THIRD TERM: E – LEARNING NOTES
J S 1 (BASIC 7)
THIRD TERM

WEEK **TOPICS**

1. **Plane shapes**: (a) Identification of common plane shapes (b) Properties of circles and triangles. (c) Properties of quadrilaterals: square, rectangle, trapezium, rhombus, parallelogram, kite. (d) Identification and naming of polygon. (e) Similarities and differences between regular quadrilaterals.
2. **Plane shapes**: (a) Perimeter of circles and triangles. (b) Perimeter of regular quadrilaterals and polygon. (c) Perimeter of irregular shapes.
3. **Area of regular plane shape:** (a) Area of circles and triangles. (b) Area of regular quadrilaterals. (c) Area of irregular shapes.
4. **Three dimensional shapes (Solids)**: (a) Identification and naming of solids. (b) Basic properties of Prism (cubes, cuboids and cylinders). (c) Basic properties of pyramids and cones. (d) Basic properties of spheres (e) Volume of cube and cuboids. (f) Net of shapes: drawing and making nets of shape.
5. **Construction**: (a) Construction of parallel and perpendicular lines (b) Bisection of given line segment (c) Construction of angles 90° and 60°
6. **Angles**: (a) Naming of angles (acute, right, complementary, obtuse, straight, supplementary reflex angles and angle at a point. (b) Units and measurement of angles (c) Angles between lines (vertically opposite, angle on a straight line and angle at a point). (d) Angles between parallel lines (adjacent, alternate and corresponding angles).
7. **Mid-term break.**
8. **Need for statistic / Data collection and representation**: (a) Purpose of statistics (ii) Need for collecting data for planning purposes (b) Collection of data in class (c) Presentation of data (rank-ordered list, frequency table; pictogram; bar chart and interpretation of pie chart.
9. **Averages**: (a) Mean (listed and tabulated data values) (b) Median (c) Mode of given set of data.
10. **Revision**
11. **Examination**

WEEK 1

TOPIC: PLANE SHAPES.

CONTENT

- **Identification of plane shapes**
- **Properties of circles and triangles**
- **Properties of quadrilaterals: square, rectangle, trapezium, rhombus, parallelogram, and kite**
- **Identification and naming of polygon**
- **Similarities and differences between regular quadrilaterals**.

Identification of plane shapes

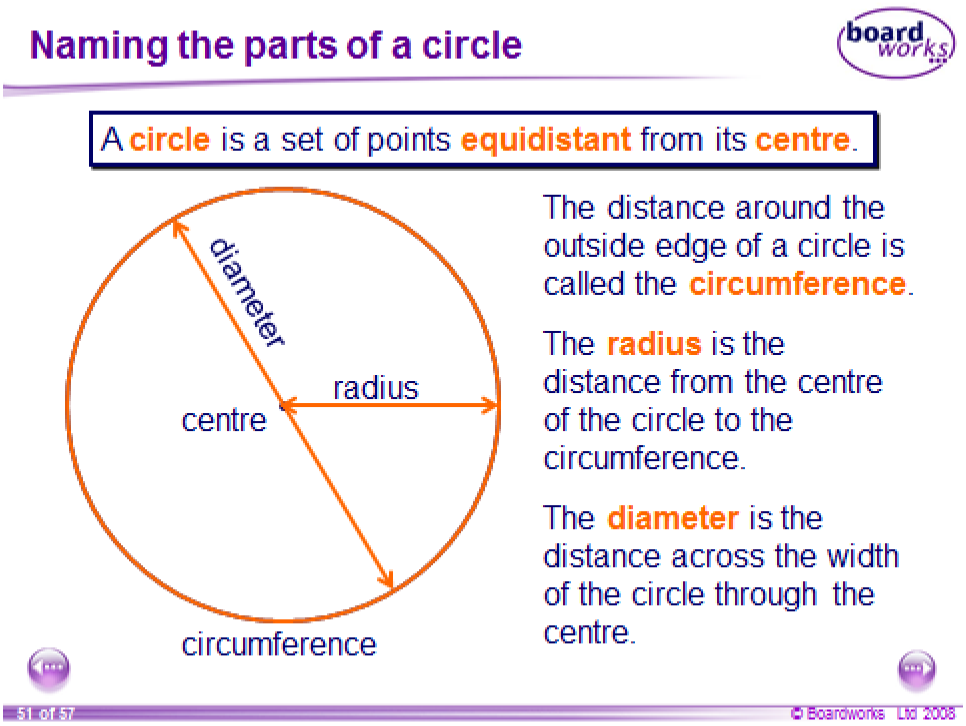
A flat surface, such as top of a table, a playing field, ceiling, wall, face of a tin and star board face is referred to as a plane. It is a plane because it is two dimensional, i.e. it is measured in only two directions. Figures drawn on flat or plane surfaces are called plane shapes. Examples include rectangle, square, triangle, parallelogram and trapezium.

