factors of 20
    (c)   List the common factors.
    (d)   What is the HCF?

Prime Numbers

> **A prime number is a number with exactly two factors. It can be divided evenly only by 1, or itself. It must be a whole number greater than 1.**

Eratosthenes was a Greek mathematician who lived from 276 to 194 BC. He invented a way of sorting the prime number from composites

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Class Activity

Step 1   Cross out 1 as it is not a prime number.
Step 2   Circle the prime number 2 and cross out all the multiples of 2.
Step 3   Circle the next number, 3.This is a prime. Now cross out any multiples of 3 not already crossed.
Step 4   Circle the number 5. This is a prime. Now cross out any multiples of 5 not already crossed out.
Step 5   Continue using this method until all composite numbers have been crossed out.

Some pairs of prime numbers differ by 2. Examples of prime numbers which differ by 2 are {17, 19}, {41, 43} and   {71, 73}

a)   List five prime number pairs which also have a difference of 2?
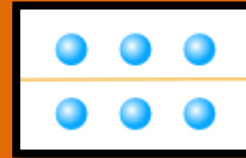b)   How many prime number pairs have a difference of 2?

Composite Numbers

It is a **Composite Number** when it can be divided evenly
by numbers other than 1 or itself.
Example: 6 can be divided evenly by 2, or by 3:
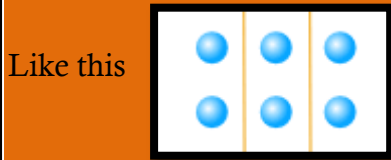
Like this   **or**

divide into 3 groups   divide into 2 groups

Note: 1 is neither prime nor Composite.

Some facts:
- ❖ The only even prime number is **2**. All other even numbers can be divided by **2**.
- ❖ If the **sum** of a number's digits is a multiple of **3**, that number can be divided by 3
- ❖ **No** prime number greater than **5** ends in a **5**. Any number greater than 5 that ends in a **5** can be divided by 5.
- ❖ **Zero and 1** are not considered prime numbers.
- ❖ **Except for 0 and 1**, a number is either a **prime number** or a **composite number**. **A composite number is defined as any number, greater than 1, that is not prime**

Prime Factors

Prime factors **are prime numbers multiplied together to make the original number**.
Example: What are the prime factors of 40?

40

4 × 10

2 × 2   2 × 5

40 = 2 × 2 × 2 × 5

Write the number.

Write any pair of factors.

Continue until all the factors are prime.

Write the factors from least to greatest.

These are written as product of prime numbers

Exercise 1.1F

1. Copy and complete the table below, listing all the factors for the numbers 1 to 20.

Number	Factors	Number	Factors
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

   a) List all the numbers from 1 to 20 that have only two factors.
   What do we call these numbers?
   b) List all numbers from 1 to 20 that have more than two factors.
   What name is given to these numbers?

2. a) Write down all the even prime numbers.
    b) How many odd prime numbers are less than 50?
    c) List down all the odd composite numbers less than 40.
    d) How many composite numbers are between 20 and 40?

3. Draw factor trees for the following numbers.

    (a) 12   (b) 28   (c) 42   (d) 45

4. Write the following numbers as product of prime numbers.

    (a) 30   (b) 112   (c) 84   (d) 135

5. Which of the following are prime numbers?

    a) 101   b) 147   c) 313   d) 167

Square Numbers

The number you get when you <u>multiply an integer by itself.</u>
Example: $4 \times 4 = 16$, so 16 is a square number.

"Squared" is often written as a little a^2 like this:

— this means "squared"

$4^2 = 16$

This says *"4 Squared equals 16"*
(the little 2 says the number appears twice in multiplying)
Here are the first few square numbers:

1 Squared = 1²	=	1 × 1	=	1
2 Squared = 2²	=	2 × 2	=	4
3 Squared = 3²	=	3 × 3	=	9
4 Squared = 4²	=	4 × 4	=	16
5 Squared = 5²	=	5 × 5	=	25
6 Squared = 6²	=	6 × 6	=	36
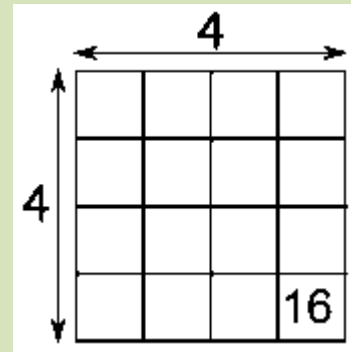
Triangular Numbers

Number that can make a triangular dot pattern.
Example: 1, 3, 6, 10 and 15 are triangular numbers
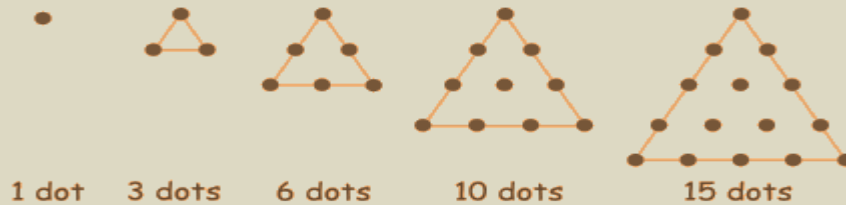
1 dot   3 dots   6 dots   10 dots   15 dots

By adding another row of dots and counting all the dots we can find the next number of the sequence

Exercise 1.1G

1. Draw squares using dot patterns.
2. Using dots make patterns to form a right angle triangle.
3. What can you notice about square and triangular numbers? Are they prime numbers, even numbers or odd numbers? Discuss you finding s in class.
5. How many triangles can be formed from?
   a) 28 dots?   b) 36 dots?   c) 55 dots?

STRAND	M 1: NUMBER AND NUMERATION
Sub-strand	M 1.2: Integers

Using number line to order integers

Achievement Indicator
- ❖ *Read, write and order integers in ascending and descending orders*
- ❖ *Plot numbers on the number line indicating negative numbers*
- ❖ *Order positive and negative numbers*
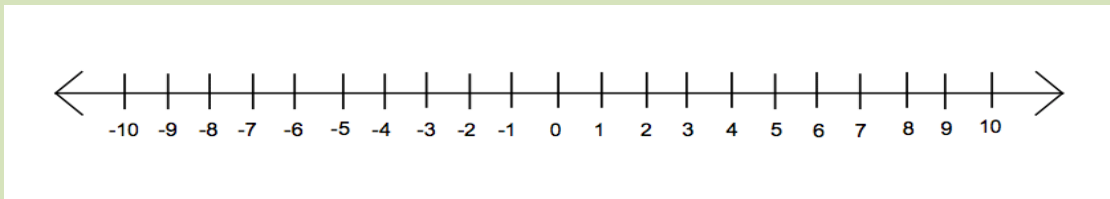
The number line shows integers from -10 to 10

Exercise 1.2A

1. Read, write and order integers in ascending and descending order

a) 0, -3, 1, -1, -4, 5, -6   b) 1, 2, 3, 8, -3, -9,-8

c) -2, -3, -4, 0, -7, 4, 6   d) 9, -9, 8, -8, 7, -7, 6

2. Draw a number line and plot integers from
   a. -5 to 5
   b. -9 to 10
   c. -10 – 0
   d. -9 to 9

3. Adding and subtracting integers

   a.   2 + 2 =   b) 9 – 5 =
   b. -2 + 2 =   c) 9 - -5 =
   c. -5 + -2=   d) -9 - -5 =

STRAND	M 1: NUMBERS AND NUMERATION
Sub-strand	M 1.3: Sets

SETS

Achievement Indicator

❖ *List and count collections and elements of any given set.*

❖ *Find the cardinality of a collection and describe its properties.*

> A set is a **collection of objects.** The things that are contained in a set are called *elements* or *members* of the set.
>
> Two common ways of describing a set are by
> ❖ Listing the elements of a set in braces
> ❖ Describing the elements or a member of the set in words.
>
> **Example**: Set A = {dogs, cats, cows, horses}. Or Set A is a set of animals.
>
> Dogs $\in$ of set A. Goats is $\notin$ of set A
>
> The **cardinal number** of any set tells us the **total number** of elements in a set.
>
> The cardinal number of set A is 4
>
> $\in$ = *"is a member or an element of"*
>
> $\notin$ = *"is not a member or an element of"*

Exercise 1.3A

1. List the members of each set and write down its cardinal number.

   (a)   {the first five counting numbers}

   (b)   {**rational numbers from 1 - 5**}

   (c)   {the cities in Fiji}

   > Rational numbers – numbers that can be represented as fractions e.g. 9/3 = 3

2. Describe each set in words

   (a)   {Anna, Adam, Andrew, Alisha, Abigail}

   (b)   {English, Math, Science, Vernacular}

   (c)   {a, e, i, o, u}

3. Write a symbol {$\in$, $\notin$} to make each of the statements true.

   (a)   4 ◯ {odd numbers}

   (b)   Suva ◯ {town in Fiji}

   (c)   5 ◯ {factors of 20}

EQUAL SETS

> Two sets are equal if they contain the same elements
> e.g { a, b, c} = {b, c, a} = { c, a, b} = {a, c, b}

Exercise 1.3B

1. Consider the following sets. Which two sets are equal?

    A = {1, 2, 3, 4, 5}   B = {4, 2, 3, 1}
    C = {1, 3, 4, 2}   D = {5, 3, 1, 4, 2}

2. Which pairs are equal sets?

    a) {a, b} ;   {1, 2}   d) {June, July} ;{ May, June}
    b) {x, y, z};   { w, x, y, z}   e) {0}   ; {1}
    c) {dog, cat, cow} ; {dog, cat} f) {4,3,0,1,2}   ; {1,2,3,4,0}

FINITE AND INFINITE SETS

> A set with a definite number of elements is called a finite set
>
> Example: A = {1, 2, 3, 4, 5……8}
>
> An infinite set has no limit to the number of its elements. The number of elements in an infinite set cannot be counted.
>
> Example: Q = {1, 2,3,4,5 …….

Exercise 1.3C

1. Say whether it is possible to list all the members of these sets.

    a) {members of your community}
    b) {children in your class}
    c) {people who have died in Fiji in the last decade}

2. Classify the following sets as finite and infinite sets.

    a) {all the people in Fiji}
    b) {stars in the sky}
    c) {square numbers less than 100}
    d) {people who have reached the moon}
    e) {all natural numbers between 10 and 100}
    f) {all the money kept in the bank in Fiji}

UNION OF SETS

Achievement Indicator

❖ *Show union, intersection, and Venn diagrams, subset information about a collection of rational numbers.*

The union of two sets A and B is written as A∪B. It includes all the elements which belong to either set A or B or both. The union of two sets is shown by shading both sets as shown in this diagram

Set A = {1,2,3,4,5}

Set B = {2,6,7,8}

Set AUB = {1,2,3,4,5,6,7,8) it includes all elements of the Set A and B.

A Union B
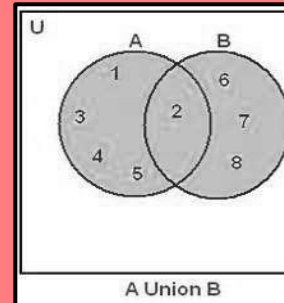
Exercise 1.3D

1.   Study the Venn diagram.
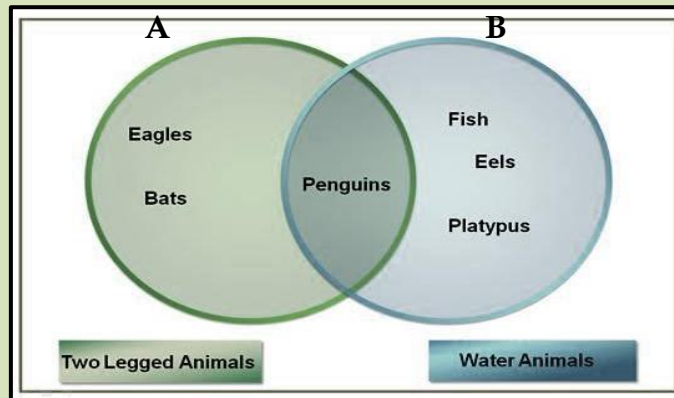
   a)   List down set A.
   b)   List down Set B.
   c)   List down set A∪B
   d)   Which animal is common to both sets?

2.   Here are three sets.

   X = {1, 4, 9, 16}   Y = {2, 3, 5 7}   Z = {10, 11, 12}
   a)   X∪Y   c)   X∪Z
   b)   Y∪Z   d)   X ∪ Y ∪Z

INTERSECTION OF SETS

The intersection of two sets **A** and **B** is the set of elements common to both **A** and **B**. The symbol is an upside down **"U" like this: ∩.**

Example: The intersection of the "Soccer" and "Tennis" sets is just **casey** and **drew** (only **casey** and drew are in both sets) which means they play both the sports.

$$\text{Soccer} \cap \text{Tennis} = \{\text{casey, drew}\}$$
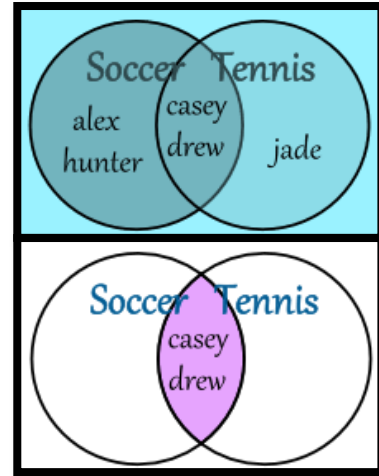
Two sets which do not have any common elements are called *disjoint sets*.

For *disjoint sets* the intersection is a *null set.*
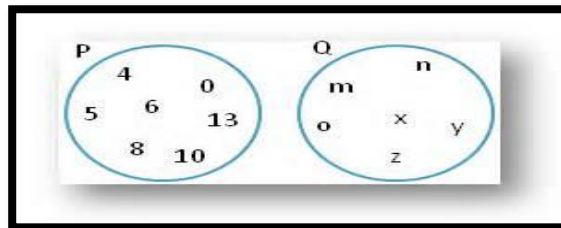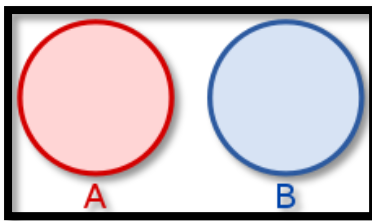
These two sets are disjoint sets because they do not have a common element. There intersection is a null set which is represented as   Ø = { }

Exercise 1.3E

1.   Use the Venn diagram to answer the questions.

   a)   List A
   b)   List B
   c)   List A∩B
   d)   Copy the diagram and color A∩B
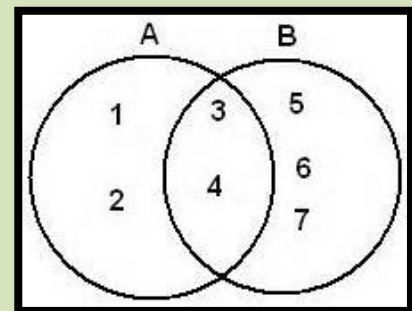
2.   Sets **X** and **Y** are given as: X = {integers from -4 to 4} Y = {factors of 12}

   a)   List X   b)   List Y   c)   List X∩Y
   d)   Draw a Venn diagram showing X intersection Y.
   e)   Shade the Venn diagram to show X∩Y.

3. List the intersection of each pair of sets and draw Venn diagram to show the intersection of the sets.

    a) P = {p, q, r}   Q = {p, q, s}
    b) R = {8, 9, 10}   S = {10, 11, 12}
    c) T = {soccer rugby, baseball,}   U = {netball, volleyball, tennis}
    d) Y = {multiples of 2 less than 12}   Z = {multiples of 3 less than12}
    e) F = {factors of 24}   G = {factors of 18}

4. List the intersection of each set.
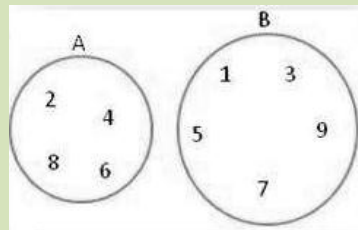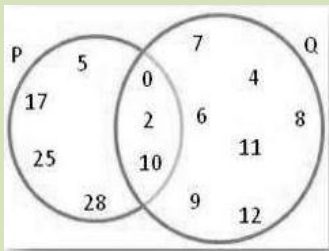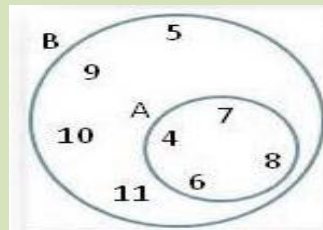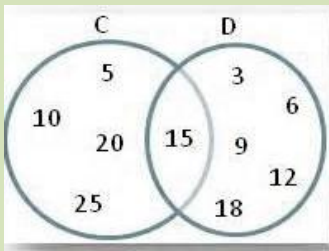
UNIVERSAL SET

A universal set is contains all the elements being discussed. It is usually represented by the symbol *U*. For example if Set A is given as
A = {0,2,4,6 } then the universal set for set A can be any one of the following sets :
    U = {0,2,4,6,8,10}
    U = {0,2,4,6,8,10,12}
    U = {0,1,2,3,4,5,6,7,8,9,10}

All other sets in the discussion will be subset of the U.
A rectangle or square is used to represent the
Universal set in a Venn diagram.
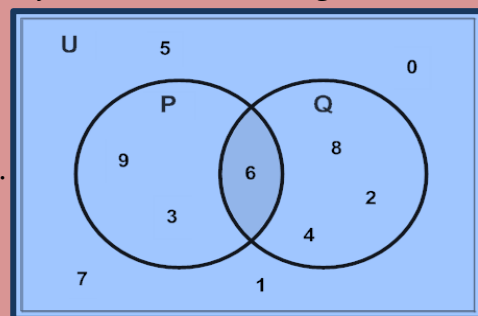
COMPLEMENT OF A SET

The set of elements which do not belong to a set but belong to the universal set is called complement of the set being considered.

Example
The complement of set A, denoted by A' is the set of all elements in the universal set that are not in A.

This shaded area outside A represents A'
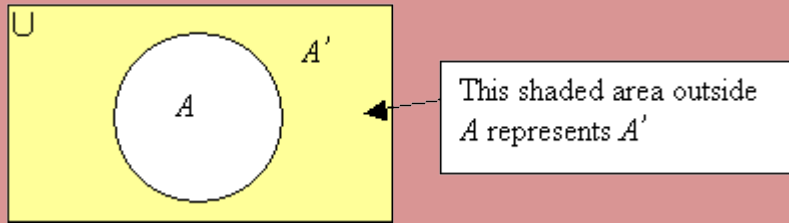
Discussion

The Venn diagram shows Set M. List 4 different universal set for set M
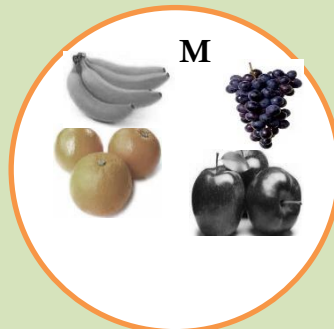
Exercise 1.3F

1. For each of the following sets shown in the Venn diagram, list :
    i)   Set A
    ii)   Universal set
    iii) Complement of Set A

a)

A	U
a c	b
d h	
g	
e	f

b)

20	A	U
	10	
	70 50	30
60	40 0	
		80

c)

	A	U
	Girls	
Your class		

d)

U

A

Multiples
of 6

Multiples of 12

e)

U

A

Prime
Numbers

Composite Numbers
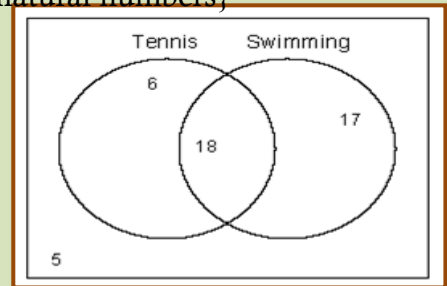
f)

U

A

Cities
in Fiji

Towns in Fiji

2.   Draw Venn diagram to show the following sets.
   a)   U = {1, 2, 3, 4, 5, 6}   A = {2, 4, 6}
   b)   U = {alphabets}   A = {vowels}
   c)   U = {natural numbers}   A = {even natural numbers}
   d)   U = {children in my class}   A = {boys in my class}
   e)   U = {Natural numbers}   A = {odd natural numbers}

3.   Use the Venn diagram to answer the questions
   a)   How many students like tennis or swimming?
   b)   How many students do not like tennis?
   c)   How many students do not like either tennis
        or swimming?
   d)   How many students like swimming?
   e)   How many students do not like swimming?
   f)   How many students like tennis?
   g)   How many students like both tennis and swimming?
   h)   How many students only like tennis?
   i)   How many students only like swimming?
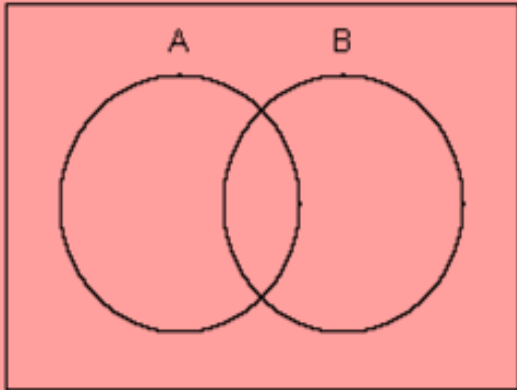   h)   How many students do not like both tennis and swimming?

Tennis   Swimming

6

17

18

5

4.   Solve the problems using the Venn diagram.

   a)   A' U (B∩C)' =
   b)   (B U C)' U A =
   c)   C'∩ (A∩B)' =
   d)   (A U B)' U C =
   e)   (A U C) ∩ B =
   f)   (A U B)' U C'=

A   B

14

3

16

5

8

9

12

17

15

13

10

7   18   C
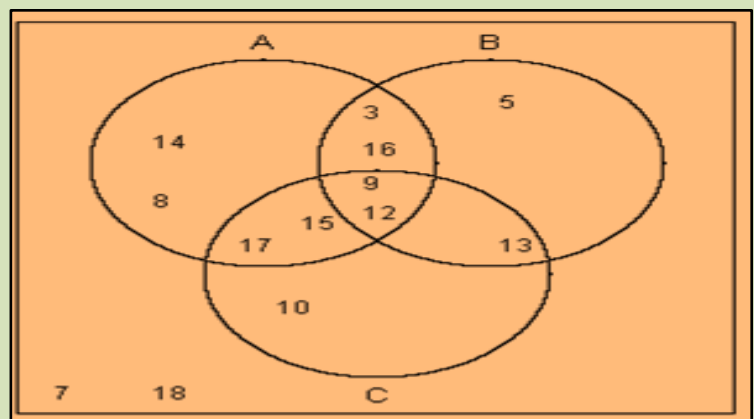
5.   Shade the Venn diagrams

1) Shade _____A' - B'_____

A   B

2) Shade _____(A ∩ B)'_____

A   B

3) Shade _____(B - A)'_____

A   B

4) Shade _____A' ∪ B'_____

A   B

5) Shade _____A_____

A   B
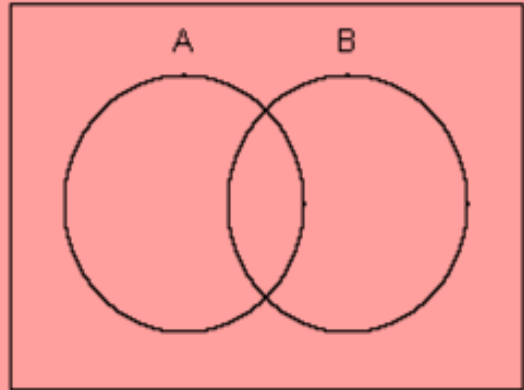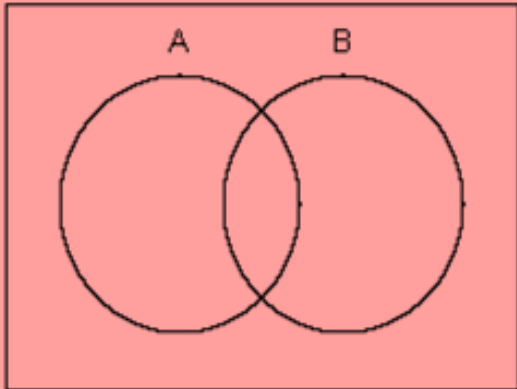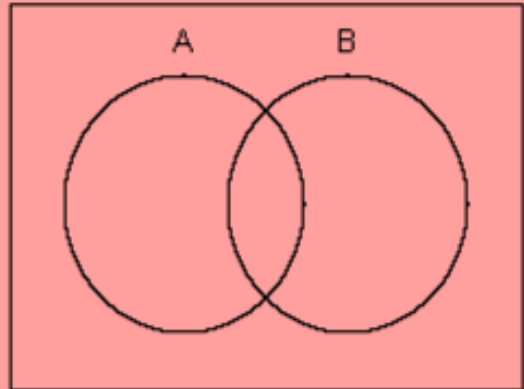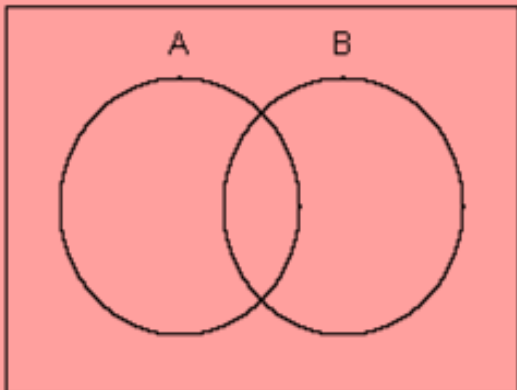
6) Shade _____A ∩ B_____

A   B
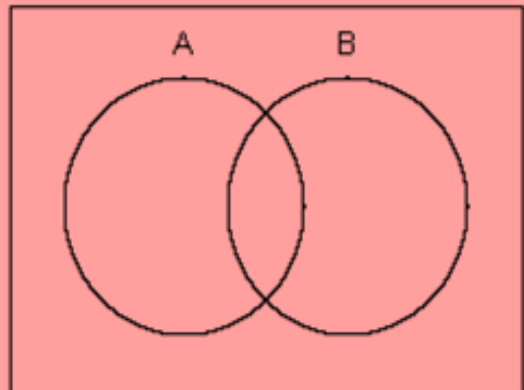
STRAND	M 1: NUMBERS AND NUMERATION
Sub-strand	M 1.4:Fractions

EXPLORING FRACTIONS

Achievement Indicator

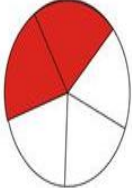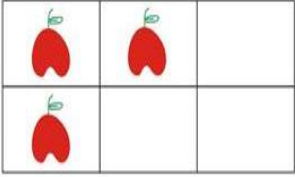❖ _Read and show fractions as part of a whole, a dollar, a percentage and a quantity_

What is a Fraction?

A fraction is a way of representing division of a **'whole'** into **'part'**, **OR** when an object is divided into a number of equal parts then each part is called a **fraction**

It has the forms :

Numerator   Numerator is the number of parts chosen

Denominator   Denominator is the total number of parts

Note: the denominator can NEVER be 0. Why? Because you cannot divide by 0.

$$Eg: \frac{2}{5} \qquad Eg: \frac{3}{6}$$

FRACTION TYPES

There are 3 different types of fractions:

Proper Fraction	Improper Fraction	Mixed Fraction
Numerator < Denominator	Numerator > Denominator Numerator = Denominator	
Proper fractions have the nominator part smaller than the denominator part. Eg: $\frac{2}{5} \ \frac{1}{5} \ \frac{4}{7}$ or $\frac{19}{20}$	Improper fractions have the nominator part greater or equal to the denominator part. Eg: $\frac{6}{6}$ or $\frac{7}{2}$	Mixed fractions have a whole number plus a fraction. Eg : $2\frac{1}{5}$ or $125\frac{18}{20}$

Exercise 1.4A

1.   What fraction of each figure is shaded?

(a)

(b)

(c)

(d)
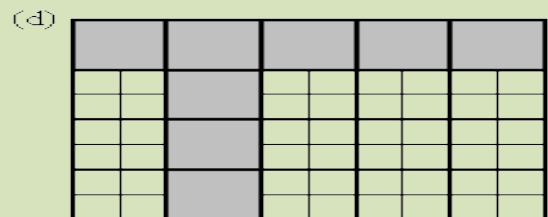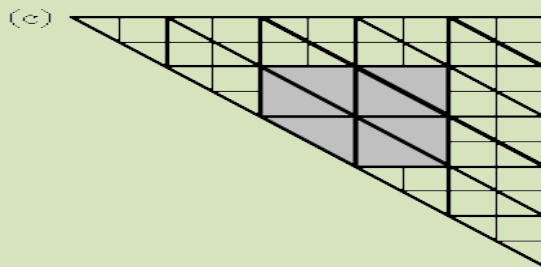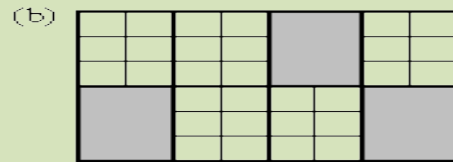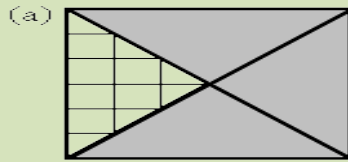
2.   Copy the figure and shade the fraction indicated.

a)

$\dfrac{3}{4}$

b)

$\dfrac{2}{5}$

c)

$\dfrac{1}{6}$
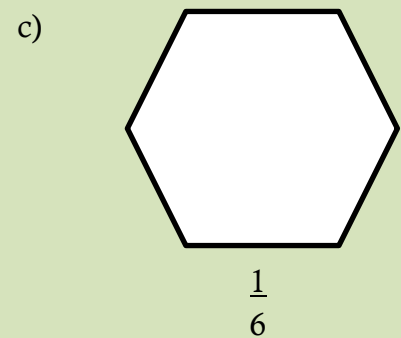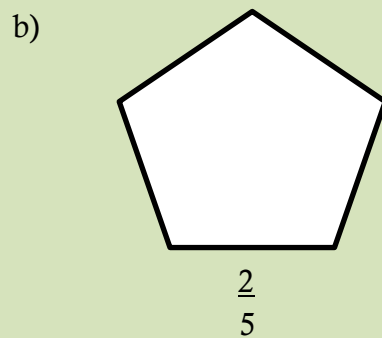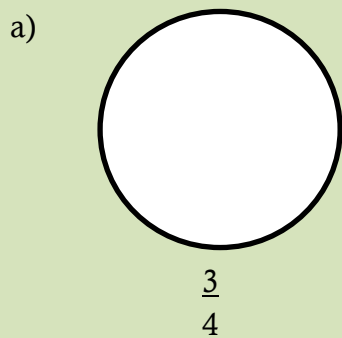
3.   Pearl runs 1 kilometer on Saturday and $\frac{1}{2}$ kilometer on Sunday. How many more kilometers did she run on Saturday than on Sunday?

4.   Peter has one cup of sugar and half of a cup of vegetable oil. How many more cups of sugar than vegetable oil does he have?

5.   How many people could share a cake if each received $\frac{1}{12}$ of a piece?

6.   There were 24 students in Mary's class. She shared her birthday cake amongst them.

   i)   What fraction of the cake would each student get?

   ii)   If there were 16 boys in the class, what fraction of the cake would be shared to them in the simplest fraction?

   iii)   How many girls are there in the class?

   iv)   What fraction of the cake did they share in the simplest fraction?

SHOWING FRACTIONS AS A PERCENTAGE

Important Ideas	❖ To write a percentage as a fraction
❖ A percentage is a convenient way of writing fractions that have a denominator of 100. 'Percent', written %, means 'per 100' or 'for every 100'. eg $7\% = \dfrac{7}{100}$ ❖ To change fractions to percentages, first change the denominator of the fraction to 100. eg. $\dfrac{3}{20} \times \dfrac{5}{5} = \dfrac{15}{100} =$ 15%	or mixed number, first write it as a fraction with denominator 100, then simplify. eg....$125\% = \dfrac{125}{100} \div \dfrac{25}{25} = \dfrac{5}{4}$ Change mixed number to fraction $\dfrac{5}{4} = 1\dfrac{1}{4}$

Exercise 1.4B

1. Change these percentages to fractions
   a) 9%　　　　　b) 37%　　　　　c) 13%
   d) 67%　　　　　e) 33%　　　　　f) 99%

2. Change each to its equivalent basic fractions.
   a) 25%　　　　　b) 5%　　　　　c) 35%
   d) 44%　　　　　e) 4%　　　　　f) 90%

3. Change each percentage to a whole or mixed number.
   a) 100%　　　　b) 140%　　　　c) 203%
   d) 250%　　　　e) 109%　　　　f) 303%

4. Express each as a percentage
   a) $\dfrac{1}{20}$　　　　b) $\dfrac{3}{4}$　　　　c) $\dfrac{16}{50}$

   d) $1\dfrac{1}{4}$　　　　e) $\dfrac{4}{10}$　　　　f) $3\dfrac{1}{5}$

5. Find the simplest answer for:
   a) 10% of 700　　b) 16% of 60km　　c) 40% of 760m
   d) 80% of 7L　　e) 75% of 32minutes　f) 20% of 1km

6. Janice had $10. She spends $4 at the movie.
   a) What fraction of the money was not used?
   b) Calculate the percentage of money that was not spent.

7. Mr Smith had $2400 in his bank account. He withdrew 60% of the money to buy a new TV set.
   a) What fraction of the money was left in the bank?
   b) Calculate the percentage of money that was withdrawn to buy the TV set.