All these shapes are referred to as a regular shape, i.e. they have definite length and breadth.

There are also irregular shapes (they do not have definite length and breadth), e.g. leaves, stones, etc.

Circle

The shape traced out in which every point of it is same distance from a fixed centre point is called circle.

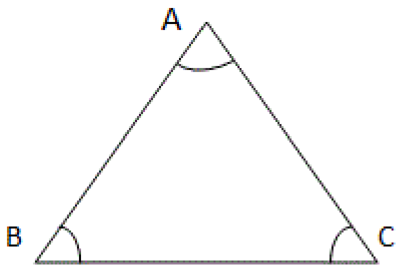


The outer –boundary of the circle is called the **circumference.** The curved part of the circumference is called **arc**. The **radius** is the straight line joining the centre to any part on the circumference.

The straight line that divides the circle into **semicircles** is called the **diameter**. The line that divides the circle into two segments is called the **chord.**

The region bounded by the diameter and the arcs of a circle is called the **semi- circle.** The **secto**r is the region bounded by two radii and the arc of the circle. The **segment** is the region bounded by the chord and the arc of the circle. A circle has infinite number of lines of symmetry
CLASS ACTIVITY
1) How many lines of symmetry have a circle?
2) Describe the following parts of a circle a) radius b) sector c) segment d) chord e) diameter.
Triangles

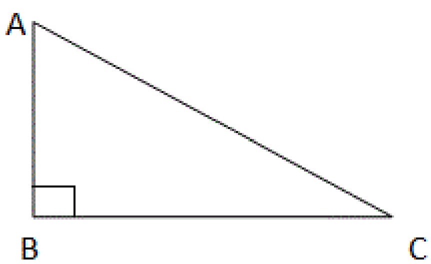
Definition: A triangle is a closed figure made up of three line segments.



A triangle consists of three line segments and three angles.

Basic properties of triangles

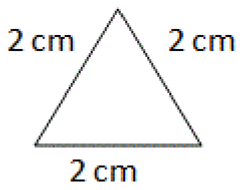
- The sum of the angles in a triangle is 180°. This is called the angle-sum property.
- The sum of the lengths of any two sides of a triangle is greater than the length of the third side. Similarly, the difference between the lengths of any two sides of a triangle is less than the length of the third side.
- The side opposite to the largest angle is the longest side of the triangle and the side opposite to the smallest angle is the shortest side of the triangle.



In the figure above, ∠B is the largest angle and the side opposite to it (hypotenuse), is the largest side of the triangle.

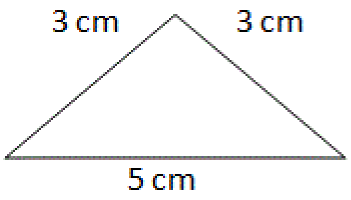
Types of triangles based on sides

Equilateral triangle: A triangle having all the three sides of equal length is an equilateral triangle.



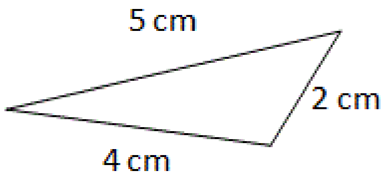
Since all sides are equal, all angles are equal too. It has three lines of symmetry.

Isosceles triangle: A triangle having two sides of equal length is an Isosceles triangle.



The two angles opposite to the equal sides are equal. It has one line of symmetry.

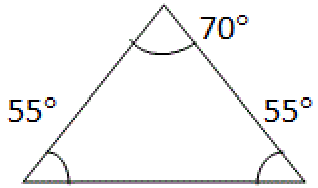
Scalene triangle: A triangle having three sides of different lengths is called a scalene triangle.



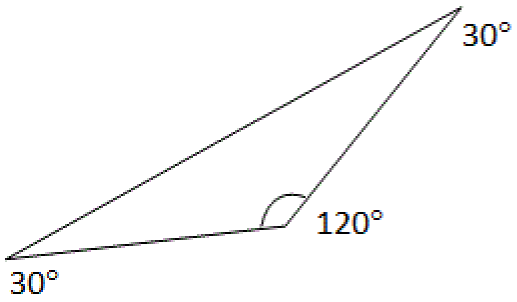
It has no line of symmetry.

Types of triangles based on angles

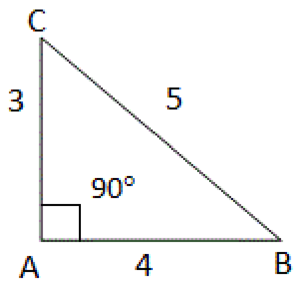
Acute-angled triangle: A triangle whose all angles are acute is called an acute-angled triangle or acute triangle.



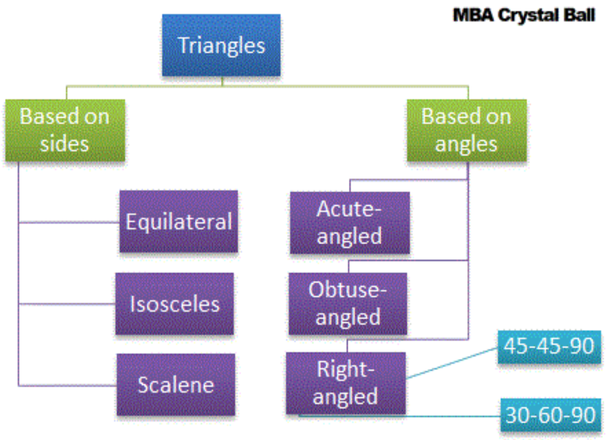
Obtuse-angled triangle: A triangle whose one angle is obtuse is an obtuse-angled triangle or Obtuse triangle.



Right-angled triangle: A triangle whose one angle is a right-angle is a Right-angled triangle or Right triangle.



Triangle tree



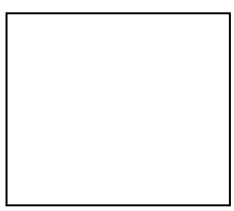
CLASS ACTIVITY

1. How many lines of symmetry have a) an equilateral triangle b) a scalene triangle?

2. List three basic properties of triangle.

PROPERTIES OF QUADRILATERALS

SQUARE



Properties

(i) All the four sides and angles are equal.

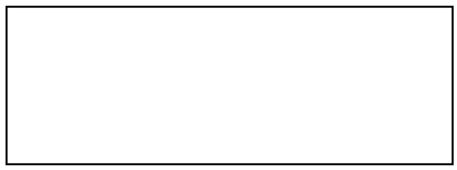
(ii) All corners of a square are identical and each equal to right angle.

(iii) Each pair of opposite sides of square is parallel and equal.

(iv) The diagonal of a square are equal and they bisect each other at point of intersection.

(v) A square has four lines of symmetry. They are line passing through the point of intersection of the diagonals.

RECTANGLE



Properties

(i) The two opposite sides of a rectangle are equal

(ii) All corners of a rectangle are identical and each equal to right angle

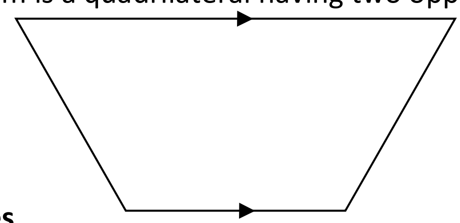
(iii) Each pair of opposite sides of rectangle is parallel and equal

(iv) The diagonal of a rectangle are equal and they bisect each other at point of intersection

(v) A rectangle has two lines of symmetry. They are line passing through the point of intersection of the diagonals.

Trapezium

A trapezium is a quadrilateral having two opposite sides parallel while the others are not .



Properties

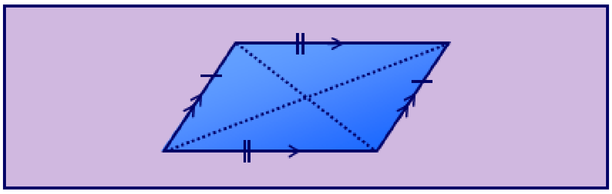
(i) The two opposite side are parallel while the other two are not

(ii)The total angle in a trapezium is add up to 360°

(iii) It has no line of symmetry

Parallelogram

In a **parallelogram** opposite sides are equal and parallel.



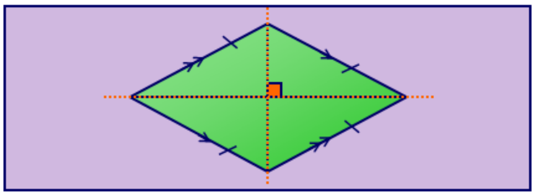
The diagonals of a parallelogram **bisect** each other.

A parallelogram has rotational symmetry of order 2.

Parallelogram has no line of symmetry.

Rhombus

A **rhombus** is a parallelogram with four equal sides.

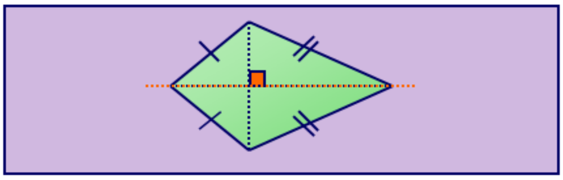


The diagonals of a rhombus bisect each other at right angles.