FRACTION OF A QUANTITY

Examples

1. Find $\frac{3}{5}$ of a meter

    $\frac{3}{5}$ of a meter $= \frac{3}{5}$ of 100

    Therefore $\frac{3}{5}$ of a meter $= \frac{300}{5}$

    $= 60$cm

2. What fraction of an hour is 40 minutes

    Fraction $= \frac{40}{60}$

Note: Changing to smaller units makes the working easier
Change to the same units

Exercise 1.4C

1. Find:

    a) $\frac{1}{5}$ of 1km

    b) $\frac{1}{4}$ of an hour

    c) $\frac{1}{8}$ of 1kg

    d). $\frac{1}{3}$ of 90^0

    e) $\frac{1}{100}$ of 200g

    f) $\frac{1}{3}$ of 3m

2. What fraction is?

    a) 50c of $1

    b) 200g of 8kg

    c) 60cm of 2m

    d) $25 of $150

    e) 100m of 2km

    d) 20minutes of 2hrs

3. Calculate:

    a) $\frac{1}{4}$ of 10kg

    b) $\frac{1}{7}$ of $42 000

    c) $\frac{1}{6}$ of 30kg

    d) $\frac{2}{3}$ of $6.30

    e) $\frac{1}{5}$ of $25.25

    f) $\frac{2}{4}$ of 8.6 m

4. What fraction is:

    a) 2cm of 1m?

    b) 200ml of 2L?

    c) 50g of 4kg?

    d) 5c of $20

    e) 25 minutes of 4 hours?

5. a) 20% of my money is $12. What is 10% of my money?

    b) 1kg of rice costs $4.10. What is the cost of $\frac{1}{4}$ kg of rice?

    c) $\frac{1}{2}$ litre of kerosene costs $1.50. What is the cost of $2\frac{1}{2}$ litre of kerosene?

d) A movie time was 2hours. 10% of the time was taken advertisement. How long was the actual movie?

e) Three friends were each given 25% of a pie. What fraction of the pie was given altogether?

CONVERTING FRACTIONS TO MIXED NUMBER AND MIXED NUMBER TO FRACTION

Achievement Indicator
  ❖ *Convert fractions to mixed numbers and vice versa*

Mixed Number to Fraction	Fraction to Mixed Number
Example 1	Example 2
Convert $2\frac{3}{4}$ to an improper fraction.	Convert $\frac{20}{3}$ to a mixed number
$2\frac{3}{4} = \frac{(2 \times 4) + 3}{4} = \frac{11}{4}$	Divide the numerator by the denominator
The whole number = 2, the denominator = 4	$20 \div 3 = 6$ plus 2 remainder
Multiply together $2 \times 4 = 8$	$\frac{20}{3} = 6\frac{2}{3}$
Add numerator (3) $8 + 3 = 11$	6 becomes the whole number
The numerator of the improper fraction is 11 and the denominator is 4	2 is the numerator of the fraction as shown
	3 is the denominator

Exercise 1.4D

Converting Improper Fractions to Mixed Numbers

1) $\dfrac{29}{4} =$ ____

2) $\dfrac{13}{6} =$ ____

3) $\dfrac{73}{9} =$ ____

4) $\dfrac{65}{8} =$ ____

5) $\dfrac{17}{2} =$ ____

6) $\dfrac{5}{2} =$ ____

7) $\dfrac{25}{4} =$ ____

8) $\dfrac{43}{7} =$ ____

9) $\dfrac{29}{4} =$ ____

10) $\dfrac{73}{9} =$ ____

11) $\dfrac{19}{3} =$ ____

12) $\dfrac{43}{7} =$ ____

13) $\dfrac{11}{5} =$ ____

14) $\dfrac{91}{10} =$ ____

15) $\dfrac{37}{6} =$ ____

Converting Mixed Numbers to Improper Fractions

1) $7\dfrac{1}{3} =$ ____

2) $7\dfrac{9}{10} =$ ____

3) $7\dfrac{3}{4} =$ ____
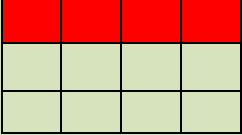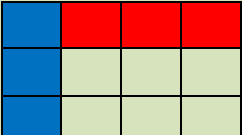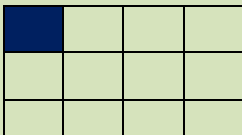
4) $2\dfrac{1}{2} =$ ____

5) $8\dfrac{4}{7} =$ ____

6) $2\dfrac{3}{5} =$ ____

MULTIPLY FRACTION WITH SAME AND DIFFERENT DENOMINATOR
Achievement Indicator
   ❖ *Multiply and divide fraction with the same and different denominator.*

$\frac{1}{3}$ has been shaded   X $\frac{1}{4}$ of the shaded part is blue   ($\frac{1}{4}$ of $\frac{1}{3}$) or ($\frac{1}{4}$ x $\frac{1}{3}$) is $\frac{1}{12}$

Conclusion: $\frac{1}{4}$ x $\frac{1}{3}$ = $\frac{1}{12}$

To multiply two fractions, multiply the numerators and multiply the denominators

    Answer = $\frac{\text{numerator 1 x numerator 2}}{\text{denominator 1 x denominator 2}}$

Note: If there is a number that will divide exactly into both, the numerator and the denominator, this division should be done. It is easier to do it before multiplying rather than when we reduce the answer

e.g. $\frac{5}{6}$ x $\frac{3}{4}$ = $\frac{\cancel{15}^{5}}{\cancel{24}^{8}}$ = $\frac{5}{8}$ **OR** $\frac{5}{\cancel{6}^{2}}$ x $\frac{\cancel{3}^{1}}{4}$ = $\frac{5}{8}$

Exercise 1.4E

1.   Use diagrams to find the products for the following fractions

   a) $\frac{1}{4}$ x $\frac{2}{3}$ b) $\frac{3}{5}$ x $\frac{3}{4}$ c) $\frac{3}{8}$ x $\frac{1}{5}$

2.   a) $\frac{1}{10}$ x $\frac{1}{10}$ b) $\frac{4}{5}$ x $\frac{3}{5}$ c) $\frac{9}{12}$ x $\frac{6}{12}$

   d) $\frac{1}{3}$ x $\frac{2}{3}$ e) $\frac{2}{7}$ x $\frac{1}{7}$ f) $\frac{5}{9}$ x $\frac{6}{9}$

3.   Give the simplest answer for each

   a) $\frac{1}{2}$ x $\frac{4}{5}$ b) $\frac{3}{4}$ x $\frac{3}{6}$ c) $\frac{6}{7}$ x $\frac{5}{9}$

   d) $\frac{1}{5}$ x $\frac{10}{12}$ e) $\frac{4}{6}$ x $\frac{2}{10}$ f) $\frac{5}{8}$ x $\frac{2}{3}$

To divide by a fraction change the division sign to multiplication and invert the divisor

Example 1

Example 2

$$1\frac{1}{2} \div 3\frac{1}{8} = \frac{3}{2} \div \frac{25}{8}$$
$$= \frac{3}{2} \times \frac{\cancel{8}^4}{25}$$
$$= \frac{12}{25}$$

4. Give the simplest answer for each

   a) $1\frac{1}{2}$ x $\frac{3}{4}$

   b) $3\frac{1}{5}$ x $4\frac{2}{3}$

   c) $\frac{5}{8}$ x $1\frac{3}{7}$

Exercise 1.4F

1. Simplify the following fractions

   a) $\frac{3}{4} \div \frac{1}{2}$

   b) $\frac{5}{8} \div \frac{1}{3}$

   c) $\frac{5}{12} \div \frac{1}{4}$

   d) $\frac{7}{10} \div \frac{2}{3}$

   e) $\frac{18}{25} \div \frac{3}{5}$

   f) $\frac{49}{100^-} \div \frac{7}{8}$

2. Simplify by first changing mixed numerals to improper fractions.

   a) $5 \div 1$

   b) $\frac{2}{3} \div 3$

   c) $3\frac{1}{2} \div 6$

   d) $1\frac{3}{4} \div 1\frac{1}{2}$

   e) $3\frac{2}{3} \div 1\frac{1}{3}$

   f) $4\frac{3}{4} \div 1\frac{3}{5}$

3. The equilateral has a perimeter of $10\frac{1}{2}$ cm. What is the length of each side?

4. A jug holds $\frac{1}{4}$ litre of water. How many of these cups could be filled from a 20 litre bucket of water?

5. How many $\frac{3}{5}$ kg cake can be made from a 12 kg bag of flour?

6. What is one and half divided by one tenth?

7. Sahai wanted to share his two birthday cakes amongst his class. There are 30 students in his class. How fraction of the cake would one student get?
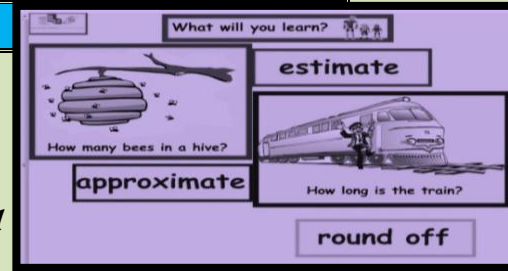
STRAND	M 1: NUMBERS AND NUMERATION
Sub-strand	M 1.5:Decimals

ROUNDING OF DECIMAL NUMBERS

Achievement Indicator

- ❖ *Express, read and round off decimals to two to three decimal places.*

Rounding off is a kind of estimating.

To round off a decimal number to two decimal places (or hundredths) e.g.(3.72**6**), we look at the last numeral. If the last numeral is 5 or more, we round up the numeral to the left of the last digit by 1(e.g.3.73), and round down if the next figure is less than 5

Rounding with decimals: When rounding numbers involving decimals, there are 2 rules to remember:

Rule One: Determine what your rounding digit is and look to the right side of it. If that digit is 4, 3, 2, or 1, simply drop all digits to the right of it.

Rule Two: Determine what your rounding digit is and look to the right side of it. If that digit is 5, 6, 7, 8, or 9 add one to the rounding digit and drop all digits to the right of it.

Examples	Because …
3.1416 rounded to hundredths is 3.14	… the next digit (1) is less than 5
1.2635 rounded to tenths is 1.3	… the next digit (6) is 5 or more
1.2635 rounded to 3 decimal places is 1.264	… the next digit (5) is 5 or more

Exercise 1.5A

1. Round off these numbers to the nearest whole number.

    a) 47.76   b) 62.92   c) 5.87

    d) 2.344   e) 70.02   f) 92.344

    g) 43.31   h) 54.4753   i) 24.4682

2. Round off these numbers to the nearest tenths.

    a) 23.22   b) 44.44   c) 2.73

    d) 96.4435   e) 12.26   f) 75.7024

3. Round off these numbers to the nearest hundredths.

    a) 853.526   b) 30.7941   c) 297.591
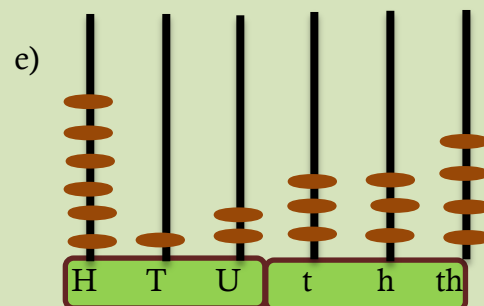
REPRESENTING DECIMAL NUMBERS ON AN ABACUS
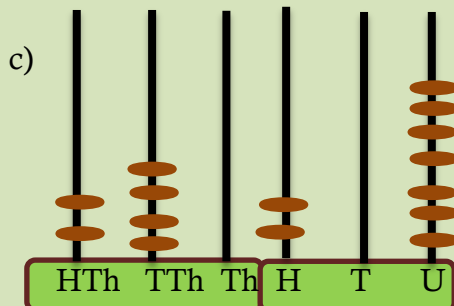
Achievement Indicator

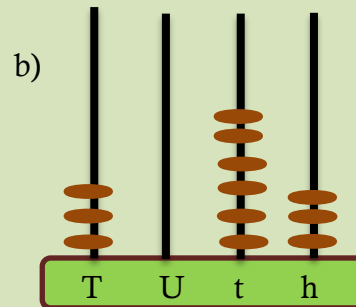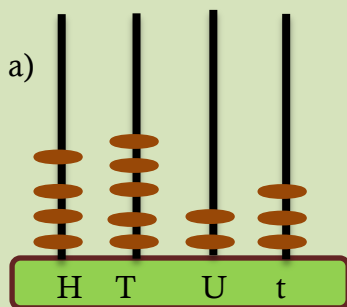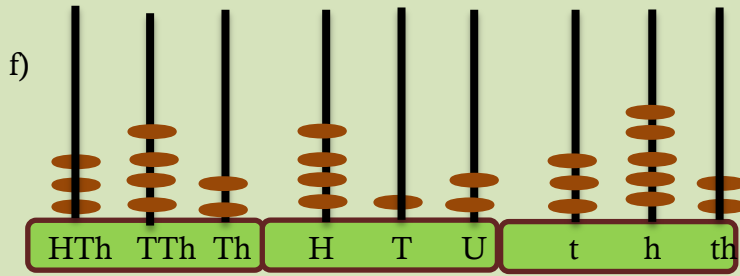❖ *Show decimals on abacus, by using squares, strips and units*

Showing decimal on abacus

TTh	Th	H	T	U	•	t	h	th
5	1	6	4	3	•	2	3	1

← 10 x bigger   10 x smaller →

Exercise 1.5B

1. Write down the value of numbers shown on abacus.

a)

| H | T | U | t |

b)

| T | U | t | h |

c)

| HTh | TTh | Th | H | T | U |

e)

| H | T | U | t | h | th |

f)

| HTh | TTh | Th | H | T | U | t | h | th |

2. Show the following decimal numbers on abacus.
   a) 23.41   b) 405.781   c) 1.009
   b) 724.43   e) 3 762.263   f) 451 378 . 321

ADDITION AND SUBTRACTION OF DECIMALS

The column in which a figure is placed determines its size.
The decimal point separates the whole numbers from the parts of a whole, so the decimal points must be under one another in question and answer.
Remember: To add or subtract decimals use the PUP rule: place Points Under Point.
An empty spacemay be filled by a zero.
Example:

Exercise 1.5C

1. Add the following decimal numbers
   a) 1.36 + 72.983   b) 76.907 + 0.03
   c) 897.123 + 32.08 + 0.5783   d) 0.186 + 0.23 + 0.0281
   e) 9 + 0.09 + 1.009   f) 23.1 + 437 + 0.489

2. Calculate the difference between the decimal numbers given.
   a) 876 − 34.98   b) 4782.136 − 78.9423
   c) 1.097 − 0.563   d) 689.5 − 18.254
   e) 9 − 0.366   f) 354.06 − 1.958

3. The first, second and third tracks on a CD are 5.03 minutes, 4.82 minutes and 5.28 minutes long respectively. Calculate the total time taken to play the three tracks.

4. Two packages of vegetables weigh 4.821 kilograms and 3.84 kilograms. Find the total weight.

5.   Stephanie deposited $23.18 and $29.07 in cash in her bank account. What is the total amount deposited?

6.   Sally ran 7.38 meters in the first softball practice session and 8.39meters in the second softball practice session. Find the difference in the distance.

7.   Sam scored 53.75 in Basic Science, 62.75 in English and 77.75 in Mathematics. What will be Sam's Healthy Living if his total score was 276.5?

8.   The height of the ground floor of a building is 5.25 meters. The height of the second floor from the first floor is 6.2 meters. What is the height of the second floor from the ground level?

9.   A water tank contains 5400.401 liters of water. 2540.24 liters more water was added. Find the quantity of water in the tank.

MULTIPLICATION AND DIVISION OF DECIMAL NUMBERS BY 100 AND 1000

Achievement Indicator

❖ **Multiply and divide decimals by 100 and 1000 and by another decimal number**

x 10	digit moves 1 place to the right	÷ by 10 digit moves 1 place to the left
x 100	digit moves 2 places to the right	÷ by 100 digit moves 2 place to the left
x 1000	digit moves 3 places to the right	÷ by 1000 digit moves 3 places to the left

When dividing a decimal you can place extra zeros to the decimal. You can place extra zeros before the whole numbers number part too.

Exercise 1.5D

1.   Multiply the decimals numbers by 10, 100 and 1000
   a)   1.25 x 10   b)   9.125 x 100   c)   0.12 x 1000
   d)   2.315 x 1000   e)   712 x 10   f)   0.015 x 1000
   g)   8.1 x 100   h)   0.11111 x 1000   i)   8.4351 x 100

2.   Divide these decimal numbers by 10,100 and 1000
   a)   34.1 ÷ 10   b)   745.67 ÷ 100   c)   4781 ÷ 1000
   d)   346.92 ÷ 100   f)   24.671 ÷ 1000   g)   0.091 ÷ 10
   h)   0.307 ÷ 1000   i)   4 ÷ 100   j)   246 ÷ 10

3.   Fill in the correct numeral
   a)   67 x ____ = 6700   b)   ____ x 100 = 389.12   c)   32.1 x ____ =321
   d)   890 ÷ ____ = 8.90   e)   78.32 ÷ __ =0.783   f)   ____ ÷ 100 =90.236
   h)   ____ ÷ 1000 = 74.903 i)   32.7 x ___ =3270   h)   ___ ÷ 10 =0.005

MULTIPLICATION AND DIVISION OF DECIMAL NUMBERS

Examples:

	Multiplication of Decimals	Examples	Division of Decimals	Examples
By whole number	• Multiply as whole numbers • Place decimal point such that the result has same number of decimal places as multiplicand	2.35 × 5 235×5=1175 (2 places) = 11.75	• Divide as whole numbers • Place decimal point such that the result has same number of decimal places as the dividend	2.35 ÷ 5 235 ÷ 5 = 47 (2 places) = 0.47
By Decimal	• Multiply as whole numbers • Place the decimal point such that result has decimal places equal to sum of decimal places of the operands	2.51 × 7.2 251 × 72 (3 places) = 18.072	• Multiply dividend and divisor by a multiple of 10 to convert divisor into whole number • Divide the dividend by the whole number	4.75 ÷ 2.5 Multiply by 10 47.5 ÷ 25 47.5 ÷ 25 (1 place) = 1.9

NOTE: **1.** When multiplying decimals, the number of figures after the decimal point in the answer must be the same as the total number of figures that come after the decimal points in the   question.

2. To divide by a decimal, we change the question so that we are dividing by a whole number.

Exercise 1.5E

1. a) 7 x 0.892   b) 5 x 3.16   c) 0.376 x 13
   d) 2.43 x 75   e) 6.800 x 246   f) 6 x 87.2

2. a) 1.2 x 0.892   b) 3.9 x 3.16   c) 0.376 x 0.9
   d) 2.43 x 5.8   e) 6.800 x 2.46   f) 6.12 x 87.2
   g) $(0.8)^2$ i) $(0.17)^2$

3. a) 8.35 ÷ 5   b) 0.9 ÷ 3   c) 3.6 ÷ 9
   d) 4.72 ÷ 8   e) 2.7 ÷ 3   f) 0.651 ÷ 3

4. a) 0.8 ÷ 0.2   b) 7.125 ÷ 0.005 c) 4.72 ÷ 0.8
   d) 365 ÷ 0.04   e) 8.76 ÷ .012   f) 5.58 ÷1.8
   g) $\dfrac{25.5}{0.5}$ h) $\dfrac{2.718}{0.03}$ i) $\dfrac{31.71}{0.04}$

5. Chuck`s class is going on a fieldtrip this next Thursday. There are 95 students going on the field trip, and each one is paying their teacher $3.75. How much money will be collected?

6. Marcus bought 8.6 kg of sugar. He poured the sugar equally into 5 bottles. There was 0.35 kg   of sugar left over. What was the mass of sugar in 1 bottle?

7. The watermelon bought by Peter is 3 times as heavy as the papaya bought by Paul. If the watermelon bought by Peter has a mass of 4.2 kg, what is the mass of the papaya?

8. A team of 28 divers set a record by diving 190.4 miles under water. What is the mean distance dived by each diver?

CHANGING FRACTIONS TO TENTHS, HUNDREDTHS, THOUSANDTHS

Achievement Indicator

❖ *Express fractions involving tenths, hundredths and thousands as decimals.*

Changing tenths and hundredths to decimals:

Hint:-

Look at the denominators:

$\frac{1}{10} = 0.1$ - if there is one zero you must have one number after the decimal point.

$\frac{1}{100} = 0.01$ - if there are two zeros you must have two numbers after the decimal point.

Exercise 1.5F

1 Change these fractions to decimals:

a) $\frac{2}{10} =$ _____ b) $\frac{5}{10} =$ _____ c) $\frac{9}{10} =$ _____ d) $\frac{3}{10} =$ _____ e) $\frac{6}{10} =$ _____

f) $\frac{4}{10} =$ _____ g) $\frac{10}{10} =$ _____ h) $\frac{8}{10} =$ _____ i) $\frac{1}{10} =$ _____ j) $\frac{7}{10} =$ _____

2. Change these fractions to decimals:

a) $\frac{25}{100} =$ _____ b) $\frac{79}{100} =$ _____ c) $\frac{34}{100} =$ _____ d) $\frac{99}{100} =$ _____ e) $\frac{16}{100} =$ _____

f) $\frac{8}{100} =$ _____ g) $\frac{3}{100} =$ _____ h) $\frac{9}{100} =$ _____ i) $\frac{1}{100} =$ _____ j) $\frac{4}{100} =$ _____

3. Complete the table given below

Fraction	Decimal	Fraction	Decimal
$\frac{79}{10}$		$\frac{8932}{10000}$	
	0.902		
One and seventy two hundredth			0.36871
	0.00101	Forty five and one ten thousandth	

CHANGING FRACTIONS TO DECIMALS

Proper fraction to decimal	Improper fraction to decimal	Repeating or recurring fraction

A **terminating** decimal comes to a definite end. It has a definite number of decimal places.
A **repeating** or **recurring** decimal does not come to an end, but forms pattern that is repeated indefinitely.

Exercise 1.5G

1.   Write each as a decimal.

a) $\dfrac{4}{5}$

b) $\dfrac{1}{8}$

c) $\dfrac{3}{7}$

d) $\dfrac{12}{15}$

e) $\dfrac{9}{12}$

f) $\dfrac{20}{25}$

2.   Write each improper fraction as a decimal

a) $\dfrac{8}{4}$

b) $\dfrac{12}{8}$

c) $\dfrac{12}{10}$

d) $\dfrac{20}{12}$

d) $\dfrac{50}{20}$

f) $\dfrac{32}{24}$

3.   a) $\dfrac{6}{7}$

b) $\dfrac{9}{11}$

c) $\dfrac{3}{8}$

d) $\dfrac{12}{13}$

e) $\dfrac{5}{9}$

f) $\dfrac{7}{1}$

STRAND 2

ALGEBRA

STRAND	M 2: ALGEBRA
Sub-strand	M 2.1: PATTERNS

SQUARE NUMBERS

Achievement Indicator
- ❖ *Determine rules for generating sequences of numbers and shapes such as square numbers, triangular numbers etc.*

A number that has a square dot pattern. It is found by adding the odd numbers. Also, to square a number, just multiply it by itself.

Square Numbers

Numbers which can be arranged in a square shape - for example:

$1 \times 1 = 1 = 1^2$
$2 \times 2 = 4 = 2^2$
$3 \times 3 = 9 = 3^2$
$4 \times 4 = 16 = 4^2$

1   4   9   16

Write the first six square numbers in ascending order:

Answer: 1, 4, 9, 16, 25, 36.

1st square number = 1
2nd square number = 1 + 3 = 4
3rd square number = 1 + 3 + 5 = 9 etc.

Also by using the rule: $x(n) = n \times n$ e.g. x (1) = 1 x 1 = 1
          where (n) = number   x (2) = 2 x 2 = 4

Exercise 2.1A

1. Write down the set of the first 10 square numbers. Show it using dots.

2. Now fill in the blanks below:

        1, 4, 9, ___, ___, ___, 49, ___.

3.   What are the 10th, 11th, 12th, and 13th square numbers?

4.   Which of the following are square numbers:

   1, 5, 10, 25, 36, 48, 64, 84, 96, 100, 110, 121, 130, 144, 158, 169.

5.   What is the sum of the following?
        a)   the 2nd and 3rd square numbers
        b)   the 5th and 6th square number

6.   What is the difference of the following?
        a)   the 10th and 8th square number
        b)   the 7th and 2nd square number.

7.

CAN YOU MAKE A CIRCLE OF THE NUMBERS
BELOW SO THAT EVERY ADJOINING PAIR
ADDS TO MAKE A SQUARE NUMBER.

2,3,4,5,6,8,10,11,12,13,14,15,17,19,21,28,30,34

TRIANGULAR NUMBERS

A number that can make a **triangular dot pattern**. By adding another row of dots and counting all the dots we can find the next number of the sequence:

Triangular numbers are found by **adding the counting numbers**:
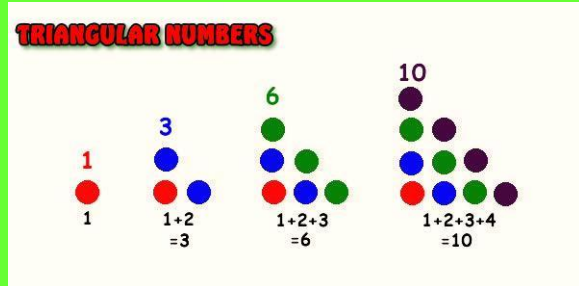
Also, by using the **rule:** $x = \dfrac{n(n+1)}{2}$. Advisable for very large numbers.

Example: Find the 3rd triangular number: $x(3) = \dfrac{3(3+1)}{2}$

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

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

$$= 6$$

Exercise 2.1B

1. (a) Write down the set of the first ten triangular numbers. Show using the dots and complete the table below. Continue with the pattern as from above.

Triangular number	Dots
1	
2	
3	
4	

1. (b). Using the numbers from the table above, graph the results below. Plot the figure number along the horizontal axis and plot the number of dots along the vertical axis. (Be sure to label both axes.)

2. What is the sum of the following?
   - a) the 3rd and 4th triangular number
   - b) the 5th and 6th triangular number
   - c) the 7th and 8th triangular number

3. Using the rule find the following triangular numbers.
   - a. 33
   - b. 54
   - c. 60
   - d. 22

NUMBER PATTERNS

Achievement Indicator:
- ❖ *Use patterns to create and solve number tricks and puzzles.*

A. Magic Triangles:
This is similar to "magic squares" however; it is in the form of a triangle. E.g. Using the numbers 1, 2, 3, 4, 5 and 6 once only, figure out how three numbers along each line adds up to 9.

Top side: $6 + 2 + 1 = 9$
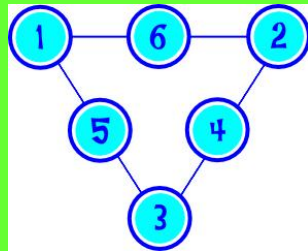
Left side:
$3 + 5 + 1 = 9$

Right side:
$3 + 4 + 2 = 9$

Exercise 2.1C

1. Place the numbers 1, 2, 3, 4, 5 and 6 once only in the circles on the triangle so that each side adds up to a total

    a) magic sum of 10

    b) magic sum of 11

    c) magic sum of 12
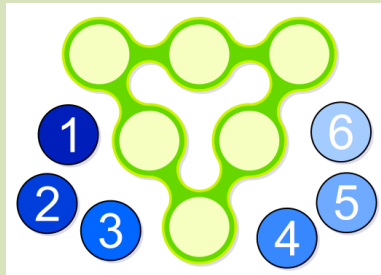
3. Add another 4 circles to the bottom of the above triangle. Place the numbers 1, 2, 3, 4, 5, 6, 7, 8 and 9 once only in the circles on the triangle so that each side adds up to a total of twenty.

B. **Pascal's Triangle:**

```
                1
            1       1
         1     2     1
       1     3    3     1
     1     4    6    4    1
```
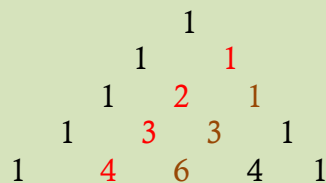
    a) Try completing row 5, then 6 and so on.
    b)   What pattern do you see?
    c) What do you notice about the numbers in red as you go down the triangle?
    d)   What do you notice about the numbers in brown as you go down the triangle?

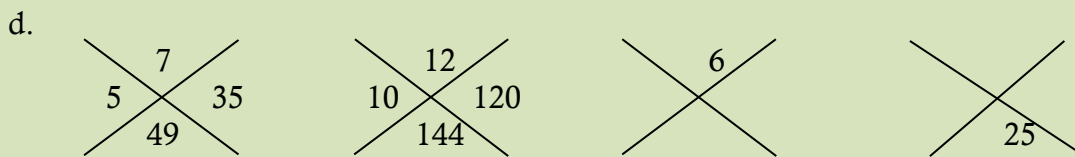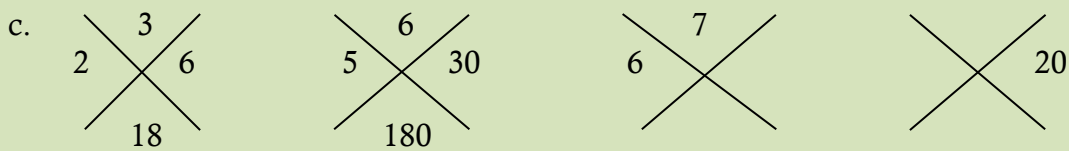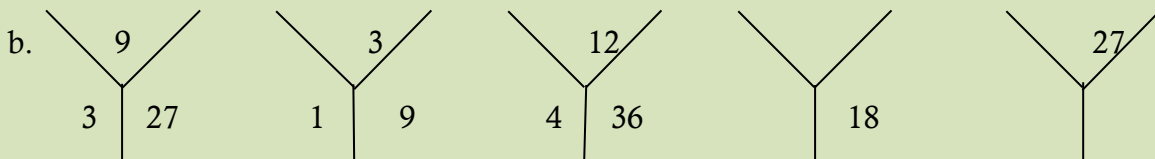e)   Try adding the numbers in a horizontal line. What do you see in the pattern of numbers produced?
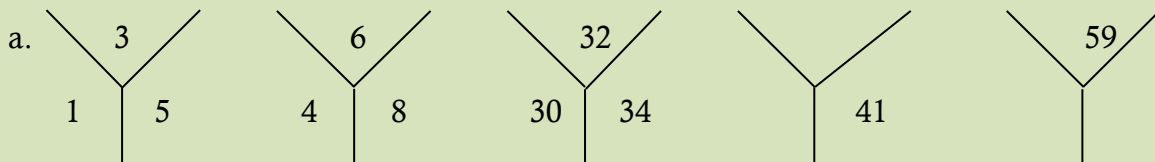
C.   **Patterns with Numbers:**

We can make patterns with number using the 'X' and 'Y' shapes. For example:
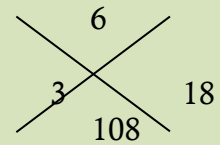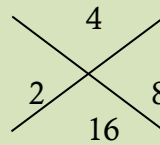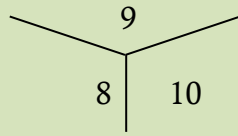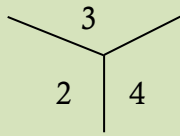
Can you find the pattern for each?

Exercise 2.1D

a.

b.

c.

d.

NUMBER SEQUENCE

Achievement Indicator:
   ❖ *Identify numbers that break a sequence and arrange numbers in sequences.*

A sequence is a list of things (usually numbers) that are in order. It usually has a rule which is a way to find the value of each term. We have a sequence when there is a continuation of a pattern.

For example: 21,   19   17   15   13   11

   -2   -2   -2   -2   -2
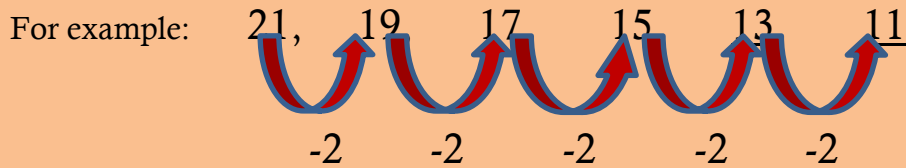
Exercise 2.1E

1.   Continue these sequences.
   a)   1, 10, 3, 12, ____, _____
   b)   9, 18, 11, 20, ___, _____
   c)   383, 481, 579, 677, ____, ____
   d)   3, 5, 8, 13, ___, ____
   e)   7, 21, 63, 189, ____, ___
   f)   6, 18, 54, 162, ___, ____

2.   Work out the number sequences in between.
   a)   22, 30, 25, ___, ___, 36, 31, 39
   b)   13, 22, 18, ___, ___, 32, 28, 37
   c)   17, 15, ___, ___, 9, 7
   d)   38, 41, 32, ___, ___, 29, 20, 23

3.   Identify the number that **does not** belong to the sequence in each of the following.
   a)   28, 32, 36, 39, 40, 44
   b)   53, 51, 49, 48, 46, 43, 40
   c)   2, 4, 8, 16, 32, 52, 64
   d)   100, 200, 300, 350, 400, 450

4.   For each number pattern, write down the next number and the rule you used to get the number.
   a)   3, 7, 11, ……………..
   b)   5, 11, 17,……………..
   c)   37, 30, 23,……………
   d)   80, 40, 20,……………
   e)   87, 27, 9, ……………
   f)   4,16,64,………………

5.   Write down the next three numbers in each pattern.
   a)   10, 25, 40, ……….
   b)   117, 99, 81,………..
   c)   151, 123, 95,………
   d)   50, 40, 31, 23, …….

STRAND	M 2: ALGEBRA
SUB STRAND	M2.2:Equations

ALGEBRAIC ABBREVIATIONS

Achievement Indicator
- ❖ *Can express an unknown using a number sentence.*
- ❖ *Can solve for an unknown.*
- ❖ *Can use a formula to solve for an unknown*
- ❖ *Utilize the skills and carry out opposite operations to find the unknown*

Algebra provides a short way of writing ideas in mathematics. Since pronumerals take the place of numerals they behave the same way when we perform operations with them. When writing algebraic expressions, we try to shorten or simplify the expression as much as possible. Look at the example given below.

$3 \times a$ is written as $3a$, and $a \times b$ is written as ab

$x \div 5$ is written as $\frac{x}{5}$ and $a \div b$ is written as $\frac{a}{b}$

regular equation
3 + 5 =

algebraic equation
m + 2 = 6

Example $3 + 3 + 3 + 3$ is the same as 4 lots of 3, or 4 times 3

so $y + y + y + y$ is 4 lots of y, or 4y

Important notice: n × 6 is always written as **6n** *and not* **n6**

Pronumeral   Numeral

Exercise 2.2A

1. a) How can 'four lots of 6' be written using algebraic expression?
    b) How can 'three lots of p' be written in a using algebraic expression?
    c) How can 4 x p be written in a shorter way?
    d) Why can't 3 x 4 be written in the same way?
    e) Write p ÷ 2 in another way.
    f) What is the difference between 34y and 3 x 4 x y?

2. Write these without multiplication or division signs.
    a) k x 7   b) a ÷ 3   c) a x b x c
    d) 5 x (a + 2)   e) 5 x (m − n)   f) 3x ÷ 5
    g) (a − b) ÷ 2   h) 2 x c ÷ 4   i) 4 x (a + 8)

3. Rewrite these expressions, showing all multiplication and division signs.
    Remember to show grouping symbols if they are needed.

    a) $\dfrac{a}{4}$ b) $\dfrac{m}{8}$ c) ab + 3

    d) $\dfrac{3a}{4b}$ e) k − 3j   f) $\dfrac{9 + x}{5}$

    g) $\dfrac{4 + y}{7 - x}$ h) $\dfrac{6}{3d}$ i) $\dfrac{11m}{10\,n}$

Substitution

An equation can have different values depending on the values we substitute for each pronumeral.

Example: Find the solution for the equation, if p is substituted with 6.

    a) p + 7   b) 2p + 3   c) $\dfrac{12}{p}$

        6 + 7 = 13   (2 x **6**) + 3 $\dfrac{12}{6}$

        =   **13**   =   12   + 3   **2**

                                  =   **15**

Exercise 2.2B

1. Find the value of each expression if **m** is replaced by 6.

    a) 3m   b) 4m + 1   c) m − 3

    d) $\dfrac{m}{2}$ e) 8 + 3m   f) $\dfrac{6m}{3}$

2. If p = 2 and q = 4 , find the value of:

    a) pq   b) p + q   c) q − q

    d) 2p + 2q   e) $\dfrac{10p}{4}$ f) $\dfrac{5 + q}{q}$

3. If each pronumeral is replaced by the value shown in the table, evaluate the expression.

a	b	c	d	e	f	g	h	i	j
0	1	2	3	4	5	6	7	8	9

    a) *cef*   b) *3a + j*   c) *f(h + 3)*

    d) *c + e*   e) *i*   f) *h + j*

g) $\dfrac{g}{di}$ \
eg

h) $ac + bd + fh$ $b + d$

i) $\dfrac{2e}{(2b-c)}$

4.   The perimeter P of a rectangle is given by the formula: $\boldsymbol{P = 2l + 2w}$ where $\boldsymbol{l}$ is the length and b is the breadth of the rectangle.
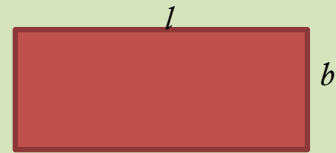
Find the value of **P** if:

a) $l = 5,\ b = 3$　　　　　　b) $l = 6,\ b = 9$

c) $l = 19,\ b = 13$　　　　d) $l = 9,\ b = 21$

5.   Apples cost 15cents each and pears cost 25cents each.
   a)   Write down an expression for the cost of buying **n** apples and **m** pears.
   b)   What is the total cost of buying;
      i)   6 apples and 5 pears?　　　　ii)   10 pears and 12 apples?
      iii)   20 of each?　　　　　　　　d)   54 apples and 23 pears

6.   Write each as an equation. Let the first number p and the second number q.
   a)   You add 5 to the first number to get the second number.
   b)   If you subtract 23 from the first number, you get the second number.
   c)   Doubling the first number gives the second number.
   d)   Diving the first number by 7 produces the second number.

7.   i)   Match each table of values with the correct rule of the formula.

a)

x	1	2	3	4
y				

b)

x	0	2	4	6
y				

c)

x	3	4	5	6
y				

d)

x	5	7	9	11
y				

e)

x	1	2	3	4
y				

f)

x	0	2	4	6
y				

g)

x	5	6	7	8
y				

h)

x	9	12	15	18
y				

A. $y = x + 7$　　　　　　　B. $y = 2x + 1$
C. $y = 6x$　　　　　　　　D. $y = 2x - 4$
E. $y = x$　　　　　　　　　F. $y = 3x + 2$
G. $y = 3x$　　　　　　　　H. $y = x - 4$

ALGEBRAIC SENTENCE

Exercise 2.2C

1. Solve these problems by first writing an equation.
    a) The sum of a certain number and 4 is 13. What is the number?
    b) The sum of 9 and a certain number is 23. What is the number?
    c) A certain number minus 8 is equal to 5. What is the number?
    d) The product of 7 and a number is 63. What is the number?
    e) A certain number is bigger than 7 and the difference from 7 and 3. What is the number?
    f) The total of a number, 9 and 12 is 32. What is the number?
    g) The number is divided by 7, the result is 12. What is the number?
    h) The product of a number and 13 is 117. What is the number?
    i) If 96 is divided by a number, the result is 16. What is the number?
    j) If a number is subtracted from 67, the result is 43. What is the number?

2. Write an equation and then solve each equation.
    a) An packet of crayon and an exercise book cost me $2.70. If a crayon cost 1.25cents, how much did the exercise book cost?
        (Hint: Let the cost of book be *b* cents.)
    b) It takes me 45 minutes to get dressed and have breakfast each morning. If it takes me 17 minutes to have breakfast, how long do I need to get dressed? (*Hint*: Let the time to get dressed be *t*).
    c) A set of library books cost $72. If each book cost $4.50, how many books were in the set?(*Hint*: Let the number of books be *n*).

    d) The sum of Jerry, Sowane and Sashi's age is 64. If Jerry's age is 23 and Sowane's is 26, how old is Sashi?

    e) 145 bars of chocolate were divided during a birthday party among a group of children so that each gets 3 bars. How many children were there?

3. To solve each problem, you need a two-step equation.
    a) If a number is multiplied by 4, and 7 is added to that product, the answer is 19. What is the number?

    b) If 15 is subtracted from the product of 4 and a certain number, the result is 5. What is the number?

    c) A number is divided by 6 and then 8 is added to the result to give 10. What is the number?

Solving Equation

Solving for Pronumeral

Example 1

$x - 4 = 7$	Original problem
$x \ -4 = 7$	We want to remove the minus 4.
$x - 4 \ +4 = 7 \ +4$	The opposite of minus 4 is plus 4, so I added 4 to BOTH sides of the equation.
$x = 11$	$-4 + 4 = 0$, so x remains on the left and $7 + 4 = 11$; therefore $x = 11$
Check: $x - 4 = 7$ $11 - 4 = 7$	This is a correct statement, so my answer is x = 11 is correct!

Example 2

$$2x - 12 = 5$$
$$2x - 12 + 12 = 5 + 12 \quad \text{Step 1}$$
$$2x = 17$$
$$\frac{2x}{2} = \frac{17}{2} \quad \text{Step 2}$$
$$x = 8.5 \quad \text{Solution}$$

Exercise 2.2D

1. Solve the equations. These equations involve one step.

    a) $n + 4 = 12$ b) $m - 5 = 6$ c) $7m = 56$

    d) $\dfrac{x}{5} = 2$ e) $\dfrac{32}{m} = 4$ f) $100 = 5y$

2. These equations involve two steps.

    a) $2x + 1 = 7$ b) $2a + 7 = 11$ c) $2x - 3 = 5$

    d) $\dfrac{4z}{3} = 8$ e) $\dfrac{y}{4} - 3 = 9$ f) $\dfrac{p}{5} + 1 = 7$

3. These equations involve three steps.

    a) $\dfrac{3x + 5}{4} = 7$ b) $\dfrac{2y}{5} - 6 = 4$ c) $\dfrac{4y - 7}{3} = 10$

4. Solve these equations using decimal numerals.

    a) $x + 3.4 = 7.8$ b) $a + 1.7 = 4.8$ c) $x - 2.3 = 6.0$

    d) $0.9x = 1.8$ e) $q \div 0.5 = 6$ f) $0.4a = 1.6$

Flowchart Method

$3x + 5 = 26$
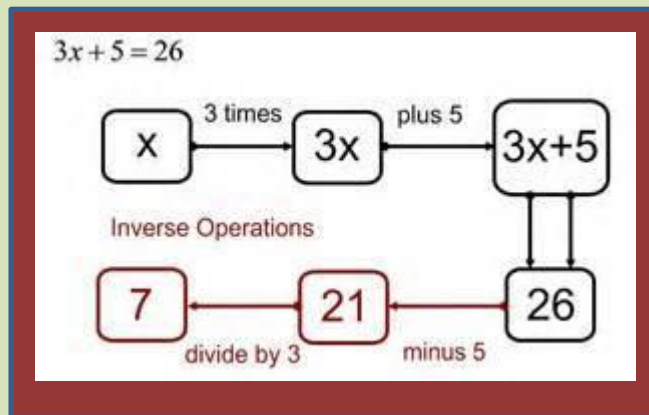
Exercise 2.2E

1. Solve the following equations using the flowchart method.
    a) $2y + 6 = 18$
    b) $2b + 8 = 15$
    c) $\dfrac{y}{3} - 6 = 10$

    d) $\dfrac{3x}{5} - 2 = 7$
    e) $\dfrac{4x + 6}{5} = 10$
    f) $\frac{1}{2}(2t + 4) = 7$

2. Solve these equations using:
    i) formal method
    ii) flowchart.

    a) $3i + 4 = 5$
    b) $\dfrac{6y - 3}{4} = 9$
    c) $(r + 2) \div 5 = 7$

STRAND 3

MEASUREMENT

STRAND	M 3: MEASUREMENT
Sub-strand	M 3.1:Length/Area

UNITS OF MEASUREMENT
Achievement Indicator
- ❖ *Express length and distances to measure, area and perimeters, using appropriate units and language of comparison.*

Imperial and Metric units of Length.
Imperial units were used before the metric units.
Example - Imperial units are foot, steps, span, fathom,
    Metric units are, kilometer, meter, centimeter, and millimeter

Exercise 3.1A

1. Which imperial and metric unit would we use to measure the
    a) length of the classroom?
    b) length of the pencil?
    c) length of the playground?
    d) distance between school and your home?

2. What unit would you use to measure the following?
    a) the height of a person.
    b) the distance from your Suva to Lautoka.
    c) the width of your thumbnail.
    d) a person's waist.
    e) the length of a fly.

3. Estimate the length and distance of the following.

Object	Estimate	Actual Measurement	Error
Desk			
Verandah			
Pencil			
Width of Classroom			
Thickness of desk top			

PERIMETER AND AREA

> **What is the difference between perimeter and area?**
>
> P
>
> P   AREA   P
>
> P
>
> **Perimeter is** *the sum of distance around an object* while the *area is the amount of space inside the boundary of a flat (2-dimensional)* object.
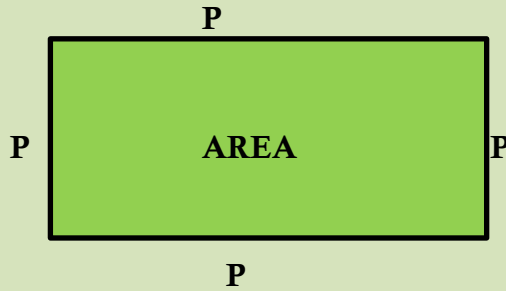
Exercise 3.1B

1.   Measure the perimeter of the following polygons

a)

b)

c)
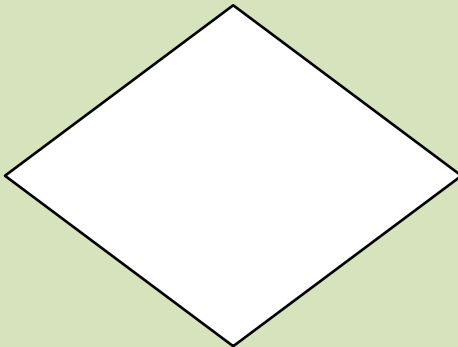
d)
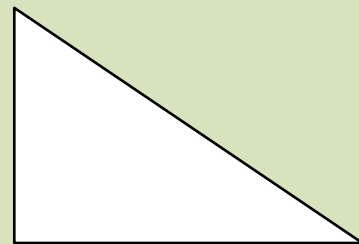
e)
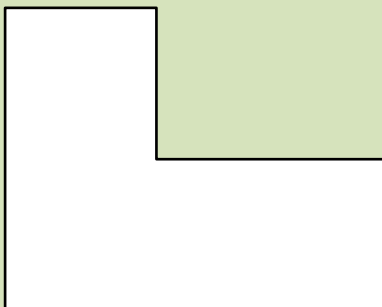
f)
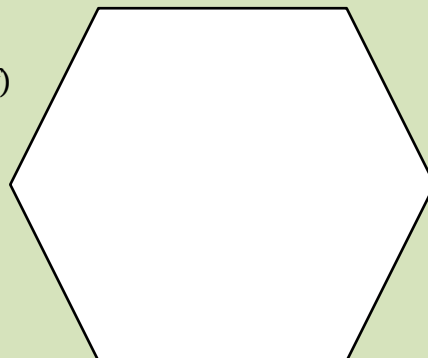
2.   Each of these shapes is drawn on centimeter grid paper. Find the perimeter and area of each   shape.

a)

b)

c)

d)

f)

h)

i)
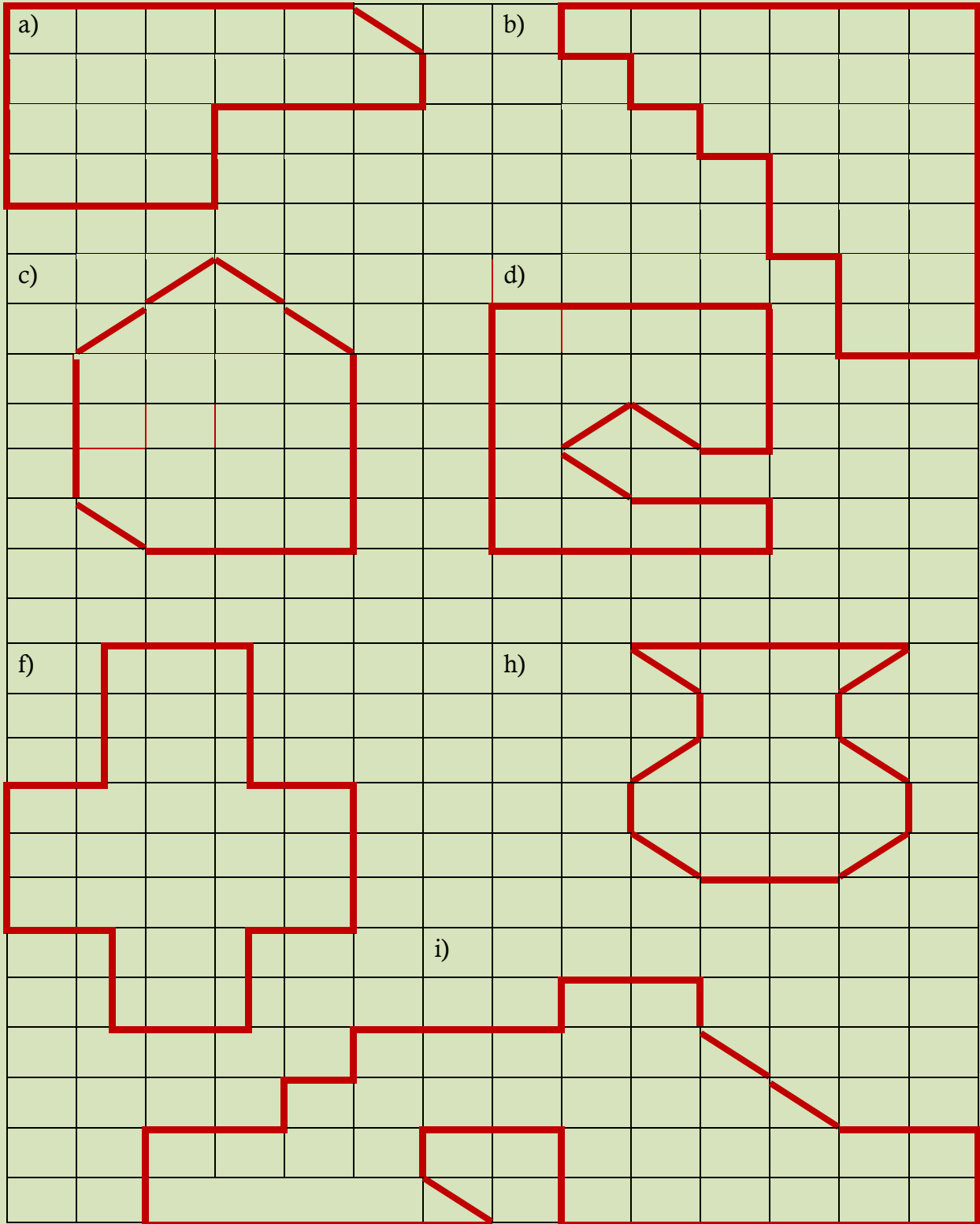
3.   Using your centimeter ruler, measure the perimeter of each of the shapes.

_____ cm   _____ cm   _____ cm

_____ cm   _____ cm   _____ cm

_____ cm   _____ cm   _____ cm

_____ cm   _____ cm   _____ cm
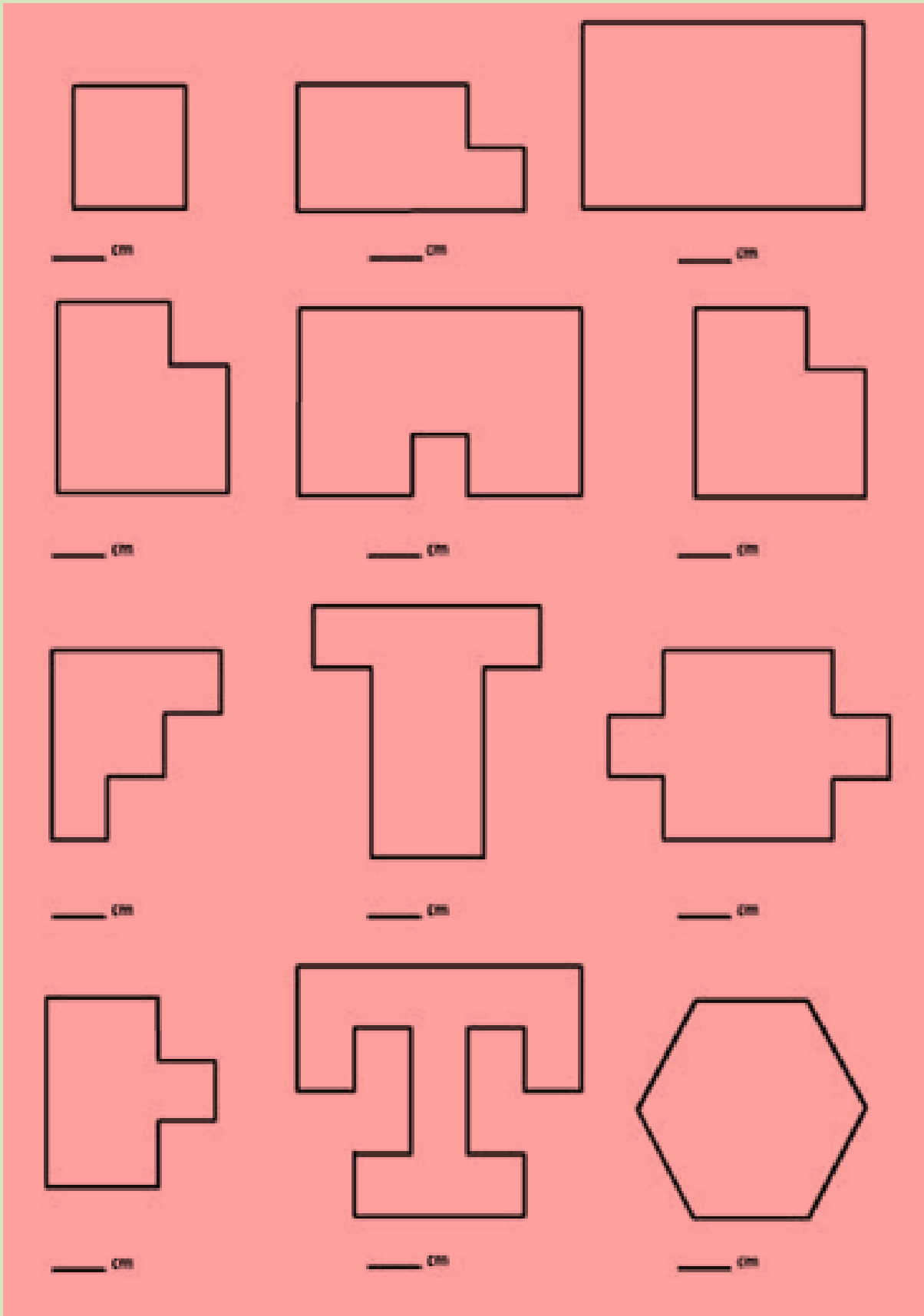
CALCULATING AREA

Achievement Indicator
  ➢ *Calculate area by counting squares or any other non-standard units.*

Exercise 3.1C

1. Calculate the area of the shapes by counting the squares. Each square =1cm²
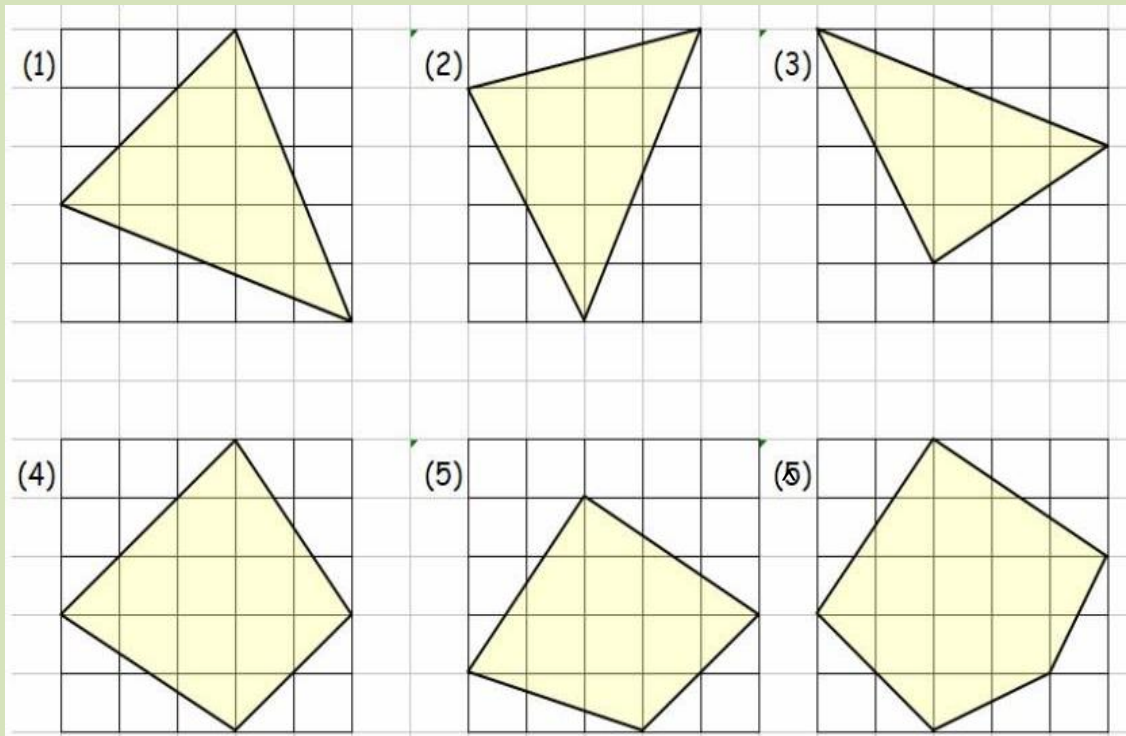
2. The irregular shapes are drawn on square paper. Find out the area of each shape.

a)   b)   c)
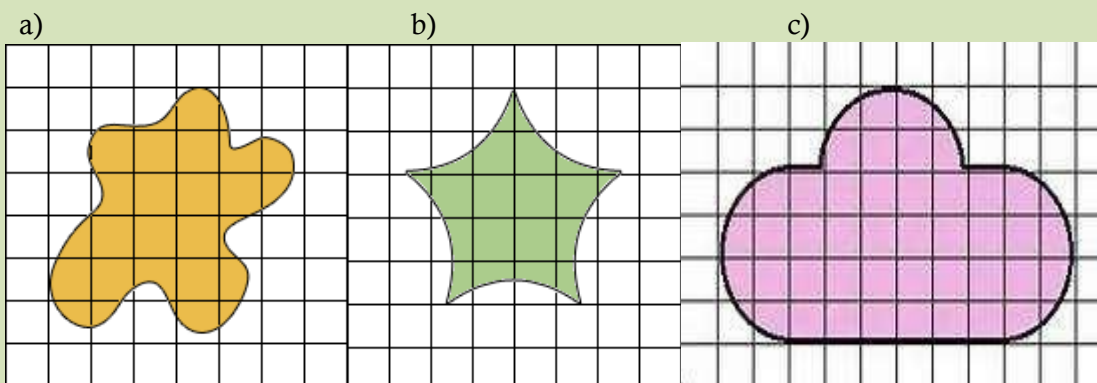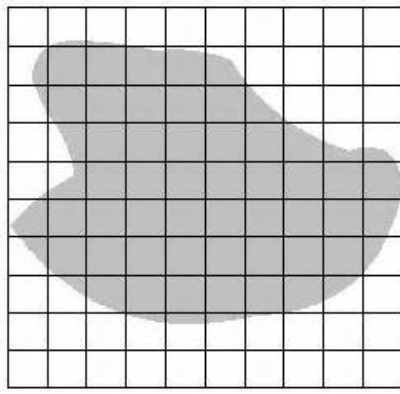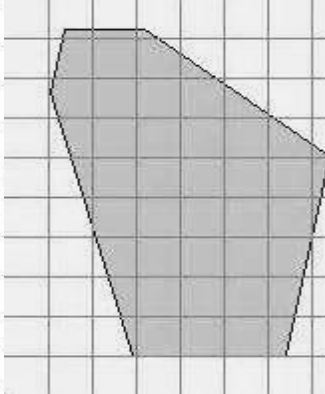
c)   f)   g)
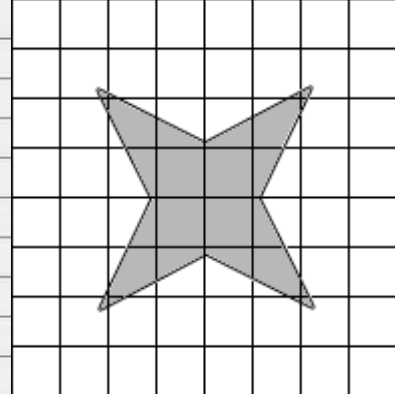
CALCULATING AREA

Achievement Indicator
   ❖ *Derive formula for area of rectangle from tabulated information and makes nets for rectangular solid.*

The **area** of a shape is a measure of the size of its surface.

Square Area = l^2	Rectangle Area = $l \times w$	Triangle Area = $\frac{1}{2}b \times h$	Parallelogram Area = $b \times h$
l	w, l	h, b	h, b
Trapezium Area = $\frac{1}{2}(a + b)h$	Rhombus Area = $\frac{1}{2}a \times b$	Circle Area = πr^2	Sector Area = $\frac{\theta}{360}\pi r^2$
a, h, b	b, a	r	θ, r

Exercise 3.1D

Calculate the area.

1.   a)   7cm

8cm

b)   10cm

6cm

c)

12m

15m

d)

45cm

14cm
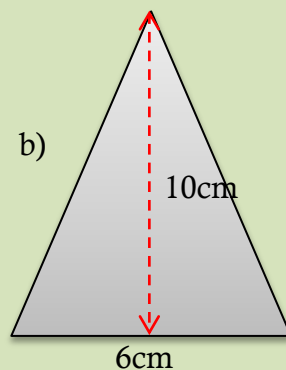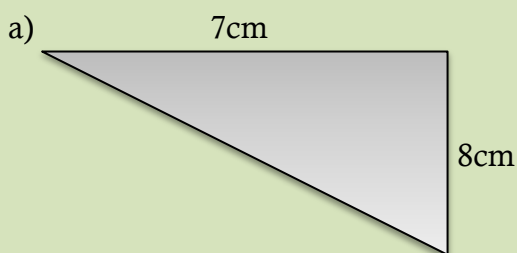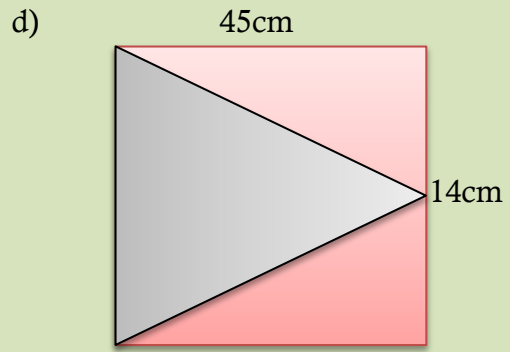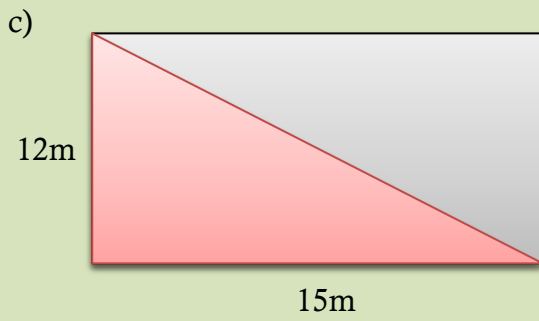
2.   Complete the table.

	Base	Height	Area
a	5.4cm	4.5cm	
b	12m		48m
c		8cm	72cm
d	1.6m		64cm

3.

a)

2cm   4cm

8cm

8cm

b)

9cm

7cm

13cm

c)

11cm
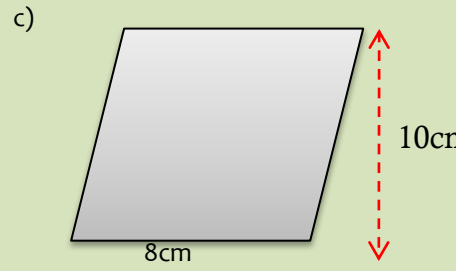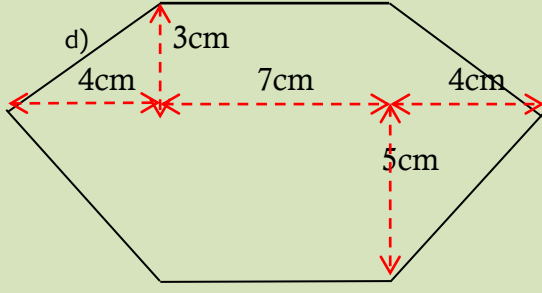
15mm

17cm

d)

3cm

10m

20cm
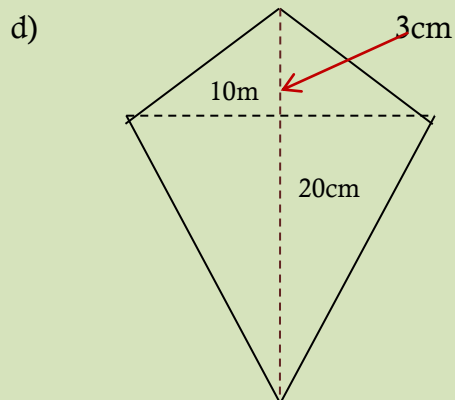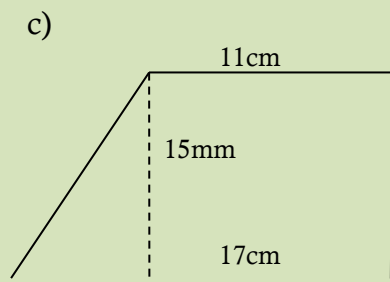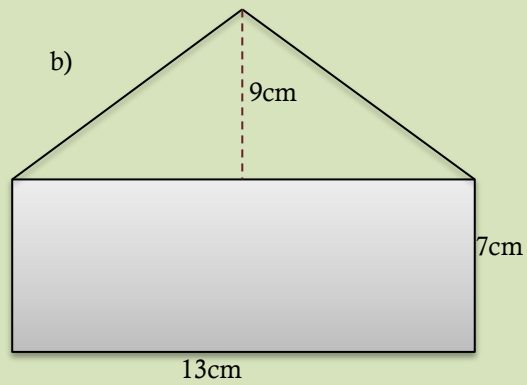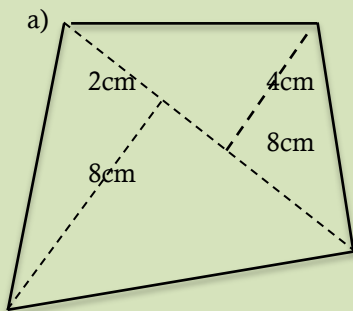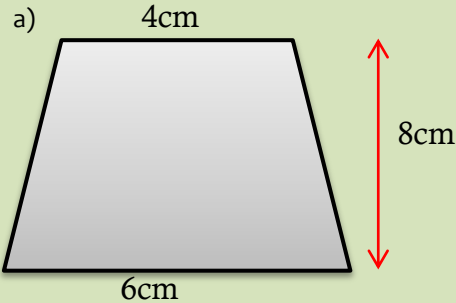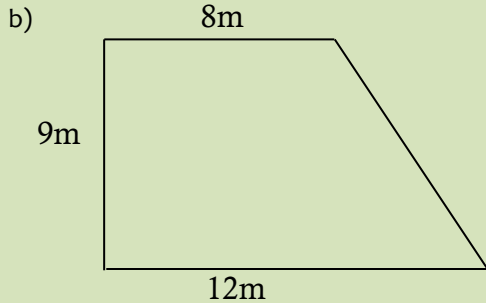
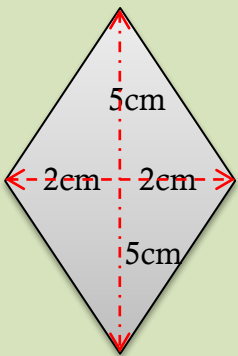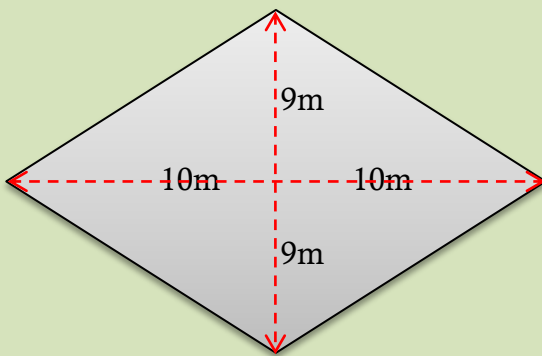4.   A triangle has a base of 20mm and a height of 5cm. What is the area?

5.   A triangle has an area of 48mm² and a height of 12mm. What is the length of the base?

6.   The area of the triangle is 72cm² and the base length of 6cm. What is its height?
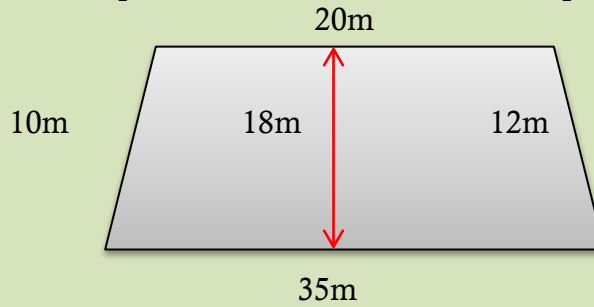
## AREA OF PARALLELOGRAM, TRAPEZIUM AND RHOMBUS

Exercise 3.1E

1.   a)
4cm

8cm

6cm

b)
8m

9m

12m

c)
10cm

8cm

d)
3cm

4cm   7cm   4cm

5cm

f)
5cm

2cm   2cm

5cm

g)
9m

10m   10m

9m

2. Fred the farmer had a piece of land shown in which he planted vegetables.
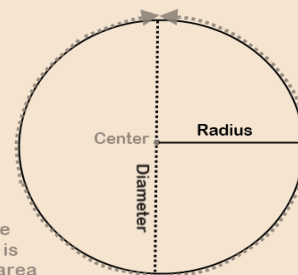
20m

10m   18m   12m

35m

i) Calculate the length of wire needed to fence the garden if he plans to put two layers of wire around the garden.

ii) What is the area of the vegetable garden?
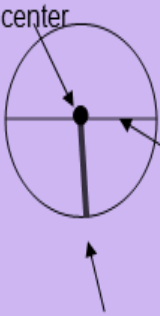
CIRCLES
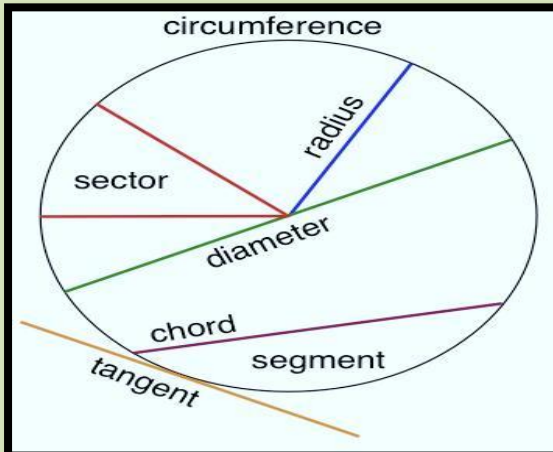
Parts of a Circle

Activity

1. Draw a circle with a diameter of 10cm and mark out the parts that are shown above. Use different colours to illustrate the different parts of the circle.
2. Draw a semi-circle and quadrant of the circle with the radius of 4cm. Shade each section with different colours.
3. How many semi-circles are there in a circle?
4. How many quadrants form a circle?
5. Which line touches a point on the circumference of the circle?
6. The line touching the inside circumference of the circle is called the _____
7. The part of the circle enclosed by two radii inside the circle is known as the

   _____
8. The distance around the circle is the _____
9. Which is the longest chord in the circle?
10. The _____ is the same as the perimeter of a rectangle.

CALCULATING THE CIRCUMFERENCE OF A CIRCLE
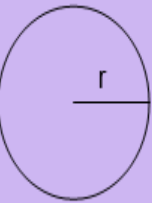
center $\pi = 3.14$

Diameter (the distance of any line segment that passes through the center of the circle and who's endpoints are on the circle.)

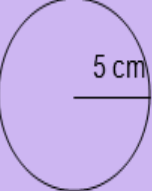Radius (the distance from the center of the circle to any point on the line.)

The radius multiplied by 2 is the same distance as the diameter.

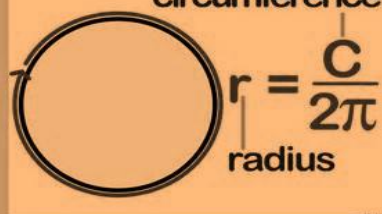The diameter divided by 2 is the same distance as the radius.

Circumference = $2\pi r$ OR
Circumference = πd

r

Example:

5 cm

Circumference = $2\pi r$
Circumference = $2\,(3.14)\,(5\ cm)$
Circumference = 31.4 cm

Calculate the radius and diameter

circumference

$r = \dfrac{c}{2\pi}$

radius

Example
The circumference is 154cm and the value of π is $\dfrac{22}{7}$
Calculate the radius of the circle

$$r = \dfrac{c}{2\pi}$$

$$= 154 \div \dfrac{22}{7}$$

$$= 154 \times \dfrac{7}{22}$$

$$= 49\text{cm}$$

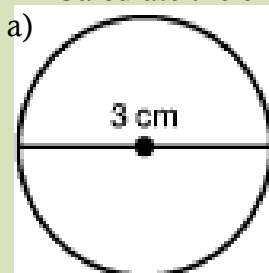If the radius is 49cm, the diameter will = 2r
$$= 2 \times 49$$
$$= 98\text{cm}$$

Exercise 3.1F
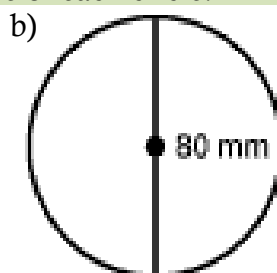1. Calculate the circumference of the following circles which have the following dimensions.
    a)   radius = 7cm   b)   radius = 28cm
    c)   diameter = 350mm   d)   diameter = 1.4m

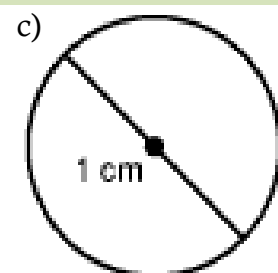2. Find the radius and diameter of the following circumference. Use any value of π
    a)   175cm   b)   468m
    c)   450km   d)   180km
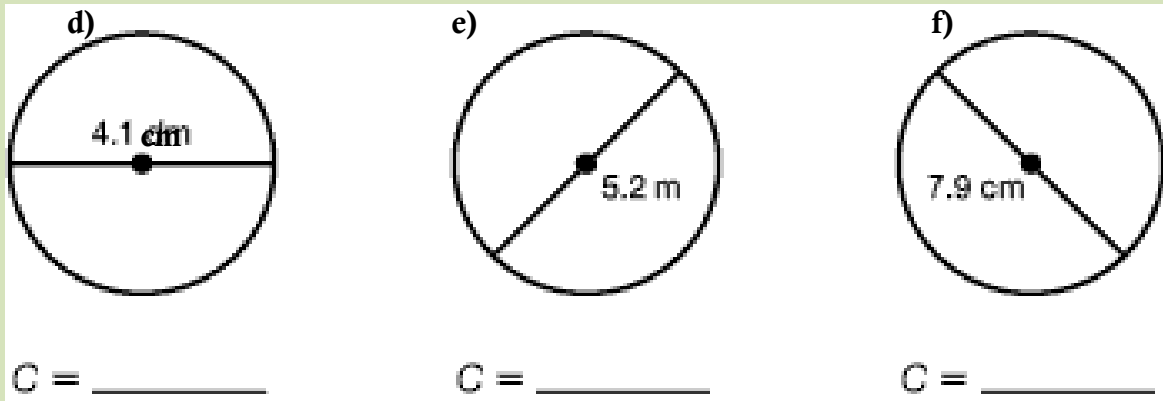
3. Calculate the circumference of each circle.

a)   3 cm

b)   80 mm

c)   1 cm

C = _____   C = _____   C = _____

d)

4.1 cm

C = _____

e)

5.2 m

C = _____

f)

7.9 cm

C = _____

AREA OF CIRCLES

To calculate the area of a circle we use the formula given.

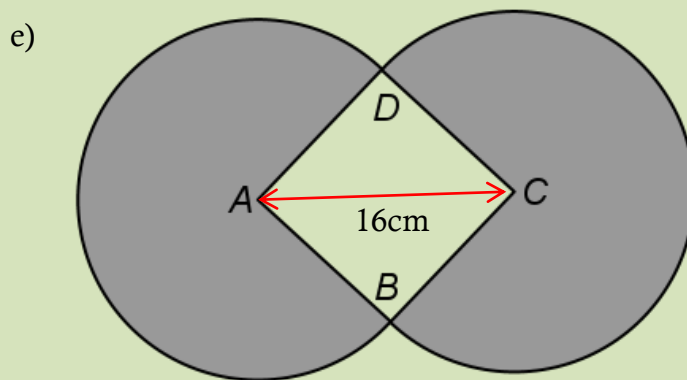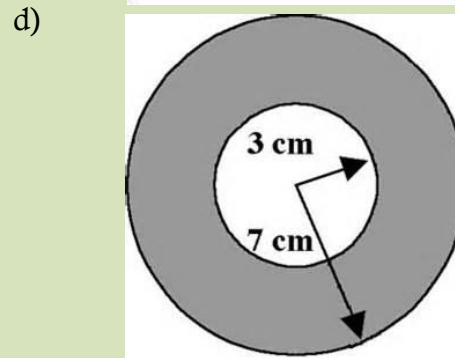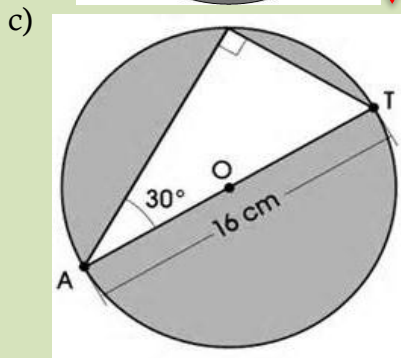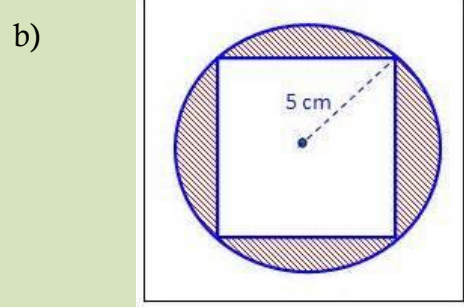| Area of Circle	Area of Sector
$A = \pi r^2$ $= (3.14)(5)^2$ $= (3.14)(25)$ cm² $= 78.5$	A = Area of one piece of Pizza 60° R = 10 cm We only have 60° out of the full 360° of the circle. This fraction is 60 / 360 This small piece of pizza part of the circle is called a "Minor Sector". 360° The full AREA inside a Circle is given by the formula: A = ∩ x R² where ∩ = 3.1416 A = 60 / 360 of a full circle A = 60/360 x (∩ x R x R) A = 0.1667 x (3.1416 x 10 x 10) A = 52.3 cm² ✓

Exercise 3.1G

Use π = **3.14** or **22** for the problems in this Exercise.
      7

1.   Find the area of the circles which have the following radii. **Use π = 22**
                                                                          7

   a)   7cm   b)   14cm   c)   42mm   d)   28m

2.   Complete the table below by
      i)   finding the radius or diameter
      ii)   calculating the area, using π as 3.14

3.

	Radius	Diameter	Area
1	5.6cm		
2		21cm	
3	9.5cm		
4		23mm	
5		17cm	

4.   Calculate the area of the shaded region.

a)

12cm

4cm

b)

5 cm

c)

30°

16 cm

T

O

A

d)

3 cm

7 cm

e)

D

A   C

16cm

B
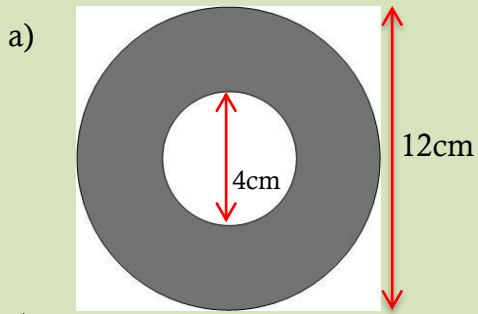
4.   Calculate the area of the shaded sectors shown below. The radii of each circle and the angles of the sector are given.

a)

t

C

14 m

135°

b)

5 cm

80°

c)   d)   f)
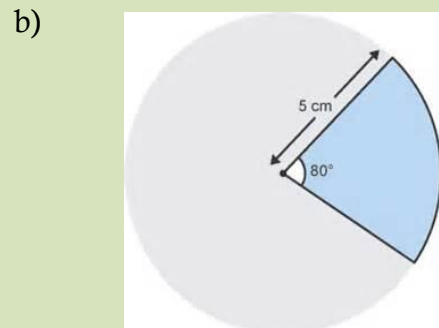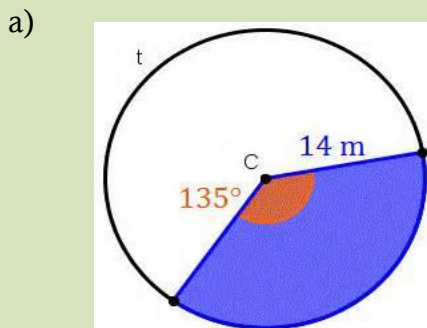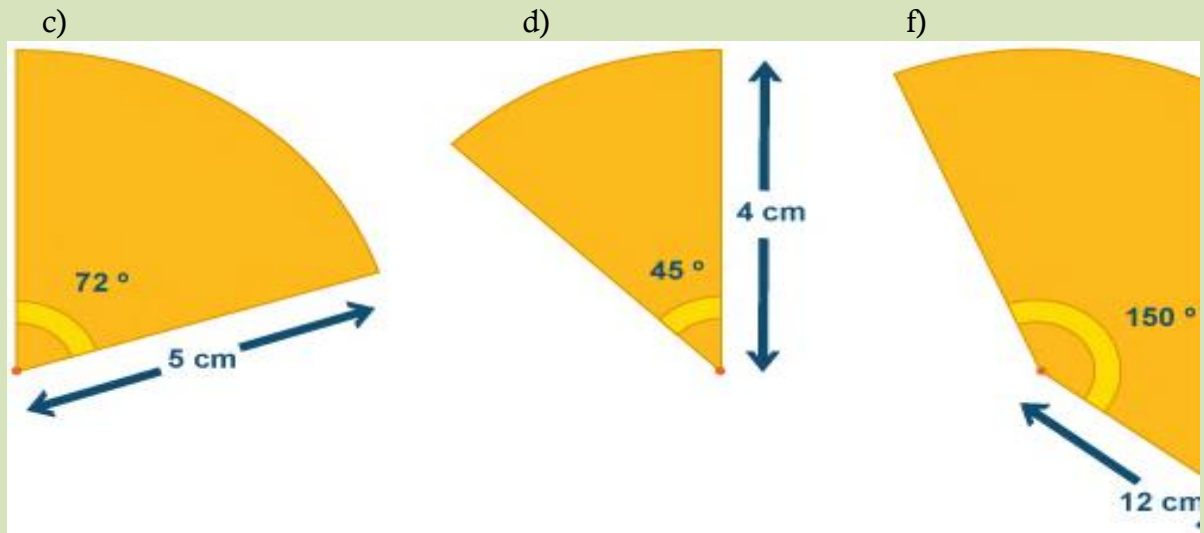
CONVERTING UNITS OF LENGTH

Achievement Indicator
- ❖ Round of length measure to any appropriate unit.
- ❖ Calculate and convert any length and distances to common and uncommon unit using basic mathematical formula

Exercise 3.1H

1.   Convert from larger to smaller unit indicated.

a)   8cm=_____mm   b)   634m=_____cm   c)   1237km=_____

d)   158m=_____mm e)   7540km=_____cm   f)   84km=_____mm

2.   Convert from smaller to larger unit indicated.

a)   10mm=_____cm   b)   24cm=_____ m   c)   302m=_____km

d)   532cm=_____km   e)   201mm=____m   f)   245mm=____km

3.   Complete the table.

mm	cm	m	km
5			
	56		
		78	
			9
	203		
		601	

4.   How many:

a)   cm in $1\frac{1}{2}$ m?   b)   cm in $4\frac{1}{4}$ m   c)   m in $2\frac{1}{4}$ km

d)   mm in $\frac{3}{4}$ m   e)   mm in $3\frac{4}{10}$ m   f)   cm in $6\frac{1}{2}$ km

5.   Arrange these measurements in order from shortest to longest.

a)   65m   6.5m   650mm   0.65km

b)   0.31km   3.1cm   3100mm   31m

c)   8500cm   8.50m   0.85km   850mm

d)   0.01km   10cm   0.100m   1000mm

6.   A cyclist rides three legs of a race, which measure 9.5km, 6.7km and 8.2km.
     What is the total length of the race in metres?

7.   I am 1.8m tall. My brother is 108cm tall. What is the difference in our height?

9.   Which total length is the longer, 8 pieces of timber each 1.2m long or 6 pieces of
     timber each 112cm long?

10. How many pieces of timber 30cm can be cut from a length of timber that is 4.2m
     long?

STRAND	M 3: MEASUREMENT
Sub-strand	M 3.2:Volume/Capacity

VOLUME OF RECTANGULAR PRISM

Achievement Indicator
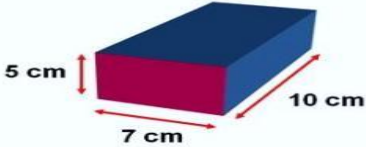
➢ *Express volumes and capacities using appropriate units and language of comparison*
➢ *Estimate, measure and compare capacities using standard unit*
➢ *Solve word problem in volume*

> **Volume is the amount of space an object occupies**

Volume of Rectangular Prism

$V = Area \times Height$

$V = L \times W \times H$

5 cm
10 cm
7 cm

$V = L \times W \times H$
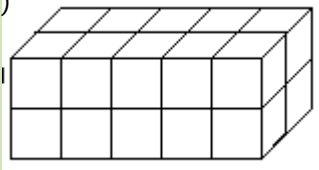
$V = 10 \times 7 \times 5$

$V = 350 \ cm^3$ ✓
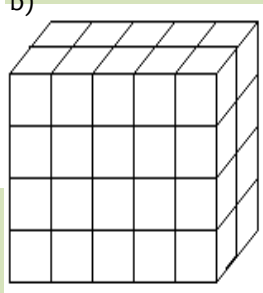
Exercise 3.2A

1.   Find the volume of each rectangular prism in cubic centimetres.
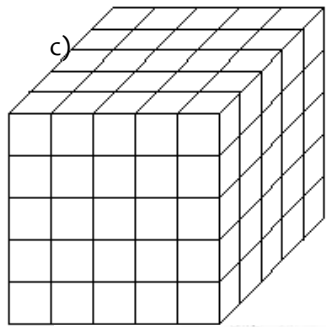
a)
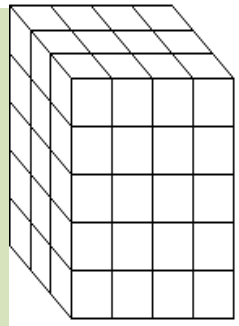
b)
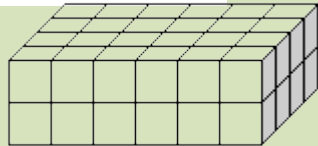
c)
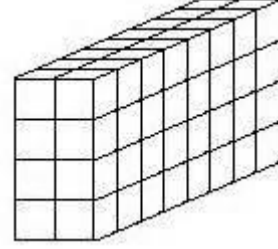
e)
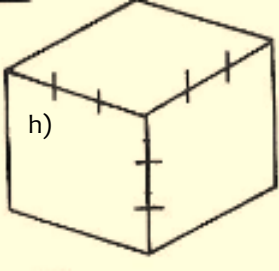
f)
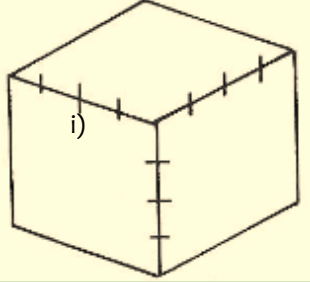
g)
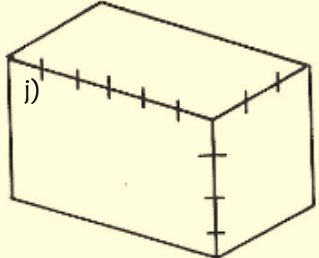
h)

i)

j)

2. If the volume of a cube is 1cm³, find the volume of a:
   a) a stick
   b) flat
   c) block

3. Find the volume of each set of Dienes blocks.
   a) 5 cubes, 4 sticks and 7 flats
   b) 9 flats, 1 block ,6 cubes and 1 cube
   c) 12 cubes, 7sticks, 1 block and 8 flats
   d) 19 cubes, 9sticks and 19flats
   e) 15 sticks, 15 cubes, 5 flat and 1 block

4. Complete
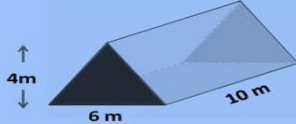
	Area of base	Length of base	Volume of prism
a	10 cm²	6cm	
b		12cm	180cm³
c	50cm²		450cm³
d		9cm	108cm³

5. Find the volume
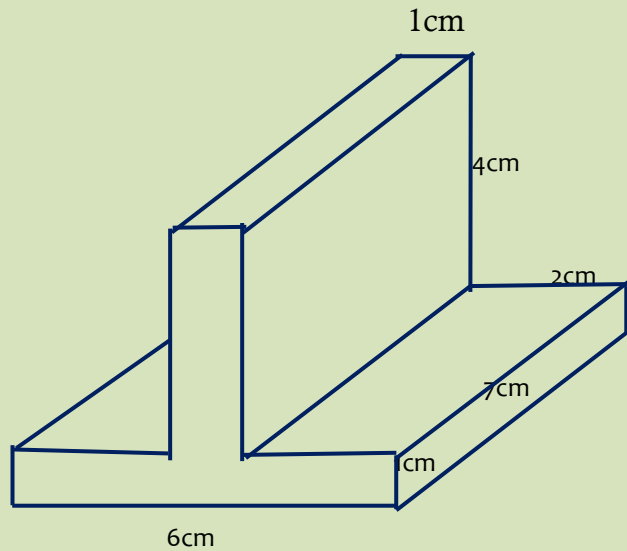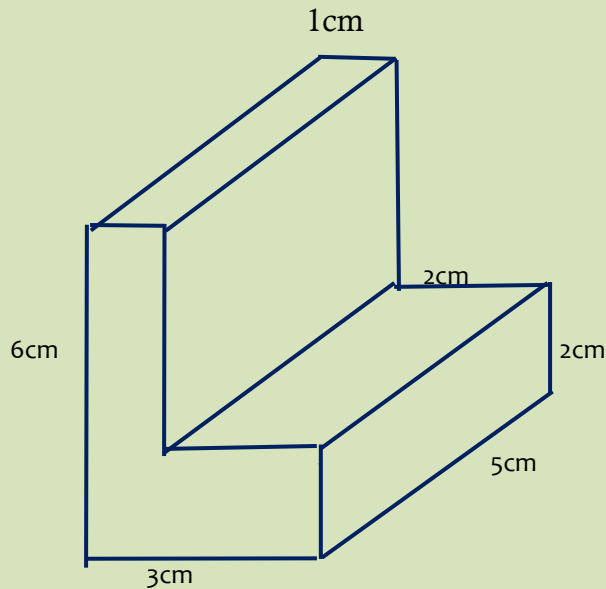
VOLUME OF TRIANGULAR PRISM

Triangular Prism - FORMULA

$V = ½ \times b \times h \times H$
or
$V = ½bhH$

4m
6 m
10 m

$V = ½ \times b \times h \times H$

$V = ½ \times 6 \times 4 \times 10$

$V = 120 \text{ m}^3$ ✓

Exercise 3.2B

a)
3 cm
8 cm
12 cm

b)
6 cm
7 cm
4 cm
12 cm

c)
10 cm
10 cm
25 cm

d)
9 cm
10 cm
8 cm
5 cm

e)
7 cm
7 cm
6 cm
2 cm
9 cm

f)
18 cm
9 cm
12 cm

g)
3 cm
5 cm
4 cm
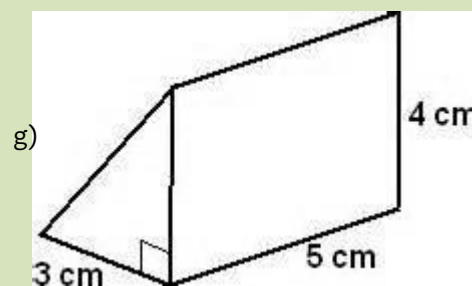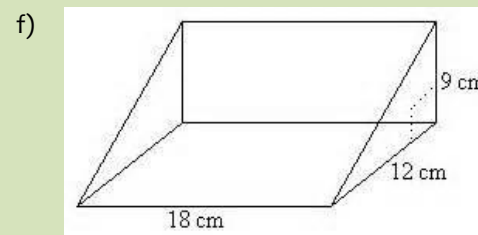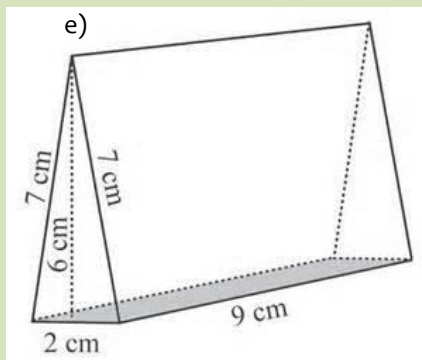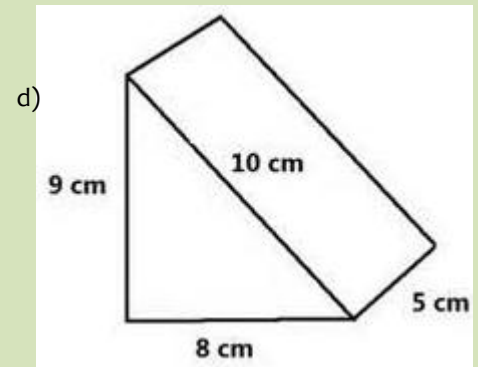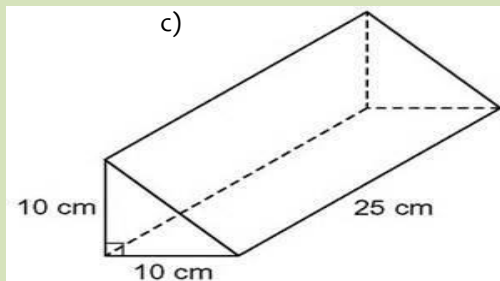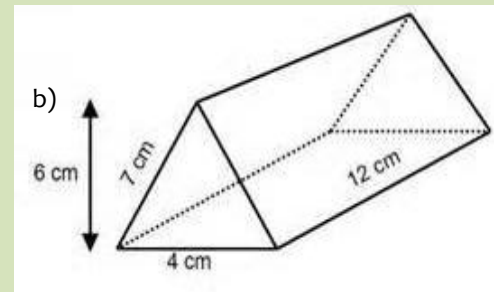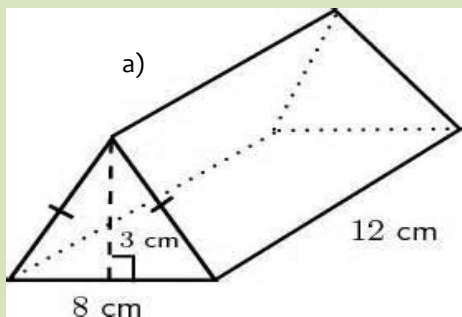
2.   Calculate the missing heights area of bases and volumes:

	Area of base (A)	Height (h)	Volume of triangular prism (V)
a	18cm²	4cm	
b	24cm²		96cm³
c		0.1m	120cm³
d	0.5m²	30cm	

3.   a)   Volume = 120cm³

6cm

5cm

b)   Volume = 210cm³

y

20cm

7cm
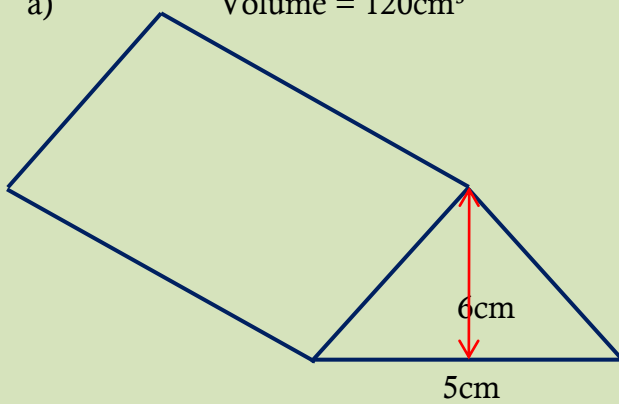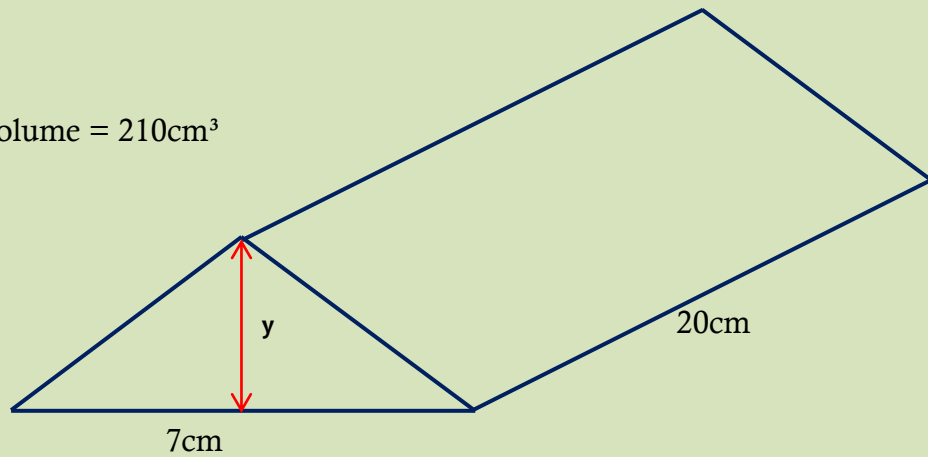
4.   Which of these triangular prisms has a greater volume?

Prism 1: base 10cm, height 12cm and Height 14cm
Prism 2: base 15cm, height 13cm and 11cm

CAPACITY

Capacity is the amount of a liquid a container can hold or it is the volume of liquids
The basic unit in the metric system for capacity is litre (L)

```
1 Litre   = 100 Centilitres ( cl )
          = 1000 millilitres ( ml )
          = 1000 cubic centimetres ( cm³ )

1 Cubic Metre (m³)  = 1000 Litres
1 centilitre  ( cl ) = 10 mililitres ( ml )

1 ml = 1 cm³
```

Exercise 3.2C

1. How many millilitres would there be in:

   a)   2L   b)   6.7L   c)   49L

   d)   0.6L   e) $\frac{1}{2}$ L   f) $\frac{1}{4}$ L

2. How many litres would there be in:

   a)   5000mL   b)   10 000mL   c)   2500mL

   d)   150mL   e)   490mL   f)   10mL

4. Which measure of capacity, 50mL, 500mL, or 50L would be mostly likely for:
   a)   a bottle of soft drink?
   b)   the petrol tank of a car?
   c)   a medicine glass?

5. The capacity of a cup of tea would be closest to 25mL, 250mL or 2500mL?

6. How many 200mL cup could be filled completely from a 3Litre kettle?

7. How many 375mL cans of drink do I have to buy to have a least 1.5Litres of drink?

8. A leaking tap loses 1mL of water every 10seconds. How much water would be lost in:
   a)   1minute?
   b)   10 minutes?
   c)   1 hour?
   d)   1 day?
   e)   1 week?
   f)   1 year?

CONVERTING UNITS OF CAPACITY

To convert from liters to milliliters multiply by 1000.

9.25 liters = 9250mL

0.25 liters = 250mL

2 liters = 2000mL

4 liters = 4000mL

3000mL   450mL

3.45 liters = 3450mL

To convert from milliliters to liters divide by 1000.

9250ml = 9.25L

250ml = 0.25L

2000ml = 2L

4000ml = 2L

3.4 5 0 ml

When dividing by 1000 place a decimal point 3 places from the end.

= 3.45L

Exercise 3.2D

1. Which unit would be used to measure the capacity of the following containers?

   a) tablespoon   b) water tank

   c) soft drink bottle   d) petrol in a car

   e) cup of tea   f) juice in a jar

2. Convert each of the following to the unit given

   a) 7500mL   (L)   b) 5.65L   (mL)

   c) 15L   (cm³)   d) $7\frac{1}{2}$ L   (mL)

   e) 6721cm³   (L)   f) 0.601L   (cm³)

3. Find the total of the quantities below, giving your answers in the units given in brackets.

   a) 4.6L + 7.55L   (mL) b) 74L + 3500mL   (L)

   c) 12.7L + 550cm³   (cm³) d) 30L + 21 300mL   (mL)

   e) 2.4L + 12.765L + 450mL (L)   e) 26 000cm³ + 1320mL (cm³)

4. How many $\frac{1}{2}$ litre jar would be needed to fill up a

   a) 5 litre bucket   b) 2.5 ice cream container
   c) 10 000ml container   d) 1 000cm³ kettle
   e) 1200ml bottle

STRAND	M 3: MEASUREMENT
Sub-strand	M 3.3:Weight

ESTIMATING WEIGHT

Achievement Indicator

   ❖ **Estimate, Measure, read and state the weight of objects using standard and non-standard units**
   ❖ **Use any operation on weight calculation in any context**
   ❖ **Solve real life problems related to weight[s]**

Units of Weight –Kilogram(kg) and grams(g)

1000g = 1kg

Exercise 3.3A

1.   i)   Draw up a table choose 5 of your friends and write down your estimation on their weights including yourself.

   ii)   Measure your actual weights and record the reading as shown on the scale.

Name	Estimated Weight	Actual Weight	Error in Estimation

   i)   Who is the heaviest student in the group or class?
   ii)   Who is the lightest student in the class?
   iii)   What is average weight of the group or class?

2.   i)   Draw up another table and write your estimation on the heights of your
            friends including yourself.
      ii)   Measure your heights and record the reading as shown on the scale.

Name	Estimated Height	Actual Height	Error in Estimation

      i)   Who is the tallest student in the group or class?
      ii)   Who is the shortest student in the class?
      iii) What is average weight of the group or class?

Exercise 3.3 B
1.   Convert the following weights to kilogram and grams?
      a)   1 001g   e)   83 021g
      b)   6 015g   h)   40 000g
      c)   21 200g   i)   83 176g
      d)   30g   j)   765g

2.   Find the total of the quantities below, giving your answers in the units given in
      brackets.

      a)   3.4kg + 651g   (g)   b)   31g + 2 318g   (kg)

      c)   1.9kg + 5.50kg   (g)   d)   60kg + 6 3910g   (kg)

      e)   9.8kg + 12.765kg + 450g (kg)   e)   4702g + 1.904kg   (g)

3.   Mr. Josefa weighs 86kg and his eldest daughter weighs 43.75kg. What is the
      difference in their weight?

4.   Mrs. Roko bought 10kg of sugar. She used ¼ of it to make cake, $\underline{1}$ to make juice.
                                                                        5
      a)   Calculate the amount of sugar used to make cake.

      b)   What amount of sugar was used to make juice?

      c)   How much sugar was left?

5.   Jope picked 720 kg of tomatoes from his farm. He sold two thirds of it to the
      market and packed the remainder in boxes to be sold in the supermarket. Find out
      the weight of each box.

STRAND	M 3: MEASUREMENT
Sub-strand	M 3.4:Time

ANALOGUE AND DIGITAL CLOCK

Achievement Indicator
   ❖ *Read and write analogue, digital time and 24 hour clock times .*

The clock uses the positions of the hands to describe the time – the clock is an analog that describes the time of day. A digital clock uses numbers, not hands, to describe the time.

   60 min = 1 hour   **60s = 1 min**   **24hours in a day**

Exercise 3.4A

1.   **Show time shown below in analogue form.**

a)   b)   c)   d)

3:30   11:15   7:45   9:45

2.   **Write the following time in digital form.**

a)   b)   c)   d)

3.   Complete the following.

     a)   2h = _____min   b)   3 min =_____ s   c)   180min =_____h

     d) $\frac{1}{4}$ h =_____   e)   15 s=_____min   f)   48 h =_____day

4.   How many :

     i)   seconds in an hour? ii)   minutes in a day?   iii)   hours in a week?

5.   If Jope works 42 hours in a week, calculate

     a)   the number of hours of work for each day.

     b)   the number of hours in a week he is not at work.

12 AND 24 HOUR TIME.

Normally the time is shown as **Hours:Minutes**. There are 24 Hours in a Day and 60 Minutes in each Hour. Example: **10:25** means 10 Hours and 25 Minutes
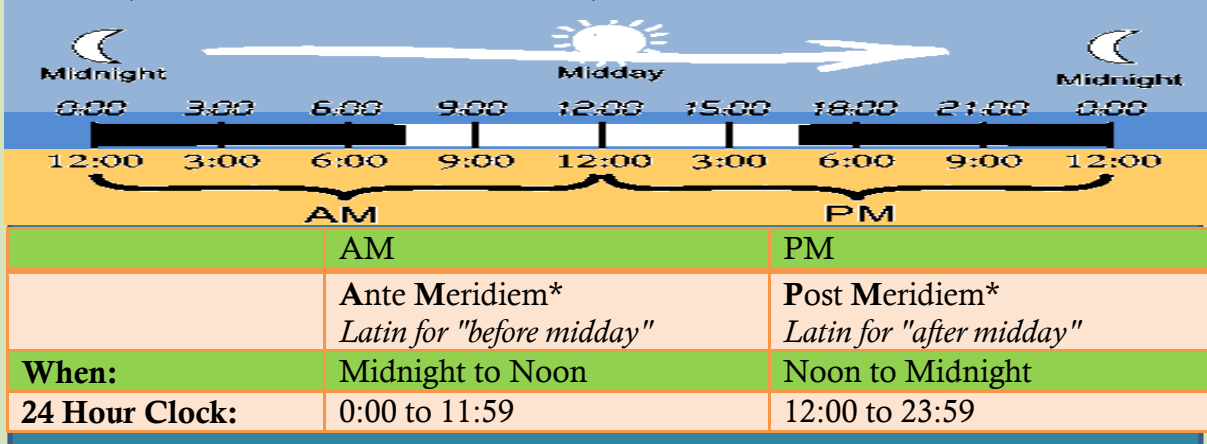
Showing the Time

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). Like this (24-hour above and AM/PM below it):

	AM	PM
	Ante Meridiem* *Latin for "before midday"*	Post Meridiem* *Latin for "after midday"*
When:	Midnight to Noon	Noon to Midnight
24 Hour Clock:	0:00 to 11:59	12:00 to 23:59

Exercise 3.4B

1.   The following are written in 24-hour time. Rewrite these times in standard 24 hour time, indicating whether they are am or pm.

     a)   0420   b)   1030   c)   1310

     d)   2240   e)   0959   d)   2324

     e)   00:20   f)   14:43   g)   11:01

2.   Write these times as they would appear on a 24-hour clock.

     a)   5:20am   b)   10:50am

     c)   3:19pm   d)   9:20pm

     e)   half past 2 in the morning   f)   10 past 5 in the afternoon

     g)   a quarter to 3 in the morning   h)   12 noon

3.   Change the following time to 12 or 24 hour time.

Program	Time Settings
10:30pm to 11:30pm	22:30 to _____
9:15am to 10:45am	_____ to _____
7:45pm to 9:10 pm	_____ to _____
_____ to _____	05:30 to 06:40
_____ to _____	12:00 to 14:30
_____ to _____	17:55 to 23: 13

OPERATING WITH TIME

Examples.

I spent 2 h to 40min studying on Monday, 1h 45 min on Tuesday and 3h 25min on Friday. How long did I study altogether?

        2 h   40 min
        1 h   45 min
        3 h   25 min
        1................
        6 h   50min

    40min + 45min + 25min

    110 min = 1 h   50min

Sisilia rented a boat for 7 ½ hours. I used it for 2h 35 min. How much is left for the boat to returned ?

                5   90
              7 hr   30min
        −   2hr   35min
        −   3hr   55min

Trade 1 hour for 60 minutes then subtract

Exercise 3.4C

1.   Add these times together, expressing each answer in hours and minutes.
a)   3 h   10 min + 1hr   20min   b)   5 h   50 min + 2hr   30 min
c)   5 h   34 min + 4 h   27min   d)   6 h   45 min + 8hr   39 min

2.   Subtract these times
a)   6 h   40 min − 4h   30 min   b)   4 h   10 min − 4h   20 min
c)   7 h   35 min − 3h   25 min   d)   4 h   10 min − 4h   20 min
e)   8 h   03min − 4 h 47 min   f)   10 h   13min − 5 h 39 min

3.   Calculate the difference between each pair of time
      a)   5.00 am,   8 am   b)   6.30 am,   11.45 am
      c)   8.15 am,   2.40 pm   d)   2.17 am,   8.54 am
      e)   4.24am,   6.50 pm   f)   8.35 pm,   3.30 am

4.   What is the length of time in hours and minutes, from:
      a)   6.00 am on Sunday to 10.am on Monday?
      b)   2.20 pm on Tuesday to 9.00am on Wednesday?
      c)   10.30 am on Friday to 8.00pm on Saturday?
      d)   3.45 pm on Thursday to 6.55 pm on Saturday?
      e)   10.00am on Monday to 10.pm on Thursday?

5.   What the time that is :
      a)   1 ½ hours after 5.30 pm?
      b)   3 ¼ hours before 9.00am?
      c)   3 h 45 min after a quarter past 7 in the evening?
      d)   8 h 25 min before 10 in the morning?
      e)   3 ¾ min after 20 past 3 in the morning

THE CALENDAR

Achievement Indicator

❖ *Interpret and use a calendar information effectively*

1 year = the time taken for the Earth to revolve (ie travel) once around the sun

1 year = 365 days

1 leap year =366 days

1 day = the time taken for the Earth to rotate once on its axis

24 hours = 1 day

JULY 2014

S		7	14	21	28
M		8	15	22	29
T	1	9	16	23	30
W	2	10	17	24	31
T	3	11	18	25	
F	4	12	19	26	
S	5	13	20	27	

Group Discussion

In this activity, you will need to study the calendar given above. You can also study a year calendar of your choice to answer the questions provided.

Discuss the questions below in your group and record your answers.
a)   Why are calendars important to us?
b)   Name some of the important information that a calendar can provide to us.
c)   What is a leap year?
d)   How many:
   a)   days in most years?   b)   days in a leap year?
   c)   months in a year?   d)   complete weeks in a year?
   e)   days in a week?   f)   weeks in a fortnight?
   g)   days in a fortnight?   h)   complete fortnight in a year?
   i)   years in a decade?   j)   years in a century?

Exercise 3.4D

1.   How many days are there in a leap year?
2.   Which of these years are leap years?
      i)   1964   ii)   1976   iii)   1982
      iv)   1990   v)   2004

3.   i)   If 1996 is a leap year, which other years will be leap years before the year
              2020?
      ii)   What major sporting event takes place in every leap year?

3.   All these words have something in common: *decimal, decade, and decagon*.

4.   What was 2 decades ago?

5.   What does these do these words mean?
      i)   Annual   ii)   Century   iii)   Millennium

6.   After how many years will there be a:
      i)Silver jubilee   ii)   Golden Jubilee   iii)Diamond jubilee

7.   In which century are we living in at the moment?

8.   Copy and complete the following table for a normal year and answer the
      questions.

Month	Days	Month	Days	Month	Days
January		May		September	
February		June		October	
March		July		November	
April		August		December	

      a)   How many months have 31 days?
      b)   How many months have 30 days?
      c)   Where is the extra day added in a leap year?

9.   It is important to be able calculate using the calendar. Work out these problems.
      a)   If today's date is 5 September, what will be the date:
              i) in one week's time?   ii) in 3 weeks' time?   iii)   in 5 weeks' time?
      b)   How many weeks are there between 7 July and 21 August?
      c)   Janaelle's birthday is on 9 September. How many days before   Christmas
              is this?
      d)   What will be the date 3 weeks after Fiji Day?
      e)   If my birthday is in 2014 fell on Thursday, on what day of the week
              will my birthday   fall in:
      i)   2015   ii)   2020   iii)   2023

TIMETABLES

Achievement Indicator
- ❖ *Design personal timetable for a week*

Exercise 3.4E
1.   Draw up your personal timetable for a day using the table below.

Time	Activity

      a)   Which activity uses: i)   most of the time?
                                      ii)   the least time?

      b)   How much time is spent : i)   in sleeping?
                                       ii)   at school?
                                       iii) for leisure?
                                       iv) studying?

2.   Here is a timetable for Ro Camaisala Memorial School.

8.00	Duties
8.15	Moral Values
8.30	Reading Time
9.00	Lessons Start
10.30	Recess
10.45	Lessons
12.00	Lunch
12.50	Toothbrush
1.00	Lessons
3.00	Lessons finish

a)   How long are the duties and Moral Values?

b)   How long is the lunch break?

c)   How much time is spent on reading in a week?

d)   How much time is used for toothbrush in a week?

e)   How long is the school day?

3.   Here is a part of a morning Fiji One TV Programme.

Time	Monday 22/09/2014
5:00	Get Set ®
6:00	Breakfast @ Fiji One
7:00	EPL 2014 – Arsenal vs Aston Villa ®
9:00	ABC News Breakfast
9:30	Brandstar Shop on TV
10:00	Brandstar Shop on TV
10:30	Breakfast @ Fiji One ®
11:30	Korean Drama – Its all about my Family (Double Episodes)
13:30	Glee ®
14:00	Fiji One News Update
14:02	Glee ®
14:30	I Dream of Jeannie (G)

3.   a)   On which day is the TV program given above shown on Fiji One?

    b)   How long are the following sessions?

        i)   Get Set   ii)   ABC News break   iii)   Korean Drama

4.   If you want to watch the following program, at which time should you switch on you TV using 12 hour time?

        i)   EPL 2014

        ii)   Fiji One News Update

5.   Mrs. Chand watches ABC Breakfast New every day except on Sunday. How long   does it take her to watch the program in a week?

6.   If Kaur watches Korean Drama every day of the week, how long does it take her to watch the movie in a week?

7.   Calculate the amount of time from Get Set to I Dream of Jeannie as shown in the TV program.

8.   Which radio/TV program do you like the most?

    a)   How long is the program?
    b)   How much time do you spend watching the program in
        i)   a week?
        ii)   a fortnight?
        iii)   a month?

SPEED, TIME AND DISTANCE

Achievement Indicator
   ❖ *Calculate speed, time and distance*

Formula

$$Speed = \frac{Distance}{Time}$$

$$Distance = Speed \times Time$$

$$Time = \frac{Distance}{Speed}$$

Distance = Speed x Time

Example
The distance from Suva to Sigatoka is 120km. It took a car 2 hour travel the distance. What is the average of the car?

Distance $=$ 120km

Time $=$ 2 hours

Speed $= \dfrac{distance}{time}$

$= \dfrac{120}{2}$

$=$ 60km/hour

Exercise 3.4F

1.   Copy and complete the table.

Time taken	2 hr	5 hr		$\frac{1}{2}$ hr		$1\frac{1}{2}$ hr
Distance Travelled	100		420km		1200km	150km
Sped in km/h		80km/h	35km/h	70km	100km/h	

2.   The distance from Suva to Lautoka through Kings Road is 280km. A Sunbeam bus takes 4 hours to   cover the distance. At what speed is the bus travelling?

3.   An express bus travels at 80km/h. How long will it take to travel 480 km?

5.   A Fiji Airways plane travels leaves Nadi at 7.00am and reaches Brisbane at 10.00am. It travels at a speed of 300 km per hour. What is total distance travelled by the plane.

6.   In the recent Chow Athletics meet, Martin ran 100m in 8 seconds. At this speed how far will it take him to run:
   i)   50 m?   ii)   200m?   iii)   20m?   iv)   1km?

7. **Research Activity**

Do a research on the interesting speeds given below.

	Speed
Fastest man in the world	
Fastest woman in the world	
Fastest airplane	
Fastest ship	
Speed of sound	
Speed of light	
Fastest female Paralympic	
Fastest male Paralympic	

SCALE AND DISTANCE

Achievement Indicator
   ❖ *Calculating distance using scale on a map*

Exercise 2.4G

Scale: 1cm : 2km
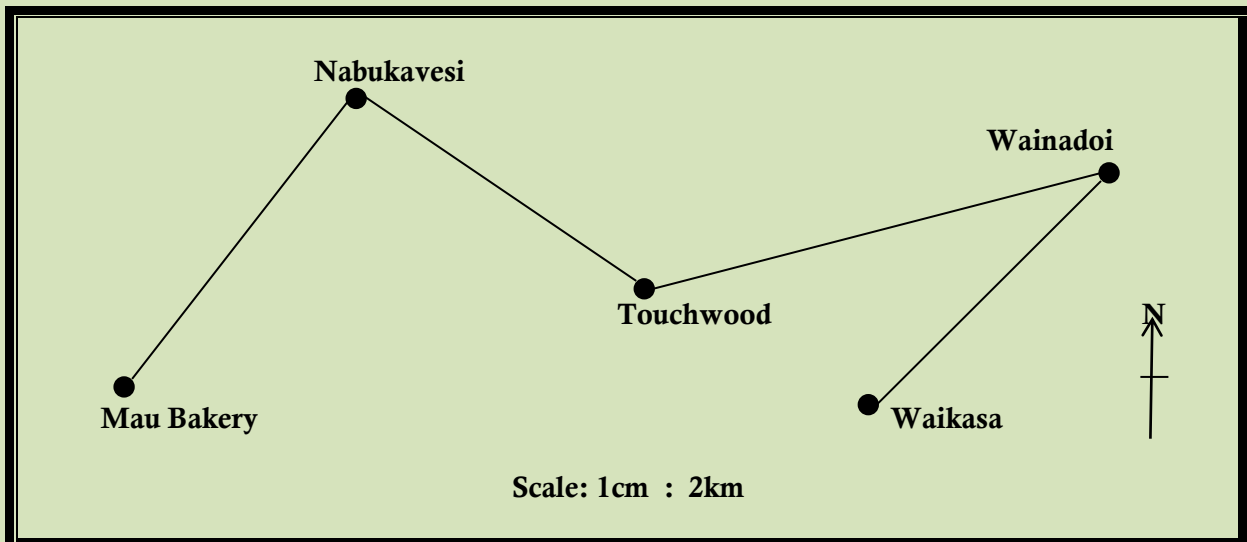
1. A delivery van from Mau Bakery delivers bread to all the villages in the area in the morning. The villages receive bread every day before the van returns to Mau.

   Find the distance the delivery van travels:

   a)   every day   ii)   every week   iii)   every month

2.

Scale 1 cm : 20 m
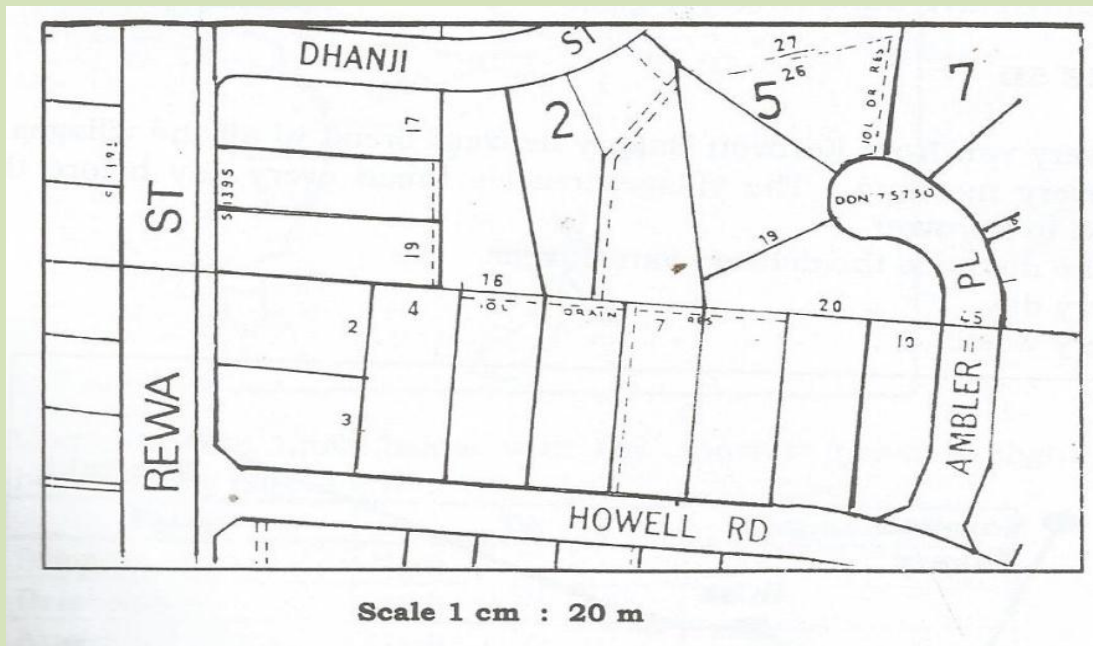
a) Find plot 4. What is the length and width of this plot?
b) Find the actual length of Howell Road from the junction of Rewa Street to Ambler Place.
c) What is the width of Rewa Street?

3. The route travelled by Northern Airways is given in the map of Fiji given below. Use the scale on the map to find the distance between each destination.

Scale: 1 cm : 20 km
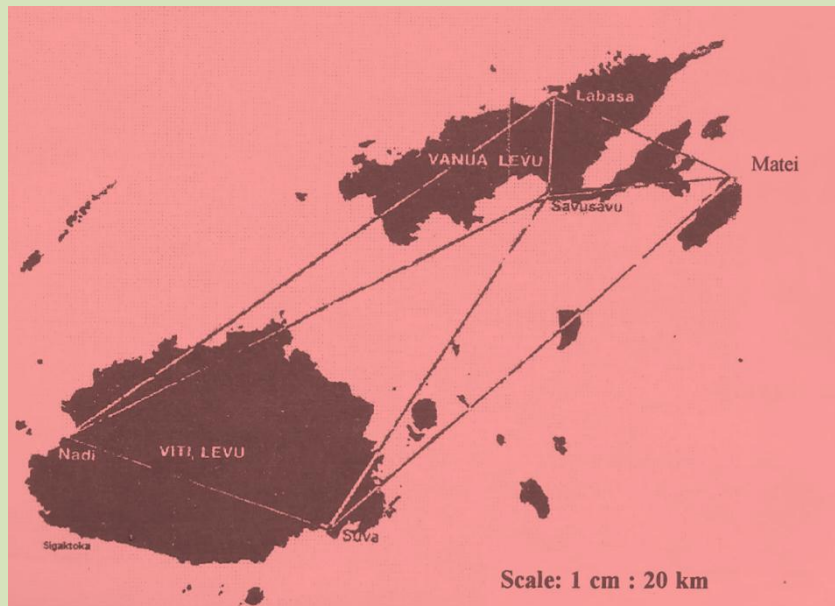
a) What is the distance in cm from Nadi to Suva on the map?
b) Using the scale, what would be the actual distance?
2. Fill this table to show the distances in km by air between airports.

From	To	Distance in cm on the map	Actual distance in km
Suva	Savusavu		
Suva	Labasa		
Savusavu	Labasa		
Labasa	Matei		
Matei	Suva		
Labasa	Nadi		
Nadi	Savusavu		

3.   Use this map to answer question 3

Scale 1cm : 430km
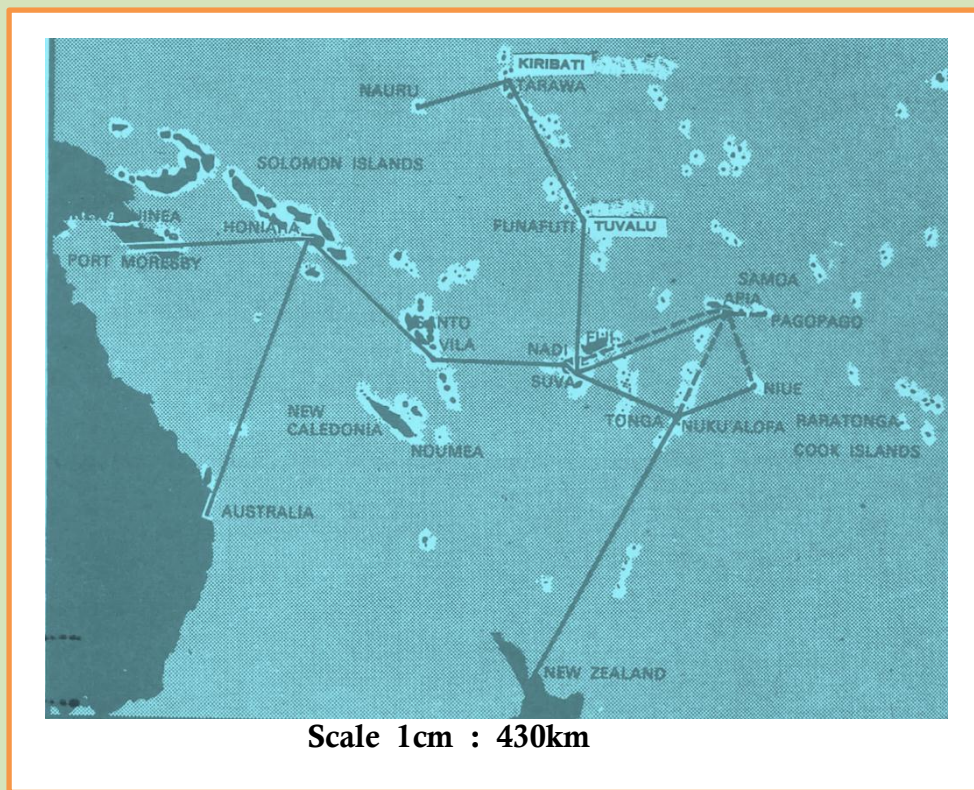
Copy this table in your book and complete it by writing the distance between cities on the map and the actual distance.

From	To	Distance in cm on the map	Actual distance in km
Suva	Nukualofa		
Nadi	Vila		
Vila	Honiara		
Honiara	Port Moresby		

STRAND	M 3: MEASUREMENT
Sub-strand	M 3.5: Money

FRACTIONS AND DECIMALS OF MONEY

Achievement Indicator
  ❖ *Calculate fractions and decimals of money.*

Example 1: What is $\frac{1}{4}$ of $1.00

$$\frac{1}{4} \times \frac{100}{1} = \frac{100}{4}$$
$$= \$0.25$$

Example 2: What is 0.25 of $2.00?

$$0.25 \times \$2.00$$
$$= 0.25 \times 200$$
$$= \$0.50$$

Exercise 3.5A

1.   Convert the following fraction to dollars and cents.
   a) $\frac{1}{2}$ of $12   b) $\frac{2}{8}$ of $60   c) $\frac{3}{5}$ of $1200

   d) $\frac{1}{4}$ of $45   e) $\frac{1}{3}$ of $6500 f) $\frac{1}{20}$ of $12500

2.   Change the following decimal number to dollars and cents.
   a)   0.25 of a dollar   b)   0.75 of $5.00 c)   0.6 of $60
   d)   0.125 of $200   e)   0.05 of $450 f)   0.15 0f $1200

3.   Mr Tekita won a lottery of $10,000 in a Fiji Tatslotto game. He decided to share
      the money to his family members. He gave one quarter of the money to his
      brother and one eighth to his sister. He deposited half of the money in his savings
      account and the rest was used for the repairing of his house.

   a)   Calculate :
      i)   the amount of money given to his brother and
      ii)   sister.
      iii)   repairing his car
      iv)   the amount deposited in his savings account.

4.   During the school bazaar, the parents raised $50 000. The money had been
      distributed according as shown in table given below.

Schools Needs	Allocation
School Maintenance	0.3
New Photocopier	0.1
New Computers	0.2
New Classroom	o.4

      Find the amount of money allocated for each of the school needs given above.

5.   Mrs Chand had $3000 in her savings account. She decided to use the money.
      Two fifths of the money would be used to pay for her air fare to New Zealand

during the holidays. She would use 0.25 of the money on her husband birthday while ¼ of it will be used to paint their home before Diwali. The rest of the money will be used to buy to buy some groceries for the orphanage.

a)   How much money would be used:
   i)   to pay for her fare to New Zealand?
   ii)   for her husband's birthday?
   iii)   to paint their home?
   iv)   to buy groceries for the orphanage?

USING PERCENTAGE

Achievement Indicator
   ❖ *Express a quantity as a percentage of another*.

To write one quantity as a percentage of another:
Make sure the two quantities are in the same units.
Write the first a fraction of the second.
Change the fraction to a percentage by multiplying by $\frac{100}{1}$

Example: I have $20 in my pocket. My wallet contains $100. What percentage of money is in my pocket?

Fraction $= \frac{\$20}{\$100} = \frac{2}{10} = \frac{1}{5}$

Percentage $= \frac{1}{5} \times \frac{100}{1}$ 20 $=20\%$

Therefore 20% of the money was in pocket.

Exercise 5.5B

1.   a)   Express 10cents as a percentage of $1
      b)   What percentage of $40 is $20?
      c)   What percentage of $600 is $30?
      d)   Express 25 cents as a percentage of $1.50
      e)   What percentage of $5000 is $400?

2.   What percentage is
      a)   50cents of 500cents?   b) $40 of $1000
      c) $100 of $20 000   d) $250 of $800
      e) $150 of $3000   f) $75 of $7500

3.   a)   I have $400 in one of my BSP savings account. My total savings is $2000. What percentage of my savings is in the BSP account?
      b)   Mrs Roko collected $2400 in a bazaar. The total money collected after the bazaar was $6000. Calculate Mrs Roko's collection during the bazaar.

4. During the Annual School Bazaar, Year 1 collected $1000, Year 4 collected $1500, Year 6 collected $2500 and Year 8 collected $3000. What percentage of the money was collected by
      a) Year 8   b) Year 6
      c) Year 4   d) Year 1

INTERESTS

Achievement Indicator
- ❖ *Calculate Bank lending or bank saving, interests rates for each bank/lending institutions.*

What is interest? Simple interest is money you can earn by initially investing some money (the principal).

Simple Interest Formula

$$I = \frac{P \times R \times T}{100}$$

Where:
I = the Interest Money created in dollars
P = the "Principal" starting amount of money
R = the Interest Rate per year (in decimal form)
T = the Time the money is Invested, or Borrowed, in Years

Example

Janice deposited $200 at the rate of 10% for 2 years.
P = $200
R = 10%
T = 2 years
I = ????

$$I = \frac{P \times R \times T}{100}$$

$$I = \frac{200 \times 10 \times 2}{100}$$

$$= \$40$$

Exercise 2.5C

1. Calculate the interest.
      a) 10% for 1 year on $100   b) 5% for 2 years on $50
      c) 2% for 3 years on $500   d) 15% for 1 year 6 months on $1500
      e) 7.5 % for 6 months on $40000   f) 12.5% for 9 months on $24000

2. The table below shows the interest rate offered by HFC Bank.

Interest Rates for Term Deposits

3months	2.75%
6months	3.5%
9months	4%
12months	5%
24months	7.25%
36months	8.5%
48months	9.75%

a) Calculate the interest if $5000 is deposited in the bank for:
      i) 1 year   ii) 3 years iii) 6 months
b) How much interest would the bank pay if $1500 was deposited for:

i)   2years   ii)   3 months   iii)   9 months

Which ones earns more simple interest? Why?

3.   Janaelle deposited $240 in her savings account for 4years. The bank pays an interest of 2.5 % per annum. How much interest would she get?

4.   Roela took a loan of $10,000 from the bank to build buy a new car. She has been given 5 years to pay the loan at the rate of 15% per annum. How much interest will she pay back?

5.   Maciu puts $6 500 in her savings account at the bank on 20th November 2012 and plans to withdraw the money on 20th November 2016. Work out the   interest he will earn of the interest rate is 8.5% per annum?

Calculating the Amount

The amount is the total sum of money you receive or pay back to the bank after a period of time so the interest is added to the principal to give us the amount

$$\textbf{Amount} = \textbf{Principal} + \textbf{Interest}$$
$$\textbf{or} = \textbf{P} + \textbf{I}$$

Example: Find the interest and the amount you have to pay back on a loan of $300 for 1year at a rate of 3% per annum?

$$I = \frac{P \times R \times T}{100}$$

$$= \frac{300 \times 3 \times 1}{100}$$

$$= \$6$$

So the Amount   =   P   +   I
                        = $300   + $6
                        = $306

Exercise 3.5D

1.   Find the Interest and Amount for:
        a) $200 for 1 year at 5% per annum.
        b) $700 for 3 year at 9% per annum.
        c) $850 for 24 months at 7.5% per annum.
        d) $900 for 6 months at 6% per annum.
        e) $2000 for 9 months at 5.5% per annum.

2.   Calculate the amount that has to be a paid back to the bank for each of these loans.
        a) $700 for 1 year at 4% per annum.
        b) $1200 for 2 ½ years at 7.25% per annum.
        c) $20 000 for 5 years at 14% per annum.
        d) $15 000 for 8 months at 10% per annum.
        e) $240 000 for 4years at 19% per annum.

3.   Complete the table below.

Principal	Interest Rate	Interest (12 months)	Amount(P + I)
$100	2%		
$150	2.5%		
$2500	7.5%		
$7550	9.5%		

4.   Antonio borrowed $1500 from a bank for 18 months at a rate of 12.5% per annum.
      a)   What interest did he pay back to the bank after 18 months?
      b)   How much did he pay back at the end of the loan period?

5.   Mrs Tawake had $750 in a Fixed Deposit Account in a bank for 2 years. The bank is offering a 12 ½ % interest per annum. What amount would she get in her account after 2 years?

CALCULATE THE PROFIT AND LOSS PERCENTAGE

Achievement Indicator
   ❖ *Financial obligations from the credit and implications of getting into debt*
   ❖ *Calculate the profit and loss percentage or actual amount*

Profit and Loss Percentage:
Profit and loss are usually expressed as percentages.

$$\text{Profit} = \frac{S.P - C.P}{C.P} \times 100\%$$

$$\text{Loss} = \frac{C.P - S.P}{C.P} \times 100\%$$

Exercise 3.5E

1.   Complete whether a profit or loss is made in each case.

	Cost Price	Selling Price	Profit or Loss	Amount of profit or loss
a	$2.00	$3.00		
b	$25.00	$24.00		
c	$152.00	$162.00		
d	$1240.00	$1180.00		
e	$2456.00	$2556.00		

2.   Find the percentage profit or loss for the following:

a)   Cost Price   = $10.00   b)   Cost Price   = $18.00

Selling Price   = $15.00   Selling Price   = $24.00

c)   Cost Price   = $160.00   d)   Cost Price   = $450.00

Selling Price   = $200.00   Selling Price   = $400.00

3.   Krishan bought a ruler for 20cents and sold it to Tema for 25cents. Did he gain or lose? Calculate his profit or loss.

4.   Kavita bought her wedding dress for $130 and sold it after the wedding for $110.00. What was her profit or loss percentage?

5.   Ecely bought a Nokia Mobile phone during a sale for $190.00. After 2 months of using it she decided to sell it for $200.00.

a)   Did she make a profit or loss?

b)   How much was her profit or loss?

c)   Calculate her profit or loss percentage.

6.   Mr Walker bought a van for $24 000. After using it for 3 years he sold it for $20 000.

a)   Did he make a profit or loss?

b)   How much was the profit or loss?

c)   Find the percentage profit or loss.

STRAND 4

GEOMETRY

STRAND	M4: GEOMETRY
Sub-strand	M 4.1: Coordinates

PLOTTING POINTS

Achievement Indicators:

❖ *Count coordinates on the x-y plane.*
❖ *Identify the x and y axis (horizontal and vertical lines).*
❖ *Determine and plot co-ordinates of any given point.*

Coordinates are ordered pairs of values usually in numbers to show position. Points are plotted on a Cartesian or coordinate plane with the x and y axis; similar to two number lines intersecting at the corner called the origin. The X- axis is the horizontal line (across) direction. The Y- axis is the vertical line (up-down) direction.

Example:

Find the coordinates of point A.

In here, the x-axis is shown by the red line and y-axis by the blue line. The coordinates for point A is 3 units across then 2 units up hence it is written as (3,2). The point is always written in the (x, y) format.
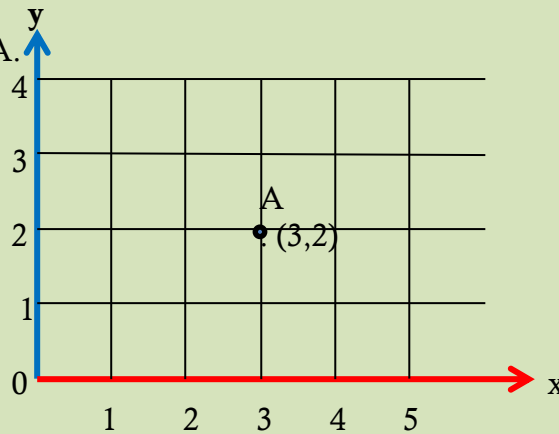
Exercise 4.1A

1. a). Copy the coordinate plane given below then indicate by shading the x-axis green and y-axis orange. Also write in the x and y value on its correct axis.
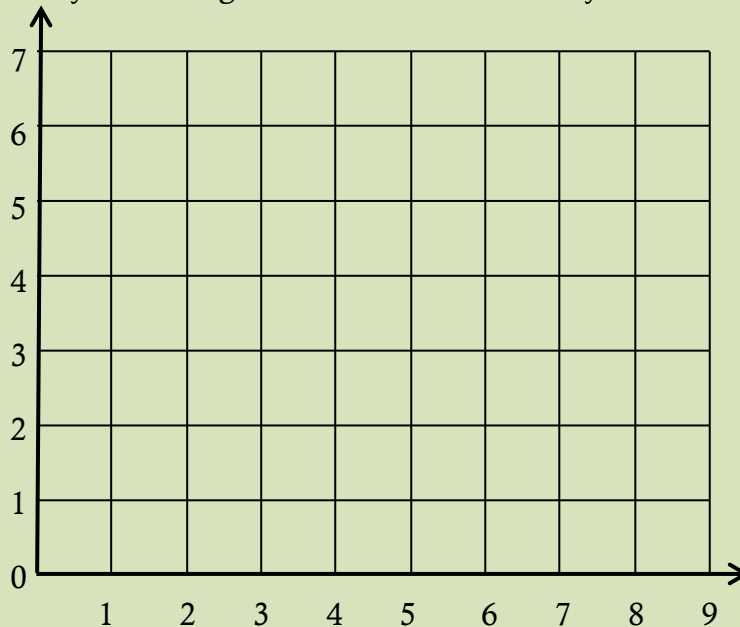
   b) Now plot in the positions of these children then write down their coordinates.

   i) Sam: 5 across then 3 up (__ ,__)

   ii) Jane: 0 across then 7 up (__ , __)

iii)   Vijay: 2 across then 4 up (__,__)
iv)   Cama: 8 across then 6 up (__ , __)
v)   Sera: 9 across then 0 up (__, __)
vi)   Rob: 1 across then 2 up (__ , __)

2.
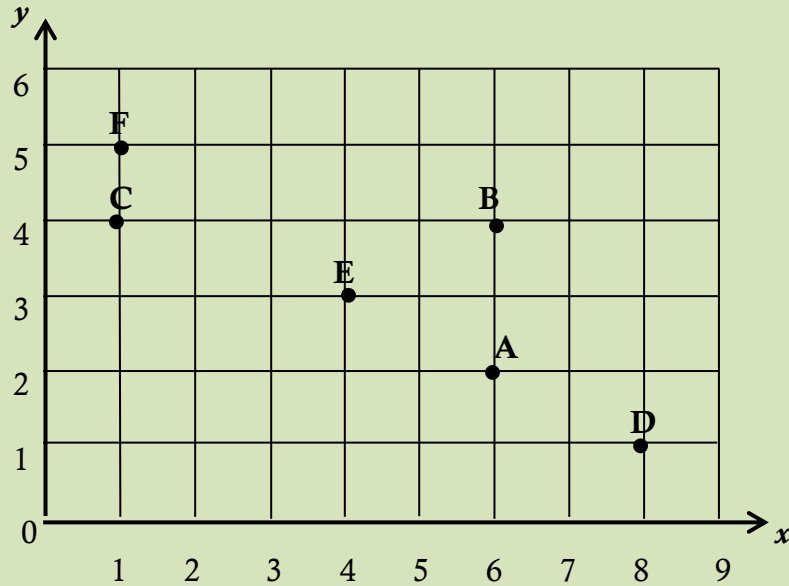
a.   Write down the points located by each ordered pair.

i)   (6, 2) _____   ii)   (8, 1) _____   iii)   (2, 5) _____

b.   Write the ordered pair for each point.

i)   E _____   ii)   B _____   iii)   F _____

3.   Draw your 6 x 6 coordinate plane and plot the following points.

A (3,2)   B (1,4)   C (3,6)

a)   Plot point D so that ABCD is a square.

b)   What is the centre point of the square?

c)   How many more squares can be drawn inside ABCD?

3. Coordinates can also be used to send secret messages. Try decoding these messages to unveil its secret message.
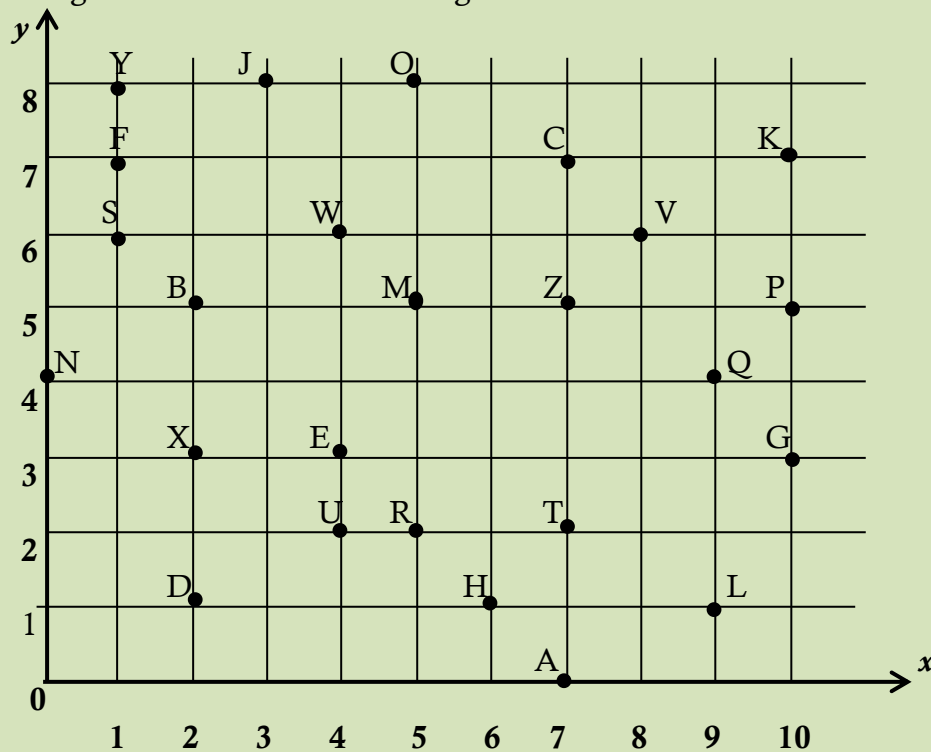
i)   (5,5) (4,3) (4,3) (7,2) (1,1) (3,8) (5,8) (6,1) (0,4) (1,1) (7,0) (7,2) (1,1) (7,2)
     (6,1) (4,3) (1,1) (10,5) (7,0) (5,2) (10,7)

ii) (4,6) (4,3) (7,0) (5,2) (1,1) (7,0) (1,1) (2,5) (9,1) (4,2) (4,3) (1,1) (7,2) (1,2)
     (4,3) (1,1) (7,2) (5,8) (5,5) (5,8) (5,2) (5,2) (5,8) (4,6)

iii) (1,2) (1,1) (4,6) (1,2) (9,1) (9,1) (1,1) (7,7) (7,0) (7,2) (7,7) (7,0) ((7,2) (7,7)
     (6,1) (1,1) (9,1) (7,0) (7,2) (4,3) (5,2)

iii) (1,6) (4,3) (4,3) (1,1) (1,9) (5,8) (4,2) (1,1) (7,2) (6,1) (4,3) (0,4)

4. Create your own message using the codes above and ask your friend to find out the secret message.

5. Write these messages in codes.
    i)   The house is on fire
    ii)   Everything is possible
    iii) Never trust your best friend
    iv)   Always listen carefully in class.

GEOBOARD SHAPES

Achievement Indicators:
- ❖ *Count coordinates on the x-y plane.*
- ❖ *Determine and plot co-ordinates of any given point.*

Coordinates can also be used to name each corner of a particular shape. Now study the given example.
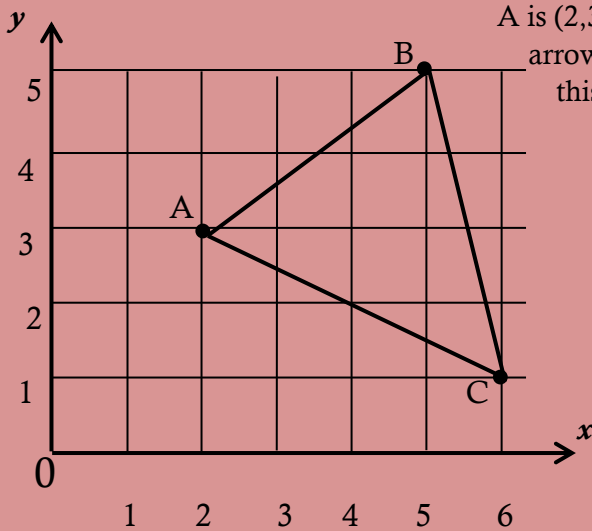
A is (2,3), B is (5,5) and C is (6,1). You can use arrows to show how the points are joined. Hence, this shape can be described like this:

$$(2,3) \rightarrow (5,5) \rightarrow (6,1)$$

Exercise 4.1B

1. Study and describe the given shapes by using coordinates.
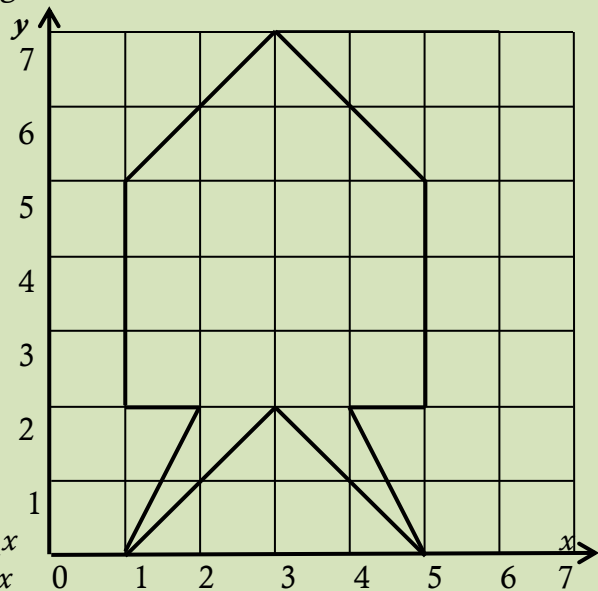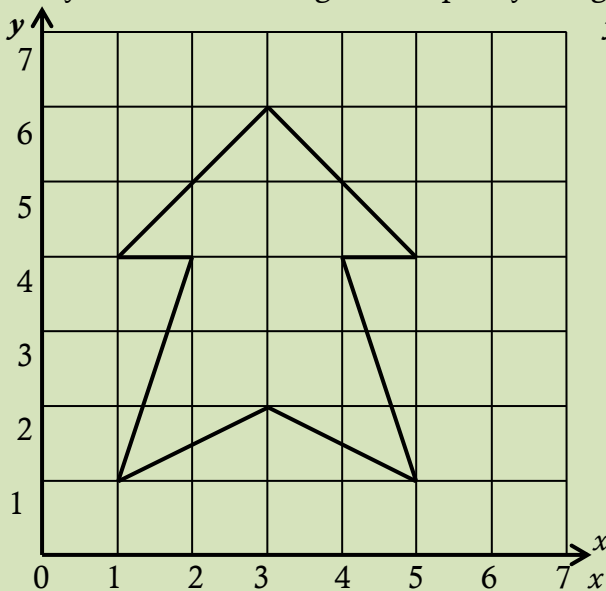
2. Draw your x-y axis and plot the following coordinate points on the plane. Join the points and name the shape it forms.

i) $(1,2) \rightarrow (2,3) \rightarrow (3,3) \rightarrow (4,2) \rightarrow (3,1) \rightarrow (2,1)$

ii) a. $(1,4) \rightarrow (2,9) \rightarrow (6,2) \rightarrow (1,4)$
 b. $(1,2) \rightarrow (7,2) \rightarrow (6,1) \rightarrow (2,1) \rightarrow (1,2)$

iii) a. $(1,1) \rightarrow (1,3) \rightarrow (3,5) \rightarrow (6,5) \rightarrow (8,3) \rightarrow (8,1) \rightarrow (1,1)$
 b. $(5,1) \rightarrow (5,2) \rightarrow (6,2) \rightarrow (6,1)$
 c. $(1,3) \rightarrow (8,3)$

MID-POINT

Achievement Indicator:
 ❖ *Solve any problem on the x-y axis.*

Finding the mid-point:
The point halfway between the endpoints of a line segment is called the *midpoint*. In other words it divides a line segment into two equal segments. You can calculate the midpoint by adding the x and y coordinates individually then dividing by 2.

Example:
Point A is located at (2,2) and point B is located at (6,2). Find the midpoint of the line segment AB.
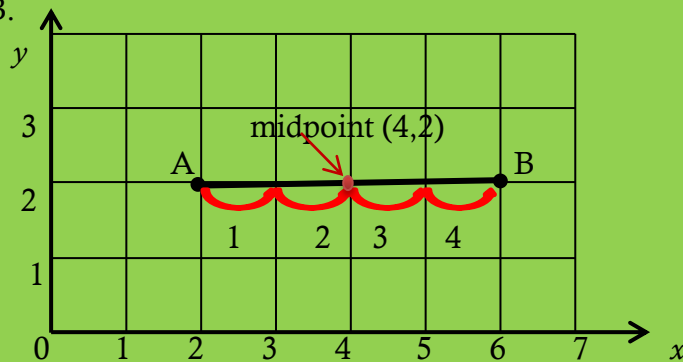
Method 1
Count the number of units between AB
  = 4 units
 → then divide by 2 since midpoint is halfway
  = 4/2
  = 2 (it is 2 units in between then mark it in)
 → = name its coordinates

Mid-point = (4,2)

Method 2

$$\frac{x_1 + x_2}{2} \qquad \frac{y_1 + y_2}{2}$$

$$\frac{2 + 6}{2} \qquad \frac{2 + 2}{2}$$

$$\frac{8}{2} \qquad \frac{4}{2}$$

$$4 \qquad 2$$

Midpoint = (4, 2)

Exercise 4.1C

1. Draw your x-y axis and plot the given points. Join the points to form the line segment AB then work out its midpoint length. Solve using method 1 then confirm it by using the formula shown by method 2.

    i.   A (6,9) B (8,1)   ii.   C (4,4) D (0,4)   iii. E (1,3) F (1,6)
    iv. G (3,5) H (5,7)   v.   I (8,3) J (2,5)   vi.   K (2,7) L (5, 2)

2. Find the end point for the following midpoints.
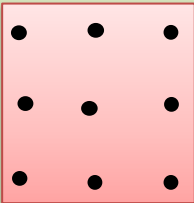
Midpoint (5,7)	A (2,7)	B (,)
Midpoint (2,4)	C (,)	D (2,1)
Midpoint (4,5)	E (3,4)	F (,)

GEOBOARD

Achievement Indicator:
    ❖ *Utilize and express information regarding shapes and lines or points on a geoboard.*

> *Geoboard*:
> This is a small wooden board with rows of nails partly driven in at regular intervals.
> Geoboard are given names. For example, here is a "3 x 3" geoboard because it has "3 nails across" and "3 nails up".

1. James used a rubber band around the nails, A and B as shown. Make as many segments as you can on this geoboard with your coloured rubber bands.
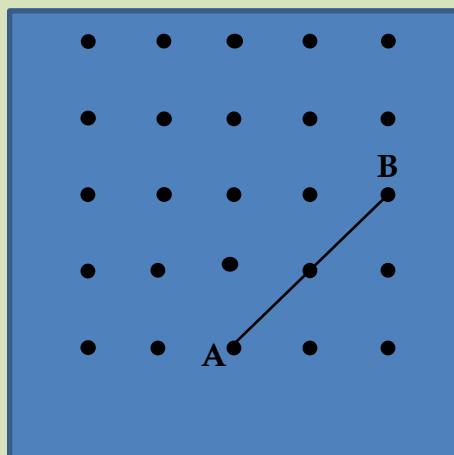
2.   Here is a pattern that Tebu made on her 5 x 5 geoboard.
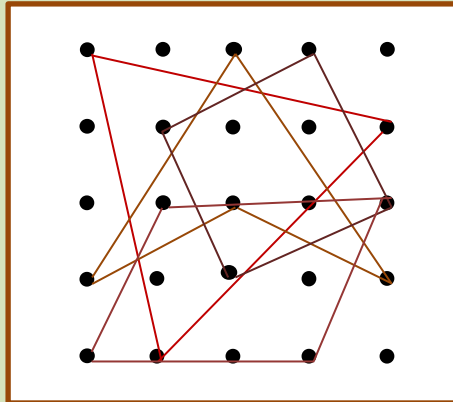
a)   Name some of the shapes made on the geoboard.
b)   How many parallel lines can you see and show it in your book?
c)   Try making another different shape on the geoboard and record in in your book.

3.   Draw your 10 x 10 geoboard then determine how many different sizes of squares can be made on it.

4.   Design a shape on one half of your geoboard. Construct its reflection. Copy this into your book.

CONSTRUCTING SHAPES ON A GEOBOARD

Achievement Indicator:
   ❖ *Utilize and express information regarding shapes and lines or points on a geoboard.*
   ❖ *Use rubber-band to draw any shape on the geoboard.*

Geoboard can also be used to find areas of different shapes. Now study this example.
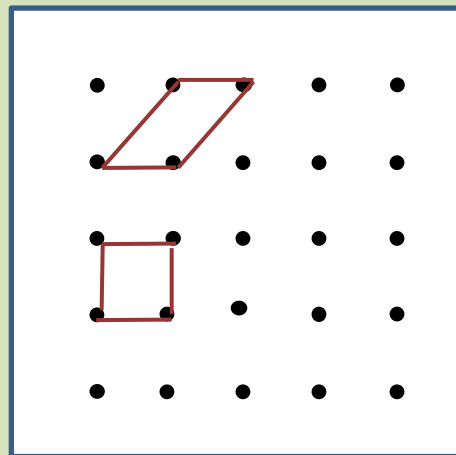
Area = 1 square unit

Exercise 4.1D

1.   a)   On your 5 x 5 geoboard construct a square with 4 square units. Work with
            a partner and make at least 7 other shapes each with an area of 4 square
            units. Record these in your books.

      b.   With each shape work out the following:
            i.   number of sides
            ii.   number of parallel sides or no parallel sides
            iii.   number of square corners or no square corners

2.   Repeat the activity with shapes of 3 or 5 square units.

3.   Teacher Ana used the three geoboard shown to create congruent shapes (the
       same shape and size) and similar shapes (similar in shape but different in size).

Figure 1   **Figure 2a**   **Figure 2b**
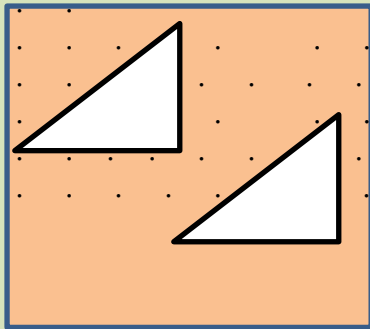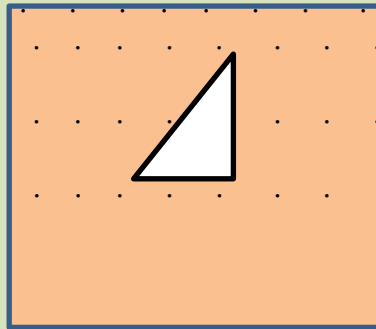
   Congruent shapes   **Similar shapes**
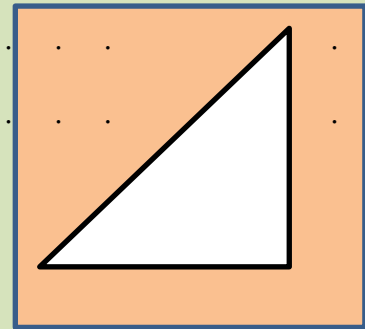
Pair up with a friend. One has to make a rectangle on the geoboard while the other
makes a congruent then similar shape of it. Copy it into your books. Repeat with some
other shapes. Also work out its area.

Here is a geoboard with a shape drawn on it using a rubber band.
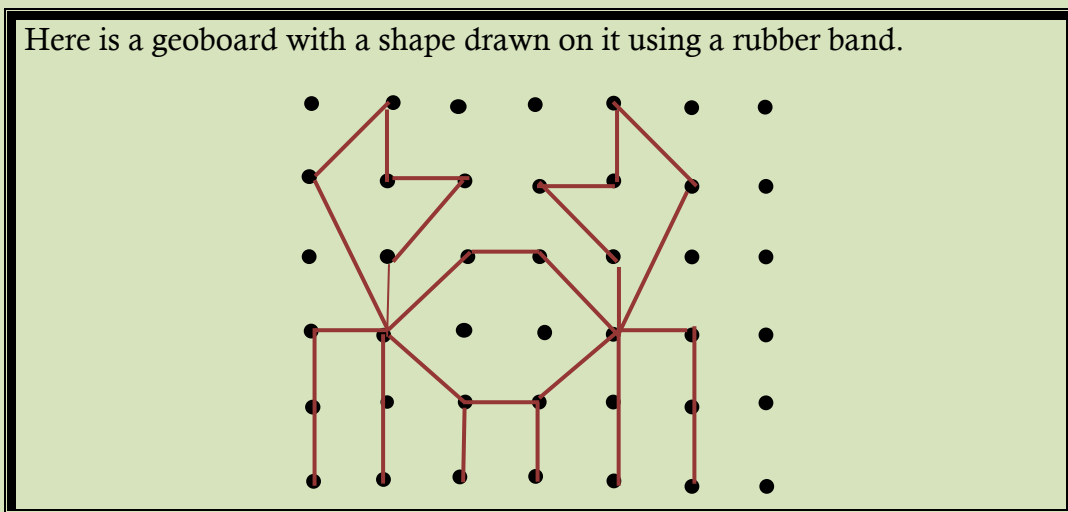
1.   Use your rubber bands to make some simple shapes on your geoboard.

     a.   Give names to your shapes and write them in your books.

     b.   Collect these shapes together in some way. For example: different triangles together, quadrilaterals, fruits etc. Then list the shapes in the sets. E.g. Set A = { , , , }

2.   Complete this figure to make a square with AB as one side
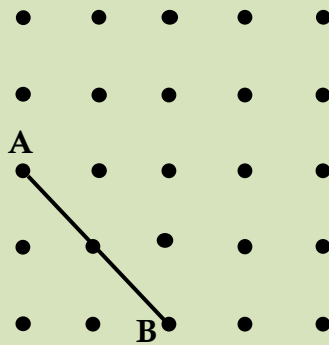
3.   Construct some quadrilateral using the geoboard given below.
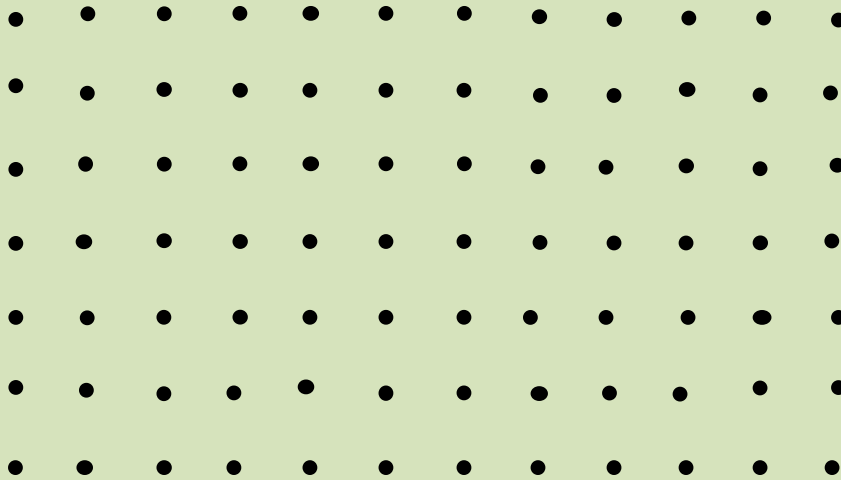
STRAND	M4: GEOMETRY
Sub-strand	M 4.2 : Shapes

POLYGONS
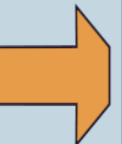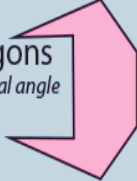
Achievement Indicator:
- ❖ *Understand properties- line segments, rays, parallel lines, curves, polygons of 10 or more sides and circles.*

Shapes are made usually made up of lines and curves. We have seen this from our last lesson. We will now look further into shapes by understanding more about polygons.

Polygons are 2-dimensional shapes. They are made of straight lines and the shape is "closed" (all the lines connect)

Identifying Polygons

A polygon can have three or more sides.	3 sides Triangle	4 sides Quadrilateral	5 sides Pentagon	6 sides Hexagon	7 sides Heptagon	8 sides Octagon
Regular Polygons all sides are equal length and all internal angles are equal						
Examples of **Irregular Polygons** any polygon that is not regular						

Concave Polygons have at least one internal angle greater than 180°

Convex Polygons have no internal angles greater than 180°. All regular polygons are convex.

Complex Polygons have a line that crosses another line (normal polygon rules may not apply)

Examples of shapes that are **Not Polygons**	Circles	Any shape that includes a curve	Any shape that isn't 'closed'	Three-dimensional objects

Exercise 4.2A

1. Indicate whether it is a polygon or not a polygon. Give a reason for your answer.
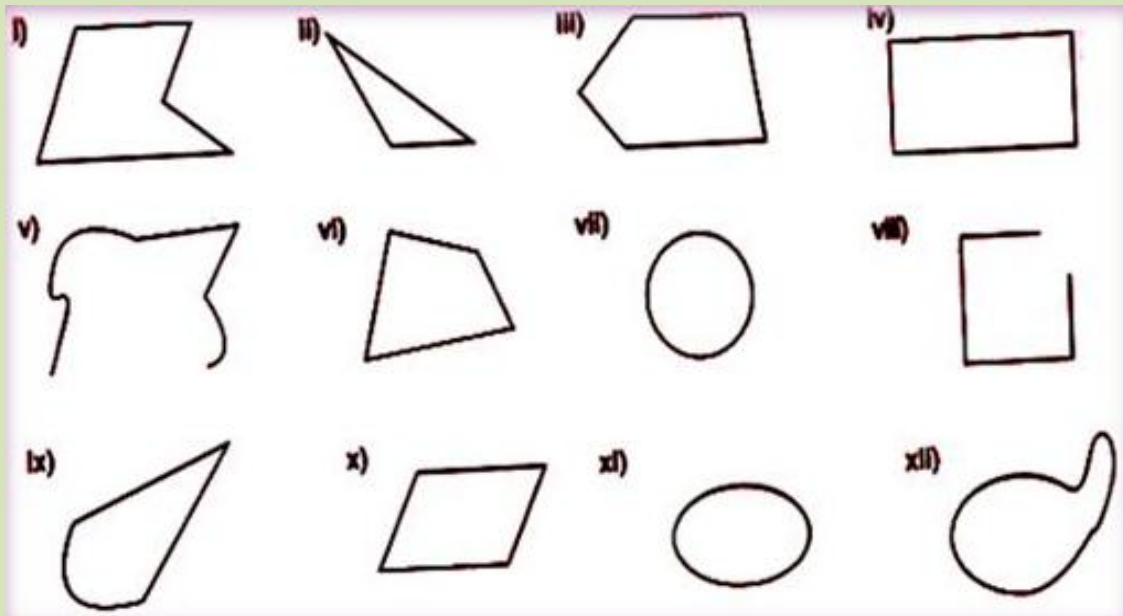
2.   State if the polygon is regular of irregular. Give a reason for your answer.

3. Polygons are named according to the number of sides they have. Try completing this table to explore more about polygons.

Number of sides	Polygon name	Shape
3	(20) (18) (9) (1) (14) (7) (12) (5)	
4	(17) (21) (1) (4) (18) (9) (12) (5) (20) (5) (18) (1) (12)	
5	(16) (5) (14) (20) (1) (7) (15) (14)	
6	(8) (5) (23) (1) (7) (15) (14)	
7	(8) (5) (16) (20) (1) (7) (15) (14)	
8	(15) (3) (20) (1) (7) (7) (15) (14)	
9	(14) (15) (14) (1) (7) (15) (14)	
10	(4) (5) (3) (1) (7) (15) (14)	
11	(8) (5) (14) (4) (5) (3) (1) (7) (15) (14)	
12	(4) (15) (4) (5) (3) (1) (7) (15) (14)	

(Hint: Numbers represent the alphabets in its alphabetical order)

CIRCLES

Achievement Indicator:
  ❖ *Understand properties- line segments, rays, parallel lines, curves, polygons of 10 or more sides and circles.*

Circle:

A line forming a closed loop where every point is a fixed distance from a center point.

Exercise 4.2B

A.   Work in pairs and follow the given instructions to construct a circle and discover its properties.

   1.   Using a compass try constructing different sized circles through experimentation.

   2.   Next construct a circle then putting in the center point. Using a ruler draw, a line segment through the center of the circle with end points on the circle. Label this segment as the diameter of the circle. Measure the length of the   diameter and record the length in centimeters.

   3.   Next draw a line segment from the center of the circle to a point on the circle. Label this distance as the radius. Measure its length in centimeters. Compare the lengths of the radius and diameter and draw conclusions about their relationship.   (2 radii=1 diameter).

   4.   Draw a line segment not including the center of the circle but having endpoints on the circle. Label the segment chord.

   5.   Colour the circular outline red. This is its circumference (distance around the circle).

Exercise 4.2C

1.   Using a compass construct a circle with a 5 cm radius. Label the center. Using a centimeter ruler construct the diameter, radius and chord of the circle. Clearly label the parts.

CLASSIFYING SHAPES

Achievement Indicator:
 ❖ *Name and classify all shapes and solids using their properties.*

Flat shapes like lines, circles and triangles that can be drawn on a flat surface like a piece of paper is called *plane geometry*. They are *two dimensional (2D)* figures having only lengths and widths.

Objects having fixed shape and size and occupying fixed space are called *solids*. They are three-dimensional (3D) figures having lengths, widths and heights. Examples are cubes, cuboids, prisms, cylinder and pyramids. Solids have *properties* (special things about them) such as:
volume (think of how much water it could hold)
surface area (think of the area you would have to paint)
how many vertices (corner points), faces and edges they have

Exercise 4.2D
1. Name and classify the following into plane shapes or solids and explain why.

b.   c.   d.   e.   f)

g)   h)   i)
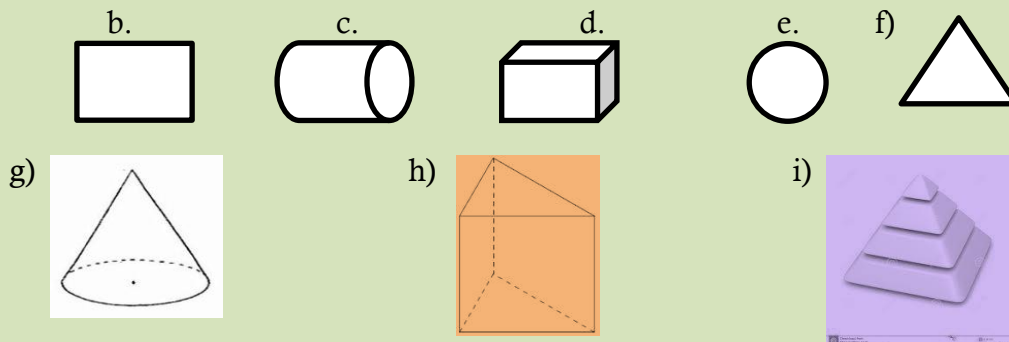
2.   Sort the following 2D shapes according to your own criterion.
.

A   B   C   D   E
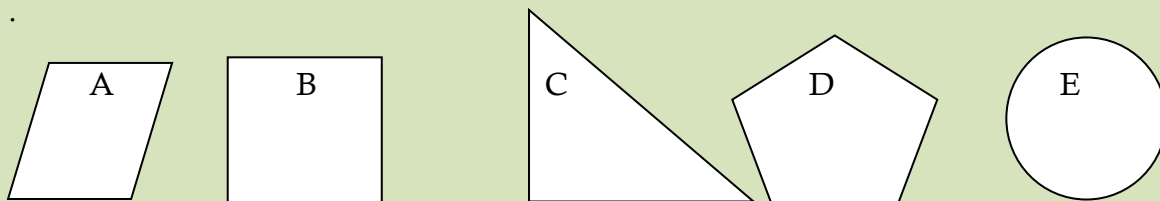
Points to remember regarding shape properties

a)   Can you draw lines of symmetry on it?
b)   Does it have any parallel or perpendicular sides?
c)   Can you say whether a triangle is right-angled, equilateral, isosceles or scalene?
d)   Can you group them into regular and irregular polygons?
e)   Can you reflect a shape when the mirror line is one of its sides?

3 DIMENSIONAL SHAPES

Achievement Indicator:
  ❖ *Identify and name the edges, corners and faces of 3D shapes.*

A three dimensional (3D) solid has a:
a) *face* - flat surface of the solid.
b) *vertex* – corner.
c) *edge* – line segment joining two vertices.

Example:
a) **faces**: ABCD, EFGH, ADHE, BCGF, ABFE and DCGH = 6 faces
b) **vertex**: A, B, C, D, E, F, G, H = 8 vertices
c) **edges**: AB, BC, CD, DA, EF, FG, GH, HE, AE, DH, BF, CG = 12 edges

Cube
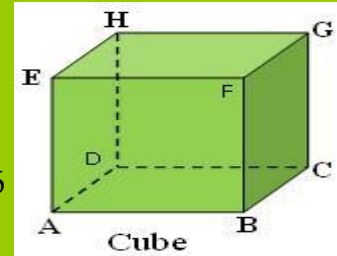
Activity

1. Colour the faces yellow, edges blue and vertices red then work out its number of faces, vertices and edges of the following solids.

Cuboid

Triangular Prism
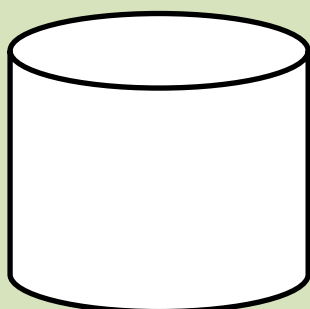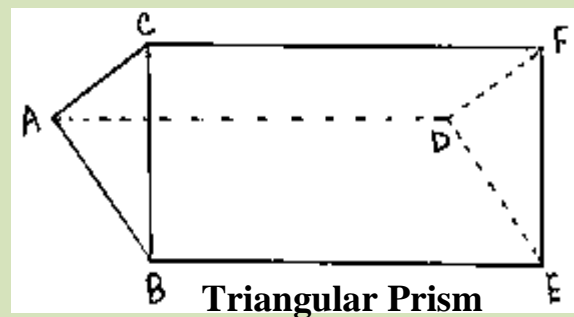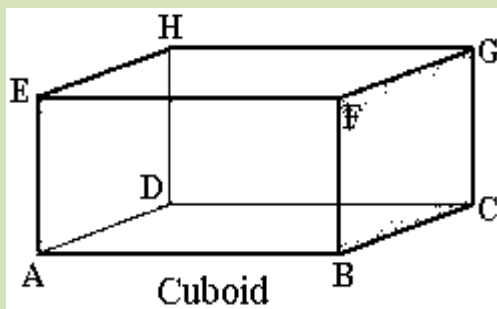
Cylinder
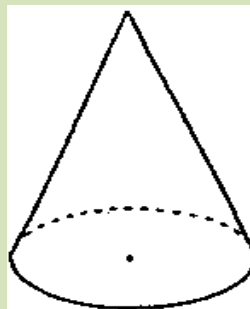
Cone
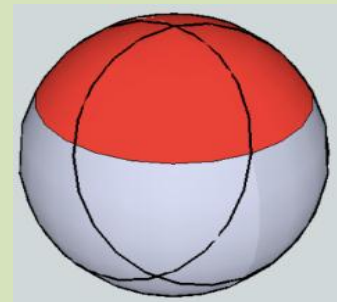
Sphere

PLATONIC SOLIDS

Achievement Indicator
   ❖ *Construct platonic solids using different shapes.*

Platonic shapes are also 3D shapes. It has the following characteristics:
   ❖ all the faces are congruent regular polygons.
   ❖ same number of regular polygons meeting at each vertex (corner).
There are only 5 platonic shapes.

The five Platonic solids
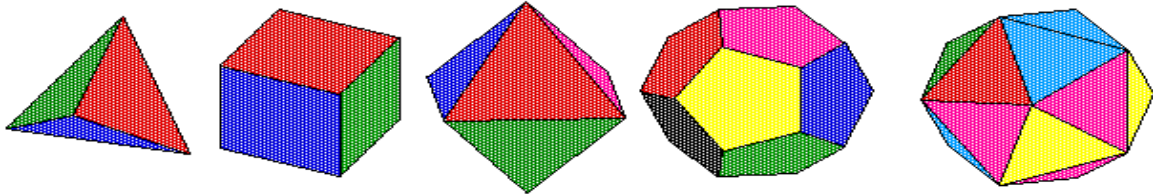
The Tetrahedron   The Cube   The Octahedron   The Dodecahedron   The Icosahedron

The five regular solids discovered by the Ancient Greek mathematicians are:
The **Tetrahedron**:   4 vertices   6 edges   4 faces   each with 3 sides
The **Cube**:   8 vertices   12 edges   6 faces   each with 4 sides
The **Octahedron**:   6 vertices   12 edges   8 faces   each with 3 sides
The **Dodecahedron**:   20 vertices   30 edges   12 faces   each with 5 sides
The **Icosahedron**:   12 vertices   30 edges   20 faces   each with 3 sides

The solids are regular because the same number of sides meet at the same angles at each vertex
and identical polygons meet at the same angles at each edge.
These five are the only possible regular polyhedra.

Exercise 4.2E

In order for you to do this exercise you will need the following regular

Equilateral triangle   Square   Regular pentagon   Regular hexagon

1.   a)   Connect three triangles together around a vertex. Complete the solid so that each vertex is the same. What do you notice? Were you able to build a solid?
      b)   Repeat the process with four triangles around a vertex, then five, then six and so on. What do you notice?

2.   Try doing the steps above with the squares, then the regular pentagons and then the regular hexagons. What do you notice for the different shapes?

3.   How many platonic shapes were you able to make?

4.   The structure of the platonic shapes are given below.
      Complete the table below by naming the solid, the number of vertices, edges and
      faces

Name	Solid	Vertices	Edges	Faces

NETS OF PLATONIC SHAPES

Nets:
Try unfolding the solid cube you had made in your last lesson so that all of its faces are
laid out as a set of squares joined at their edges. What you get is called its *net*. There are
many different nets for a particular solid depending on how you unfold it.

tetrahedron   cube   octahedron
dodecahedron   icosahedron
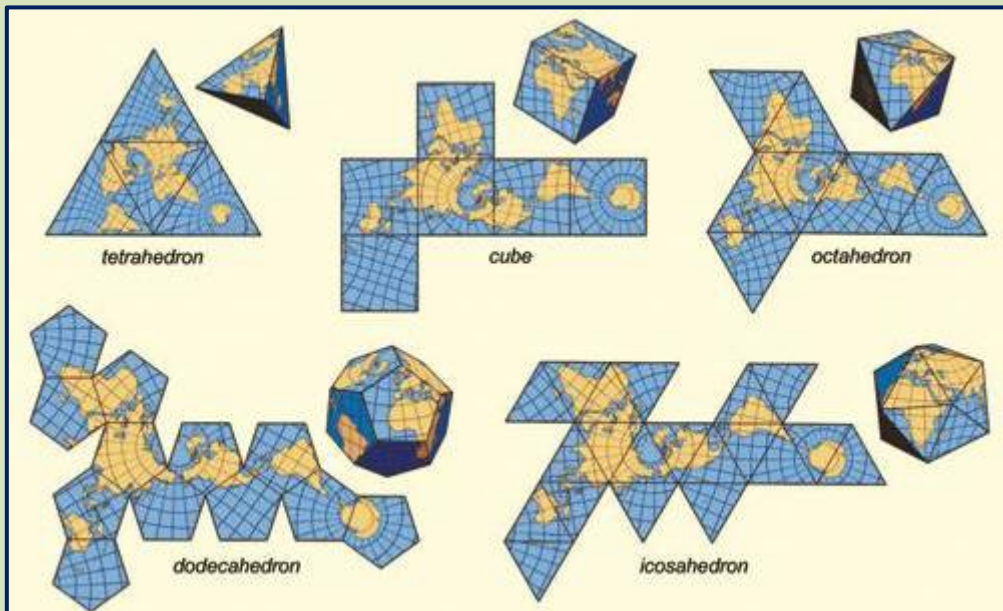
1. Follow the instructions given to construct the solid shapes.

Instructions:

Fold all fine lines.

Cut out on the inside of the dark outlines.

Fold dotted lines labeled "flap" so that they disappear inside the model.

Tuck flaps inside model.

Tape faces to faces.
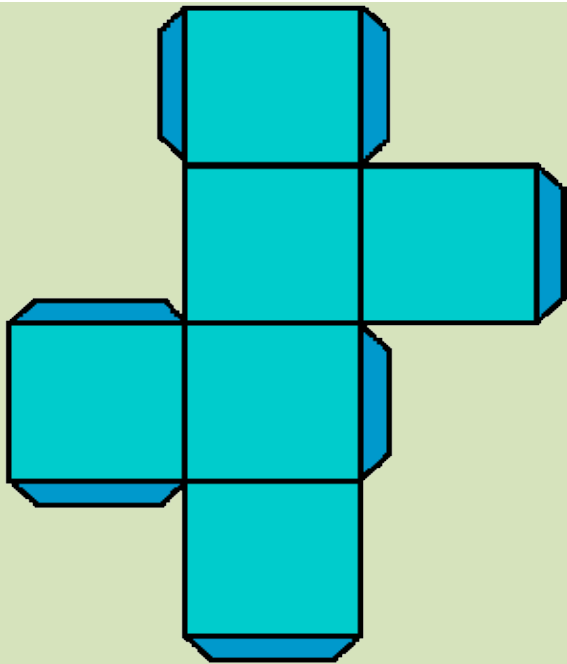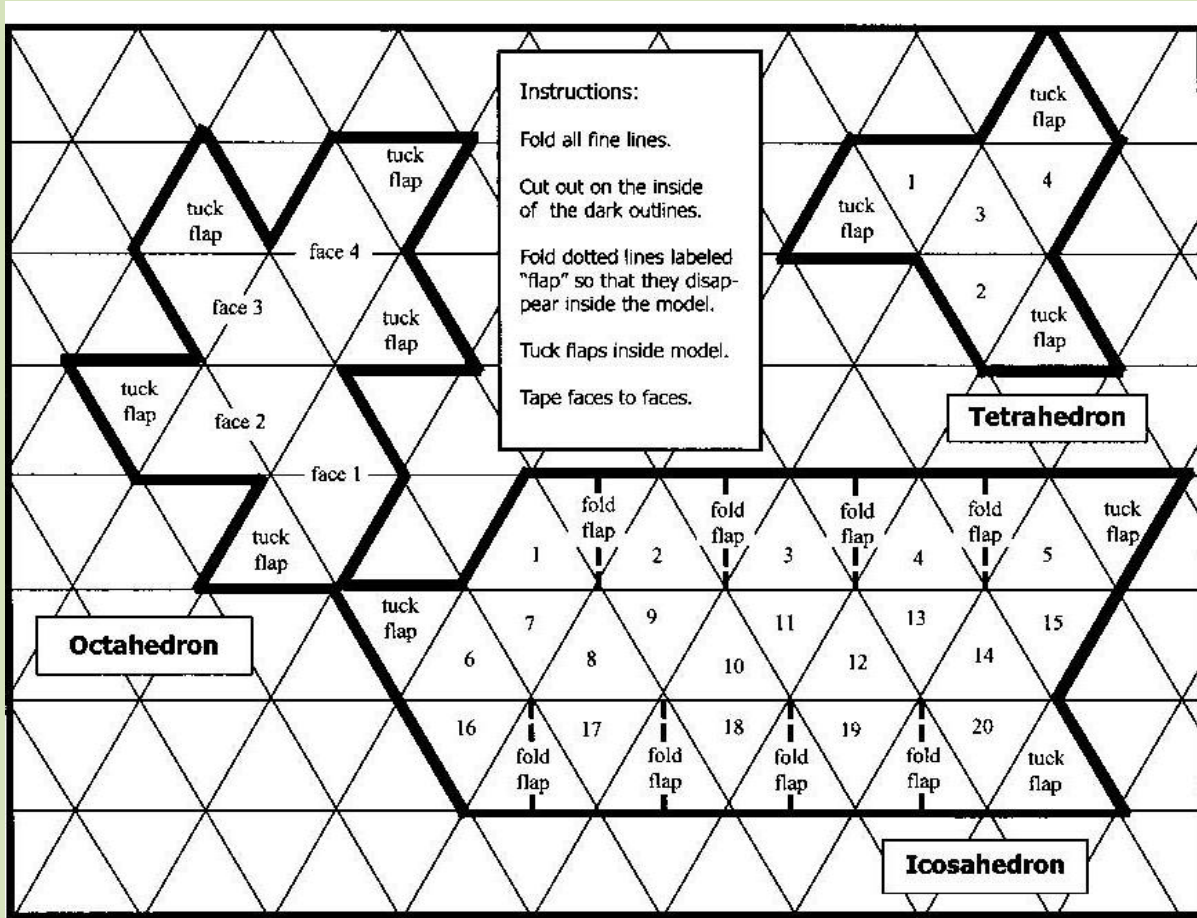
Cube
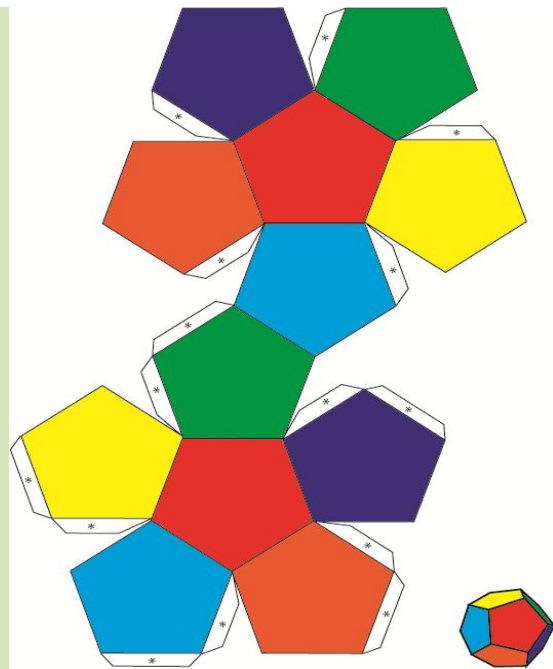
Dodecahedron

STRAND	M4: GEOMETRY
Sub-strand	M4.3 : SOLIDS- Angles and Directions

ANGLES AND DIRECTIONS

Achievement Indicator:
   ❖ *Construct the different solids.*

Geometry net is a 2-dimensional shape that can be folded to form a 3-dimensional shape or a solid. In our last lesson we had learnt about some basic solids which we will try and construct in this lesson.

1.   In this activity, you will be drawing the nets of some solids (2D shapes) and later cutting and folding it to construct some solids (3D solids).

   a) net of a cylinder (e.g. milo tin)   b) net of a cone (e.g. ice-cream cone)
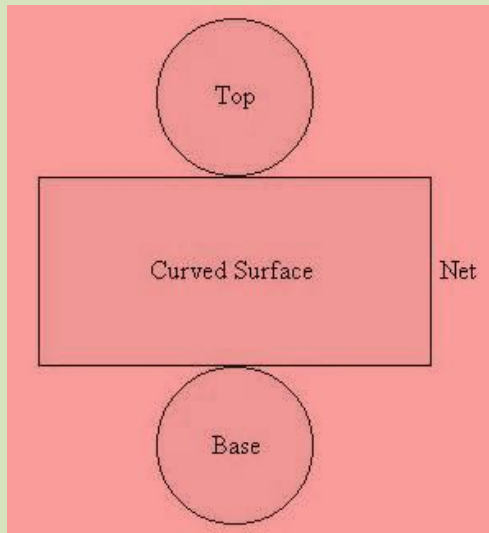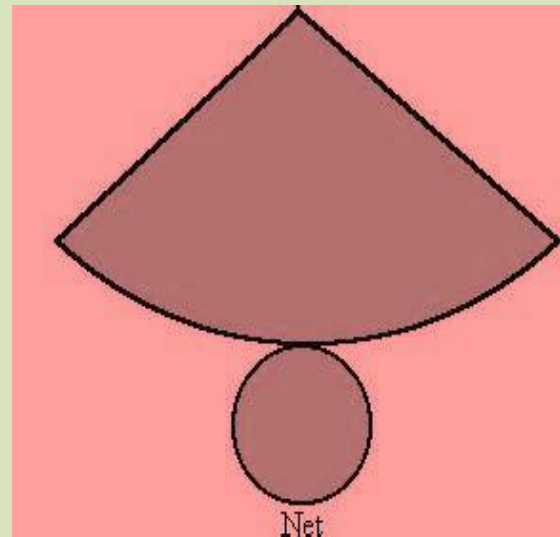
c.   Net of a pyramid
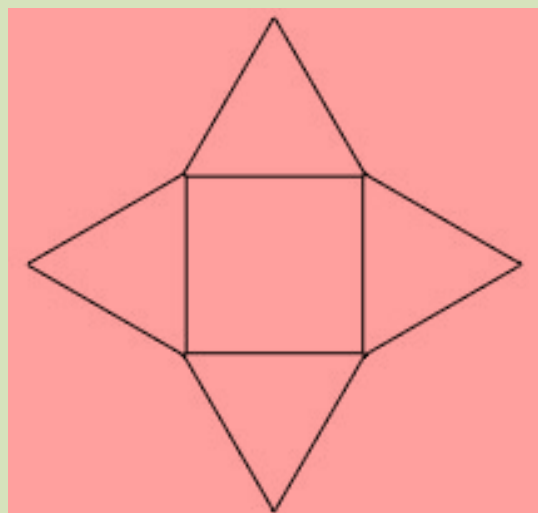
VOLUME OF CUBES

Achievement Indicator
  ❖ *Calculate the volume of the solids.*

Volume of a Cube or Cuboid

A cube is a 3 dimensional shape. To work out its volume we need to know its 3 measurements.
The volume is found using the formula: Volume = Length × Width × Height
This is usually shortened by: $V = l \times w \times h$

Example:
Calculate the volume of a match box that is 8cm long, 4cm wide and 2cm high.
Hence: $V = l \, x \, w \, x \, h$
        $= 8 \, x \, 4 \, x \, 2$
        $= 64 \, cm^3$

Exercise 4.3A

1.   Find the volume of a treasure chest that measure 2m long, 1.5m wide and 2m high.

2.   Find the volume of a pool that measures 3m high, 7m long and 4.5m wide.

3.   If the volume of a cube is 4911cm³ then what is the length of each side of the cube?

4.   The volume of a cuboid is 240m³. If its length is 5m and width is 12m, calculate its height.

5.   The diagram shows a water tank, which is the shape of a cuboid with a square cross-section.
     The water tank has a capacity of 252 m³. What is the value of x?

7m
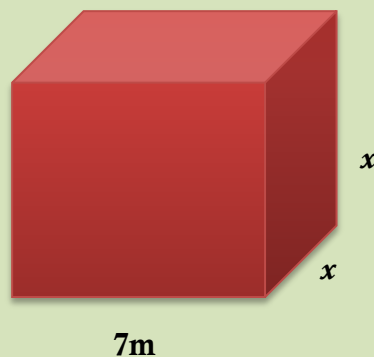
VOLUME OF A CYLINDER

A cylinder is a solid with two congruent circles joined by a curved surface.

To calculate the volume of a cylinder the formula is:
$$V = \square \times r^2 \times h \qquad (h = height \quad r = radius)$$
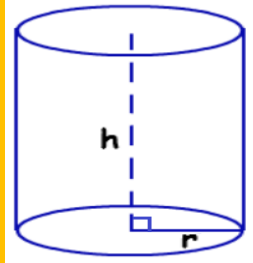
Example. Calculate the volume of a cylindrical tin with a height of 12cm and radius of 8cm.

$V = \square \; x \; r^2 \; x \; h$ (write formula)   π is always constant = 3.14 or $\frac{22}{7}$

$V = \frac{22}{7}$ x 8 x 8 x 12   (substitute)

$= \frac{22}{7}$ x 64 x 12   (simplify)

$= 2413.7$ cm³

Exercise 4.3B

1. Find the volume for each figure. Round off your answer to one decimal place where necessary.

a.

2cm

7cm

3cm

2cm
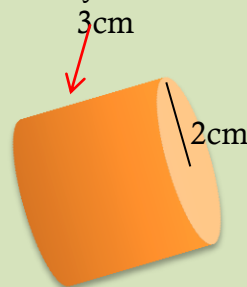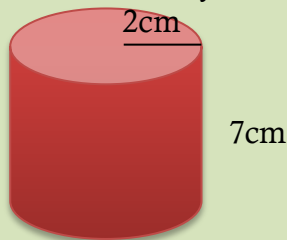
b.   A cylinder-shaped vase has a height of 12 inches and a diameter of 4 inches. What is the volume of the vase? Use 3.14 for π. Round to the nearest tenth.

c.   Have students bring a non-breakable example of a cylinder from home, such as a cookie tin, empty tub of butter, a mug or coffee can. Measure the height and diameter of the cylinder and find its volume. Then exchange cylinders with another student and find their volumes.

d.   Find the height of each cylinder. Round off to the nearest whole number.

    i.   volume: 9,189.2 cm³   radius: 15 cm

    ii.   radius: 13m   volume: 1919m³

    iii.   volume: 226.2 cm³   diameter: 6 cm

VOLUME OF CONE

Achievement Indicator:
* ❖ *Calculate the volume of the solids.*

A cone has one circular base and a vertex connected by a curved surface. The volume of a cone is one third the volume of a cylinder with the same height and same base.

The volume of a cone is: $\underline{1}$ x base x height
                          3

Or $\underline{1}$ $x \pi \times r^2 \times h$
    3

Example: Calculate the volume of a cone if the height is 12 cm and the radius is 7 cm.

Solution: $V = \underline{1}$ $x \pi \times r^2 \times h$ (write formula)
                     3

Volume $= \underline{1}$ x $\underline{22}$ x 7 x 7 x 12   (substitute then simplify)
          3   7

$= 616$ cm³

Exercise 4.3C
1.   Calculate the volume of each cone.

   a.   Radius = 6 cm   height = 5 cm

   b.   Radius = 7 m   height = 7.2 m

   c.   diameter = 9 inches   height = 6 inches

   d.   diameter = 3.5 cm   height = 12.4 cm

2.   Calculate the height of a cylindrical cone with a volume of 424 m³ (cubic meters) and a diameter of 18 meters.

3.   A guest house is in the shape of a cone. The house is 7.5 m meters high and 22 meters long. Find the volume of air that occupies the house assuming that it is empty.

CROSS SECTION OF SHAPES

Achievement Indicator:
  ❖ *Show the cross-section of the shape.*

A cross section is the face you get when you make one slice through an object. The cut through the solid can be vertical, horizontal or at an angle. The cross section cannot always contain the piece of the original face. Below is a sample slice through a solid when sliced horizontally and vertically.
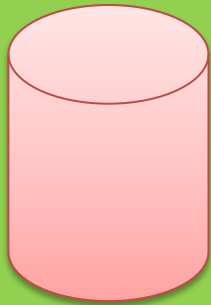
Original piece
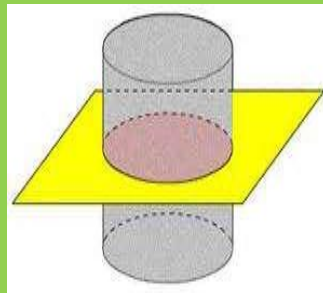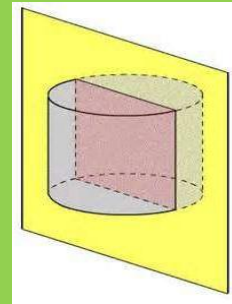
Horizontal   vertical cross section

Exercise 4.3D

1.   Model some solids that you have already learnt from your last lesson with plasticine. Cut a cross-section (very thin slice) through it to determine the cross sectional shape and complete the table with illustrations.

Solid	Horizontal cross-section	Vertical cross-section
Cube		
Cylinder		
Cone		

ANGLES
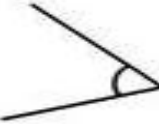
Achievement Indicator
* ❖ *Specify properties of acute, obtuse, straight and reflex angle around a point of the solid.*
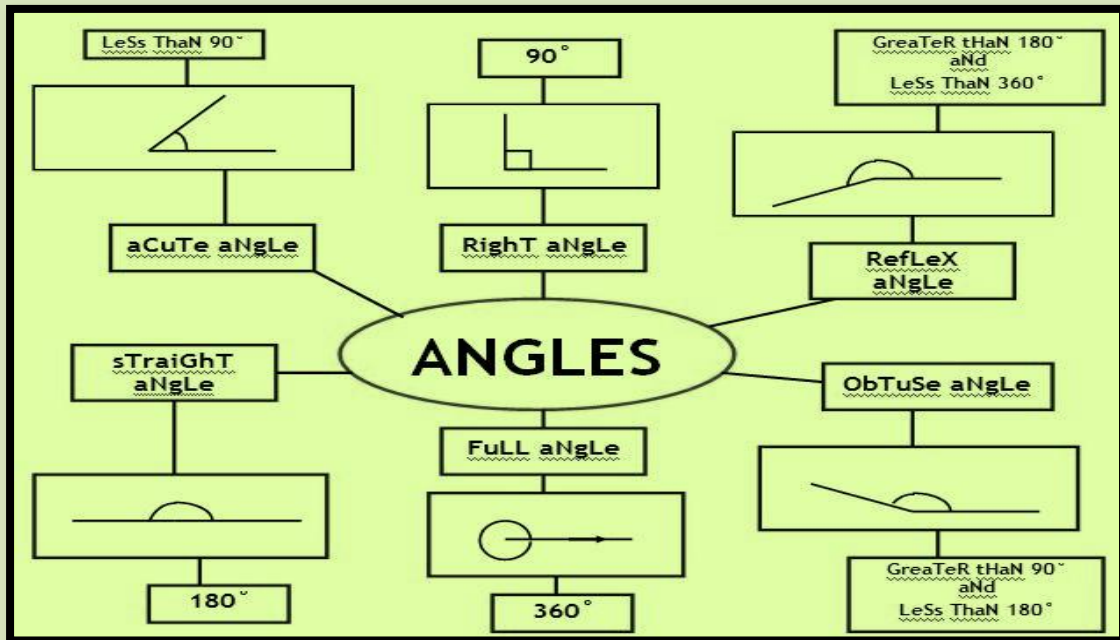
Exercise 4.3E

1. Classify the following angles according to their sizes.

a)

b)

c)

d)

e)

g)

h)

i)

j)

k)

l)

m)

n)

o)

p)

2.   Name the angle shown.   .

a.	34º	b.	90º	c.	256º	d.	180º
e.	178º	f.	345º	g.	67º	h.	98º

3.   Draw another line to form the different angles learnt with the thick line provided. The first one is done for you. Draw as many as you can.

Acute angle
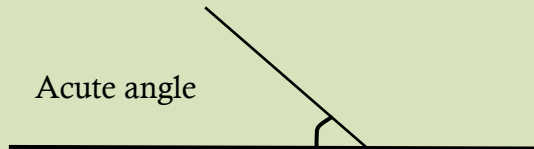
ANGLES AROUND A POINT

Angles Around a Point
Angles around a point will always add up to 360 degrees.

Example: What is angle "c"?
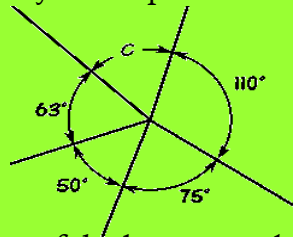
To find angle *c* we take the sum of the known angles and take that from **360°**

Sum of known angles	= 110° + 75° + 50° + 63°
	= 298°
Angle c	= 360° − 298°
	= 62°

Exercise 4.3F

1.   Calculate the missing angles.

(a)   (b)   (c)

$123°$ $110°$ a

$71°$ b $89°$ $37°$

$93°$ $19°$ c $107°$

(d)   e)   h)

$33°$ $113°$ $77°$ $87°$ d

$40°$ $80°$

$145°$ $25°$ $72°$
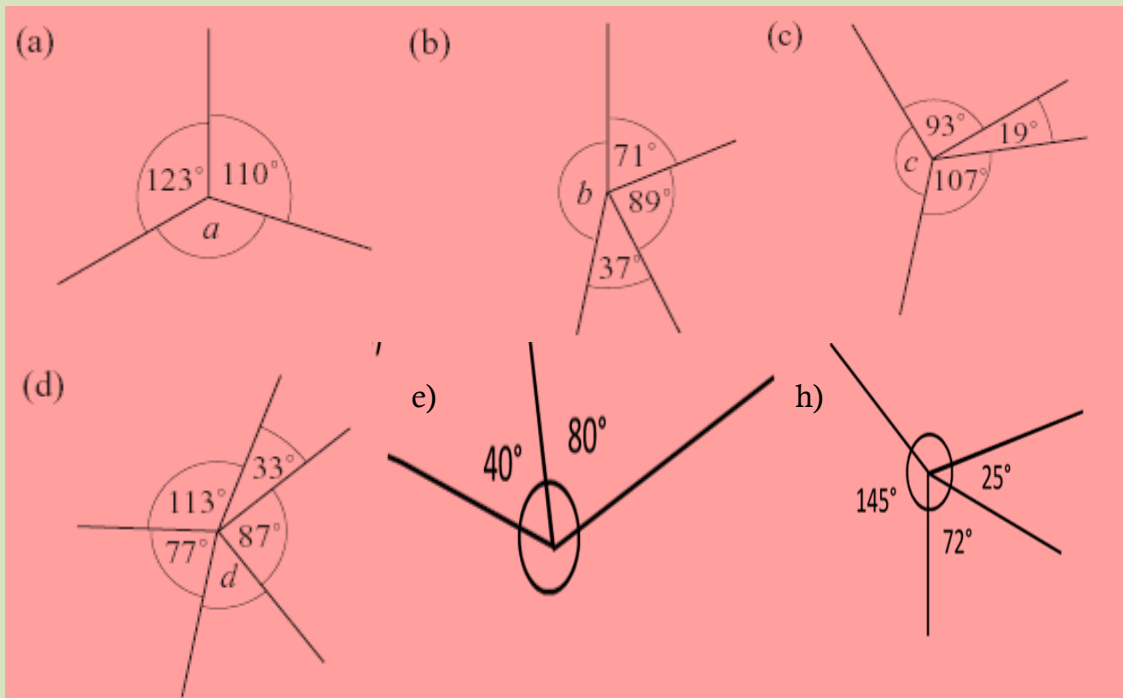
2.   There are six angles at a point. One of them is 45° and the other five angles are all equal. What is the size of each of those equal angles?

3.   What is the size of one angle at the center of a regular nonagon (nine-sided polygon)?

8.   Try working out the size of one angle for other regular polygons.

ADJACENT, COMPLEMENTARY AND SUPPLEMENTARY ANGLES

angle pairs

adjacent angles

Two angles immediately next to each other.

$30°$ $30°$
$20°$ $20°$
$40°$ $40°$
$180°$ $0°$

★ complementary angles

Two angles whose sum is 90°.

$90°$
$60°$
$30°$
$180°$ $0°$

supplementary angles

Two angles whose sum is 180°.

$90°$
$140°$
$40°$
$180°$ $0°$

Corresponding angles are equal

Opposite angles are equal

Two lines are parallel if:

Alternate angles are equal

Same-side interior angles are supplementary

Exercise 3.3G

1. Calculate the missing angles.

a
55^0

98^0
b 37^0

112^0 c
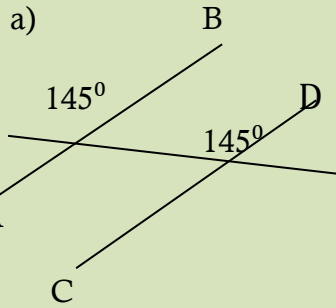
60 e
d 59^0

21^0
87^0
f

g 25^0
47^0 30^0
h
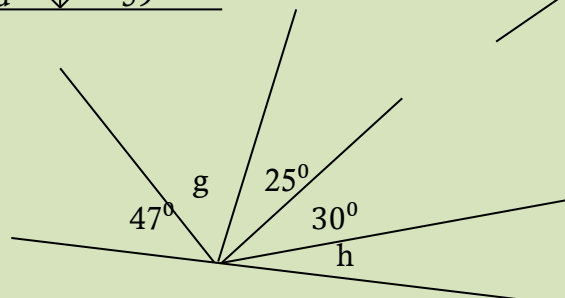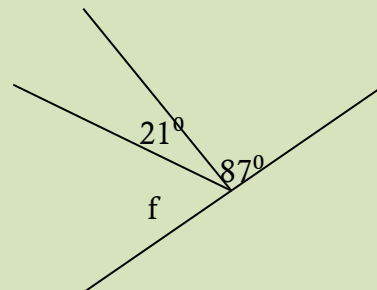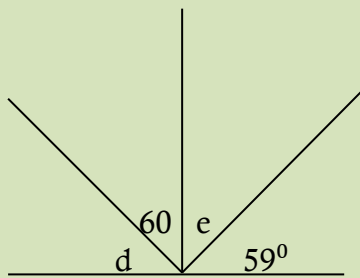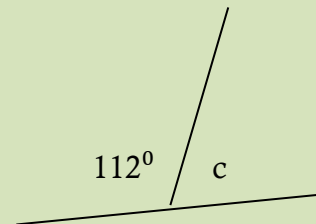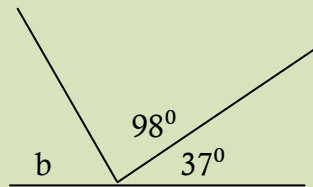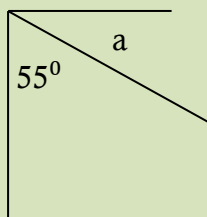
2.   AB is parallel to CD. Which of the following pairs of angles are supplementary?

E

A

F

C

B

G

D

H
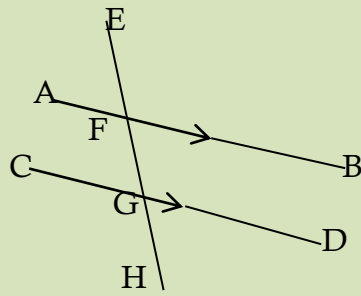
3.   In each case, is AB parallel to CD? Give reasons.

a)   B

145⁰

D

145⁰

A

C

b)

D

B

60⁰

120⁰

C

A

c)

A   C

83⁰

96⁰

B   D

d)

126⁰

A   B

C   124⁰   D
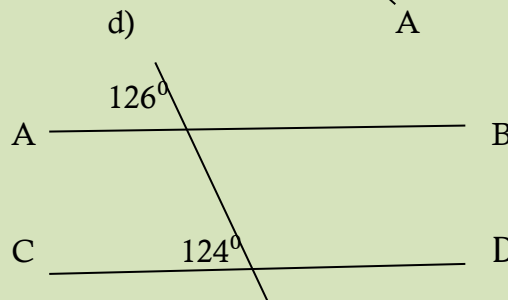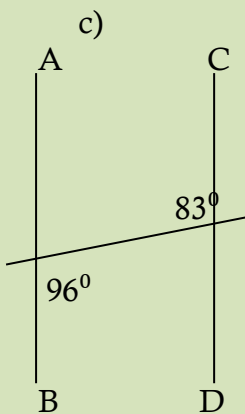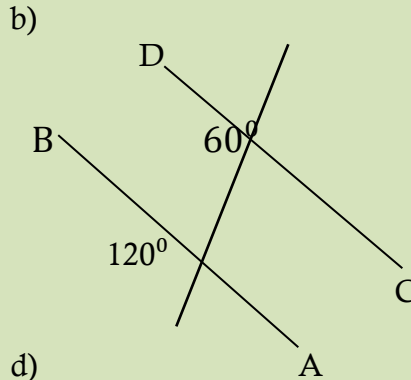
4.   Draw and mark the following angles;

a)   corresponding angles
b)   alternate angles
c)   opposite angles

VERTICALLY OPPOSITE ANGLES

These angles are opposite each other when two lines cross. They share the same Vertex (or corner point). Vertically opposite angles are equal.

Exercise 4.3F

1. Calculate the missing angles.
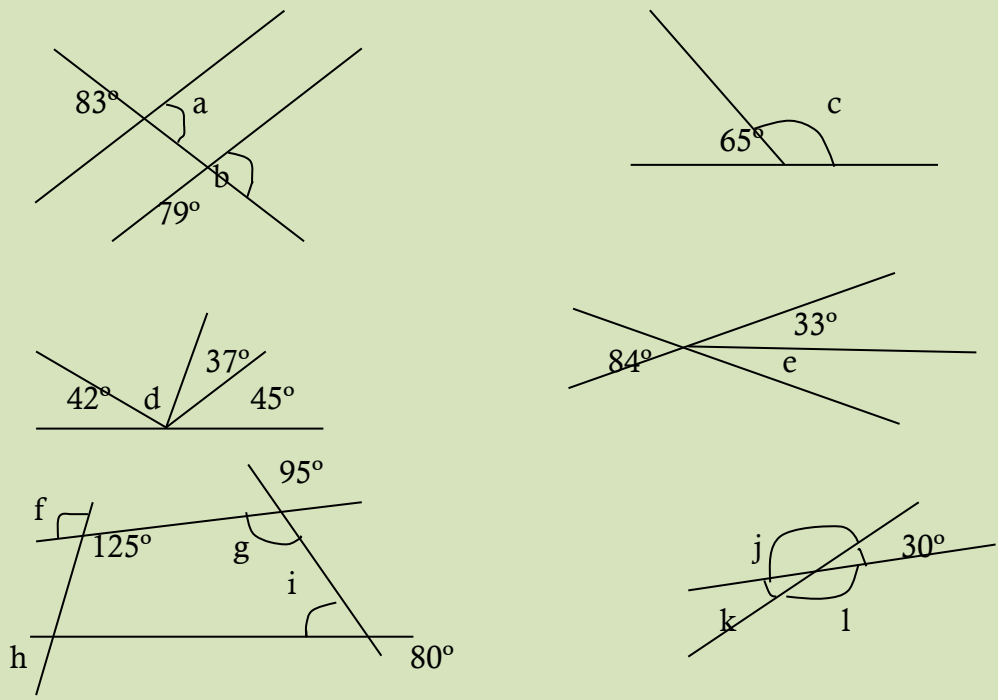
2. There are five angles on a straight line. One of them is 44° and the other four angles are all equal. What is the size of each of those equal angles?

REFLECTIONS, TRANSLATIONS AND ROTATION OF SHAPES

Reflection

When we reflect a shape, we 'flip' it over a line of symmetry or 'mirror'.
Reflections made easy in horizontal and vertical lines.
Understand simply how to reflect shapes in vertical and horizontal lines.
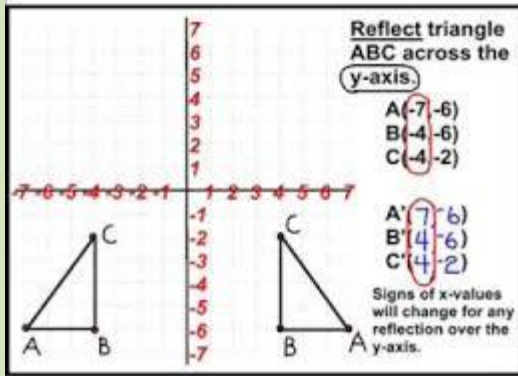
Reflect shapes in the lines y = x and y = -x

Reflection is taking the mirror image of a shape, where the mirror line is called the line of symmetry.

The mirror line does not have to be horizontal or vertical, it can also be diagonal
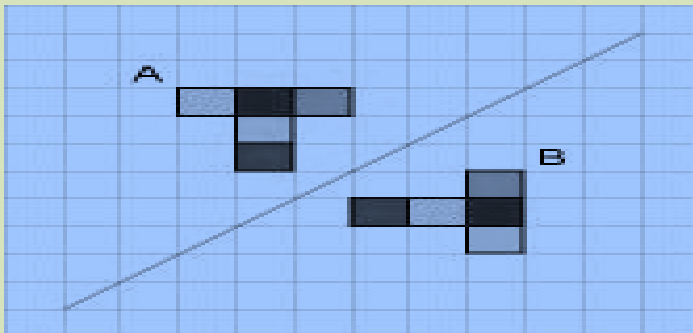
Translation

We translate a shape by moving it up or down or from side to side, but its appearance does not change in any other way. When we translate a shape, each of the vertices must be moved in exactly the same way.
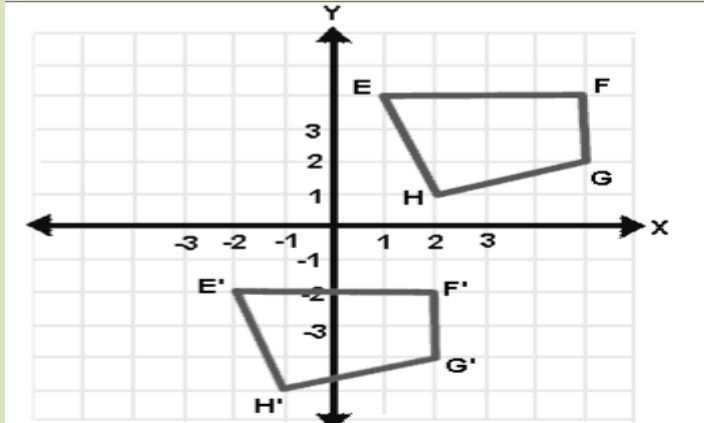
Rotation

When we rotate a shape, we turn it a certain number of degrees around a fixed point.

Angle of rotation of is 90 degrees.
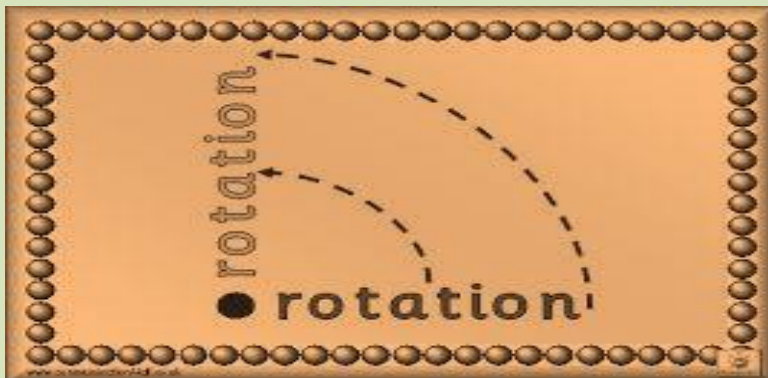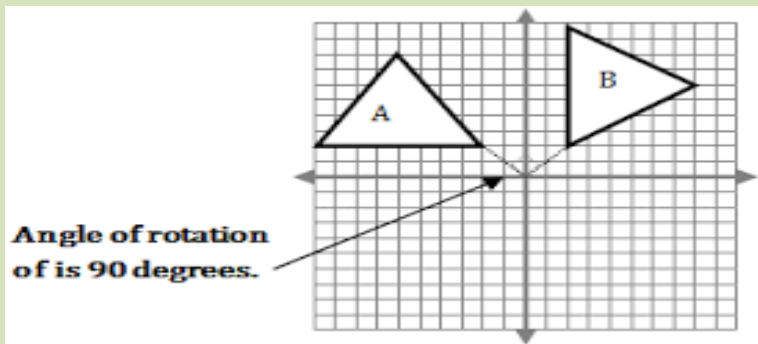
STRAND 5

CHANCE

&

DATA

STRAND	M5: CHANCE AND DATA
Sub-strand	M 5.1 : Data Representation and Interpretation

RANGE

Achievement Indicator:

❖ *Calculate a range of a set of values/scores.*

The range of a set of data is the difference between the highest and lowest values in the set.

Example: Anushka's test marks are as follows. What is the range of her test scores?

English	Math	B/Science	S/Science	H/Living	Vernacular
89	73	84	94	87	77

Solution: Ordering the test scores from the least to the greatest, we get:

73, 77, 84, 87, 89, 91, 94

highest - lowest = 94 - 73

= 21

Exercise 5.1A

1. Find the range of these scores: 93, 79, 83, 89, 90, 71, 85

2. a) The Fong family drove through 6 towns during the school holidays. Petrol prices varied from town to town. What is the range of the petrol prices?

    $1.79, $1.61, $1.96, $2.09, $1.84, $1.75

   b) Round off the calculated range to the nearest whole number.

3. a) Find the range of these race times given in seconds.

    7.3s, 8.6s, 7.1s, 9.2s, 8.9s, 6.8s, 8.4s

   b) What will the time be if Anil ran 4 seconds more than the calculated range?

4. a) Employees at a retail store are paid the hourly wages listed below. What is the range of these hourly wages?

    $7.50, $9.25, $8.75, $9.50, $7.25, $8.50

   b) Jane then worked 3 hours more than the range. Calculate her wage.

5. a) Find the range of these distances run by 6 marathon runners:

    10 km, 15 km, 12 km, 14 km, 8 km, 16 km

    b) What will the distance be if Mere ran 4.45 km less than the range?

AVERAGE

Achievement Indicator:
  ❖ *Calculate an average of a set of values / scores.*

Average is the calculated "central" value of a set of numbers. It is also called the *mean*.
To calculate the average for a set of numbers: *Total sum*
                                                    Number of count
Example: A group of seven boys have the following weights (kg): 52, 57, 55, 60, 59, 54
          and 55. Find the average weight of the seven boys.
Solution:
Average = $\dfrac{52 + 57 + 55 + 60 + 59 + 54 + 55}{7}$ ⟵ *Add all the weights*
                                             ⟵ *Number of weights*

$= \dfrac{392}{7}$

$= 54kg$

Exercise 5.1B

1. The table shows the colors favored by a group of year 7 students.

Colours	Yellow	Pink	Blue	Green	Orange
No. of people	16	20	30	24	10

    Find the average number of students in the class.

2. A booklet has 12 pages with the following numbers of words:
    271, 354, 296, 301, 333, 326, 285, 298, 327, 316, 287 and 314

3. The average of 15 numbers is 12. An extra number is included and the average
    increased to 13.   What is the extra number?

4. The average mark scored by 29 students in a science test was 56%. Samu was sick
    so he sat the test late and scored 71%. What will be the new value of the average
    mark if Samu's mark is included?

5. In the end of year Math exam, the mean mark scored by the 30 students in Year
    701 was 55% and the mean mark scored by the 25 students in Year 702 was 44%.
    What was the mean mark of all the students?

6.   What is the average of the squares of the first ten natural numbers?

PIE CHART

Achievement Indicator:
  ❖ ***Represent any given data in the form of a pie chart***.

Example:
The following table shows the numbers of hours spent by a child on different events on a working day. Show this information on a pie chart.
Solution: Firstly we work out the measure of angle as shown.

Activity	No. of hours	Measure of angle (calculation)
School	6	6/24 x 360º = 90º
Sleep	8	8/24 x 360º = 120º
Playing	2	2/24 x 360º = 30º
Study	4	4/24 x 360º = 60º
T. V.	1	1/24 x 360º = 15º
Others	3	3/24 x 360º = 45º
Total	24	360º

Now, we shall represent these angles using a protractor within the circle as different sectors to make the pie chart:
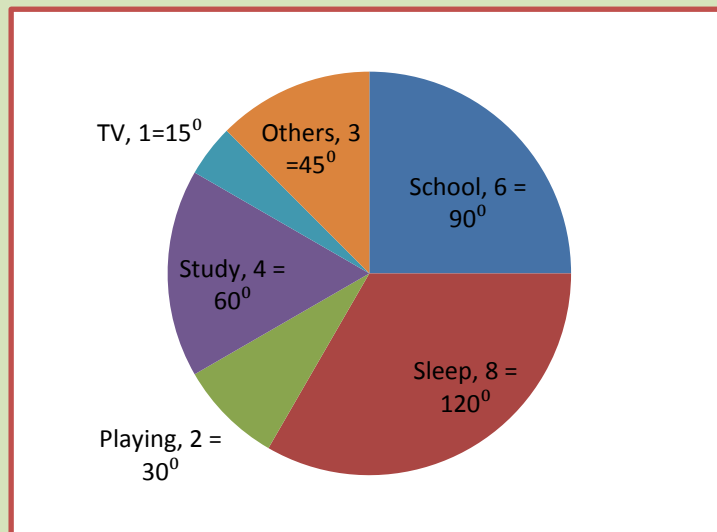
Exercise 5.1C

1.   Represent the given data by a pie chart.
a)   Various modes of transport used by 1260 students in a given school are
      given below:

School bus	Private car	Taxi	Bicycle	On foot
350	245	210	175	280

2)   Mr. Johnson's monthly income is $ 14400. The monthly expenses of his
      family on various items are given below.

Item	Rent	Food	Clothing	Education	Savings
Expenditure	$4000	$5400	$2800	$1800	$400

3)   The Singh family wanted to find out what they were using their car for. They
      collected the following over 1 week.

Journey type	Hours	Calculation
To and from work	6	
Shopping	3	
Leisure trips	3	
Total		

Draw a pie chart for the data given above.

4.   Some students recorded the different types of passing through Navua Bridge.
      They counted 142 vehicles altogether and showed the number of the different
      types of vehicles by this pie chart.

Number of Vehicles

Bikes
Tractors 4%
Rental 16%
Buses 20%
Private vechiles 40%
Trucks 12%
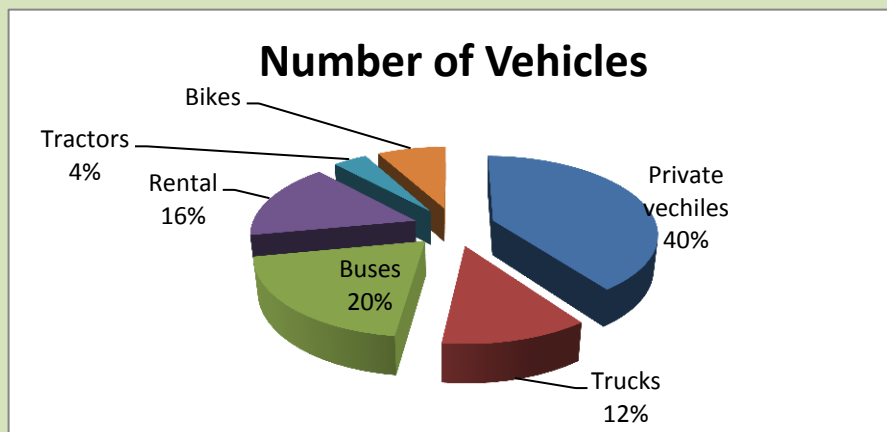
a)   Which type of vehicle crossed the bridge most often?
b)   Which type of vehicle crossed the bridge the least number of times?
c)   How many buses crossed the bridge?
d)   Show in the table the number of vehicles that crossed the bridge?
e)   What fraction of the vehicles that crossed the bridge were private vehicles?
f)   What percentage of the vehicles that crossed the bridge were bikes

BAR GRAPH

Achievement Indicator:
❖ *Represent any given data in the form of a bar column.*

A Bar Graph (also called Bar Chart) is a graphical display of data using bars of different heights.

Example: You just did a survey of your friends to find which kind of movie they liked best.

Table of Favourite Type of Movie

Comedy	Action	Romance	Drama	Scifi
4	5	6	1	4

We can show that on a bar graph in two ways: Vertical and Horizontal bar graphs.

Example
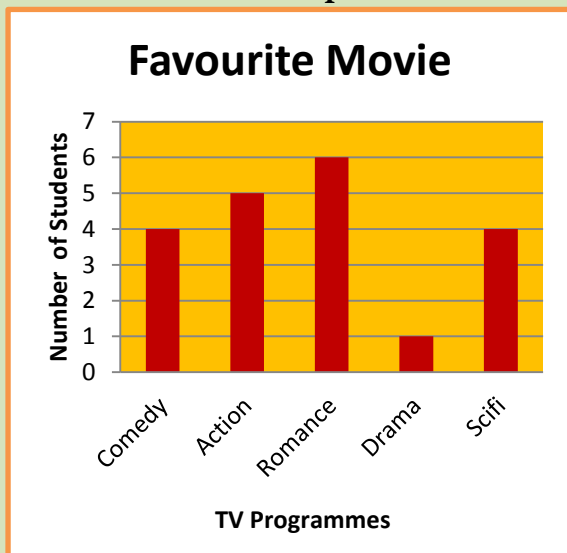
Vertical Bar Graph	Horizontal Bar Graph
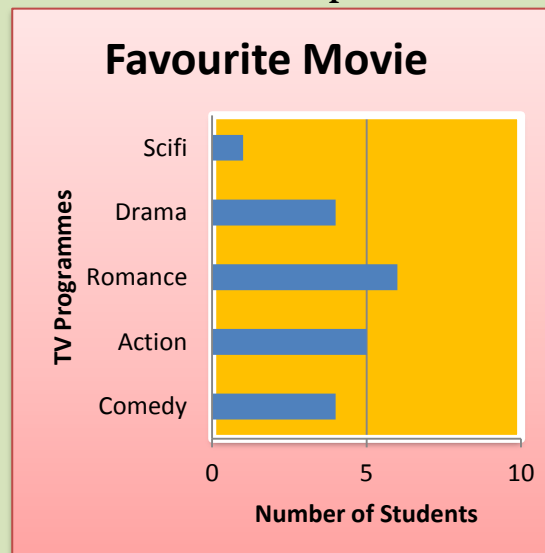
It is a really good way to show relative sizes. We can see which types of movie are most liked, and which are least liked, at a glance.

Exercise 5.1D

1.   Draw the Vertical bar graph showing the following information. The table shows the   colours favoured by a group of people.

Colours	Red	Yellow	Green	Blue	Orange
No. of people	30	14	20	26	32

2.   The following tables give the information about a patient's body temperature recorded in the hospital every hour.
        Draw a Horizontal bar graph using the figures below

| Time	9 am	10 am	11 am	12 pm	1 pm	2pm	3pm
Temperature	35º C	36º C	39º C	36º C	36.5º C	36.5º C	37º C

3.   Do a survey to find out which type of sandwich (ham, cheese, egg, chicken, tuna or beef) is the most popular in your class. Use the given tally chart to record your data.

Sandwich	Number of children	Total
Ham		
Cheese		
Egg		
Chicken		
Tuna		
Beef		

Now use the data gathered to draw a bar graph.

4.   In groups, gather data on any topic that you like; e.g. different sports like by students in your class, or their best subject in school and draw a bar graph.

Different Sports	Number of students

PICTOGRAM

Achievement Indicator:
  ❖ *Represent any given data in the form of a pictogram.*

A pictograph is a way of showing data using pictures. Each picture stands for a certain number of things.

Example:
Here is a pictograph of how many pawpaws' were sold at the local shop over 3 months:

January	
February	
March	

Note that each picture of a pawpaw means 10 pawpaws' (and the half-pawpaw picture means 5 pawpaws'). Hence the pictograph is showing:

In January 10 papaws were sold
In February 40 papaws were sold
In March 25 papaws were sold

Exercise 5.1E

1.   Now try to make your own pictographs. Here are a few ideas:

a)   Childrens' favourite sports

b)   Hours of sunshine in a week

c)   Number of coconuts/bottles collected in a week

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LINE GRAPH

Achievement Indicator

❖ *Represent any data in a line graph*

A line graph is similar to a Bar Graph but instead of using bars, a line is used to join the points with straight line.

Example

The table below shows the number of students at Ro Camaisala Memorial School from2008 to 2014.

Year	Number of students
2008	238
2009	270
2010	225
2011	265
2012	254
2013	242
2014	260

Number of Students at Ro Camaisala Memorial School
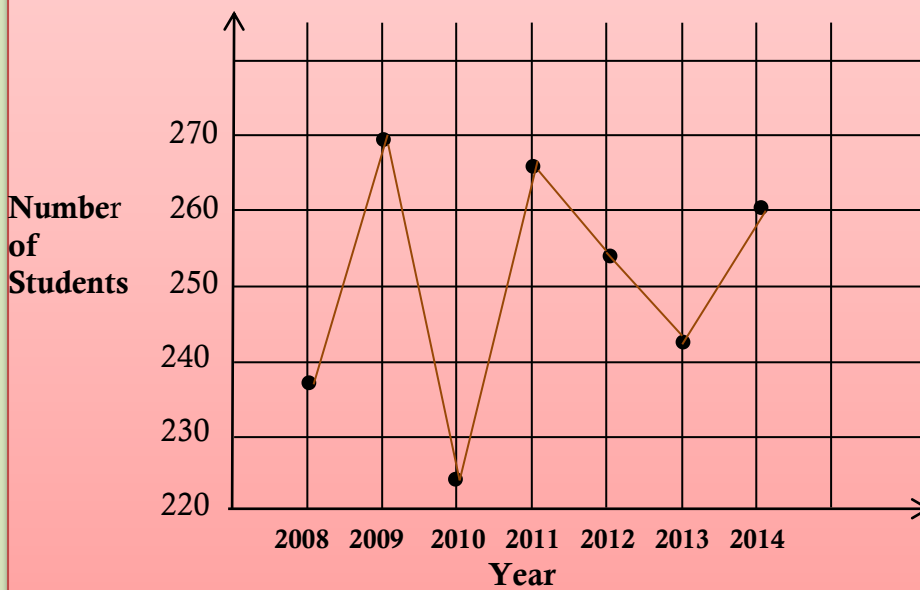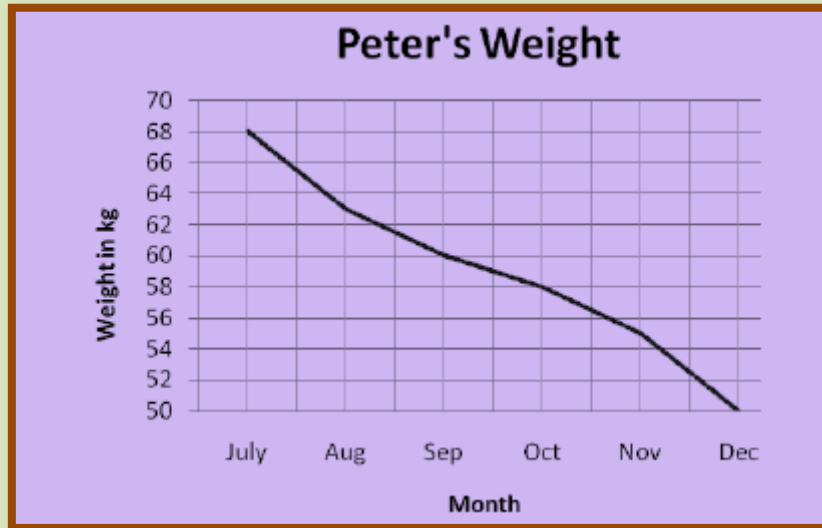

Discussion

    a)   Which year recorded the largest number of students?

    b)   In what year was there a huge increase in number of students' enrolment?

    c)   Which year recorded the least number of students?

   d)   Describe the pattern shown in the line graph.

Exercise 5.1F

1.   The line graph shows the weight of Peter for the last six months of the year.

Peter's Weight

a)   How much was Peter's weight in August?
b)   In which month was Peter's weight 55kg
c)   Did Peter's weight increase or decrease overtime?
d)   What is the difference in Peter's weight between July and December?

2.   The line graph shows the test results of Year 8 students of Mau Primary School

Students' Grades - Hours Studied
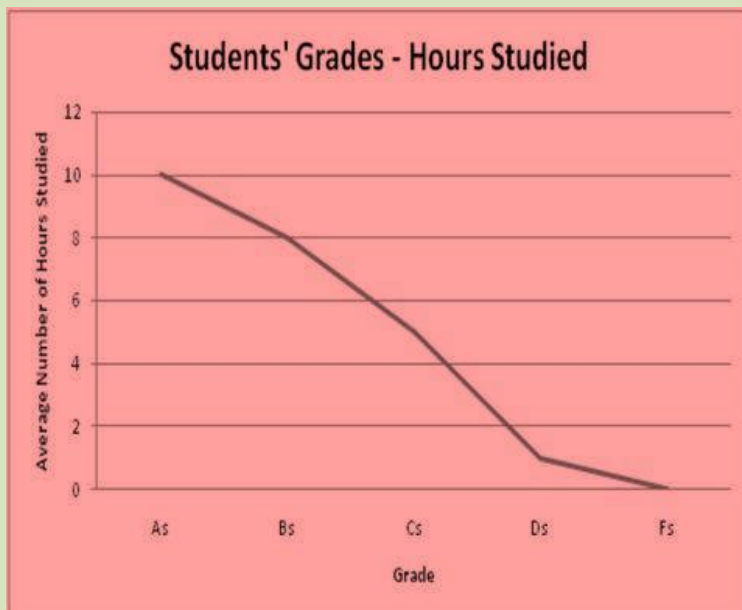
a)   Describe the graph above.
b)   What was the total number of hours of study of Year 8?
c)   What was the: i)   highest average hour of studying?
                       ii)   lowest average hour of studying?
d)   How many hours do the B,C and D grades use for studying?

3.   Collect the weight or height of children in your class. Record your data in a table shown below and draw a line graph.

Weight/Height	Number of Children

4. Given below is a line graph showing the Year 7 Mathematics result of Touchwood Primary School. Use it to answer the questions provided.

Students Vs Tests
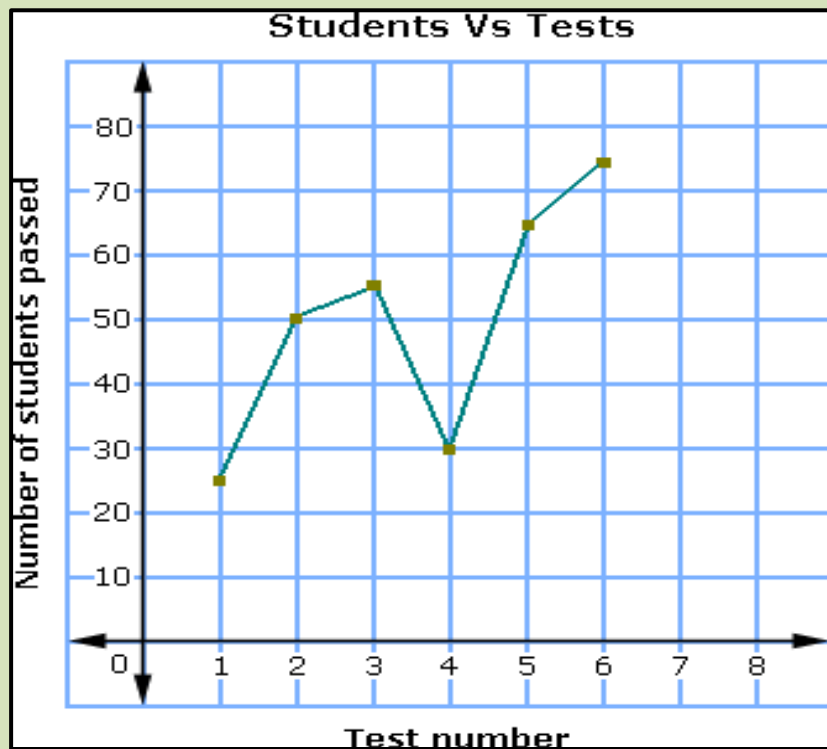
a) Which test recorded the highest number of students passing the test?
b) How many students passed Test: i)   3   ii)   5
c) Which test shows a big increase in the number of students passing?
d) Describe the students' performance from Test 1 to Test 6.
e) State some factors that could cause the decrease in result in Test 4.

5. Your teacher will give your latest test result. Record it in a table and draw a line graph of it.