A rhombus has two lines of symmetry and it has rotational symmetry of order 2.

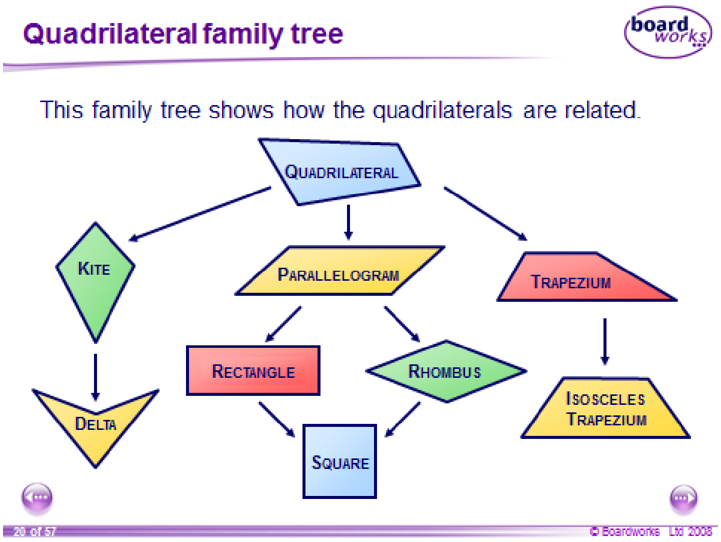
Kite

A **kite** has two pairs of adjacent sides of equal length.



The diagonals of a kite cross at right angles.

A kite has one line of symmetry.

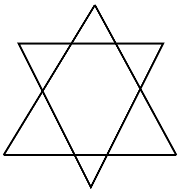


CLASS ACTIVITY

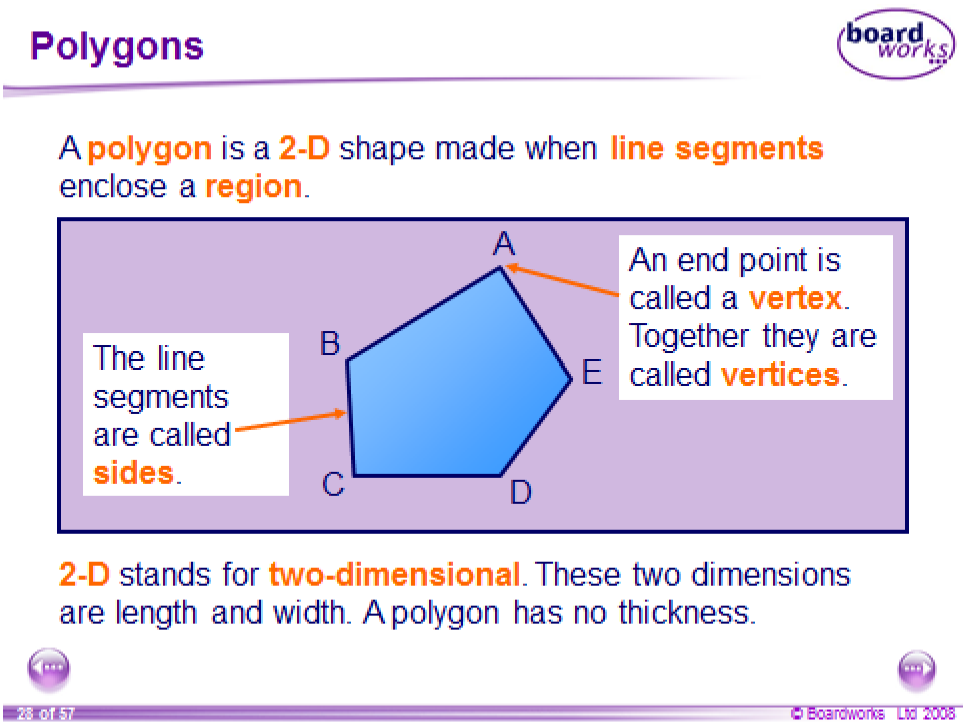
1) How many line of symmetry do the following have?

(a) a rectangle (b) a circle (c) a square

2) How many triangles are there in the diagram below?



Identification and naming of polygon



Naming polygons

Polygons are named according to the number of sides they have.

Number of sides	Name of polygon
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon

CLASS ACTIVITY

1. A four-sided polygon is called --------
2. A plane shape with nine sides is called --------

PRACTICE EXERCISE

1. How many sided polygon is an icosagon?
2. List two similarities between a rectangle and a square
3. A triangle with each of its angles less than 90^0 is called ---------
4. A triangle having equal base angle is called ---------
5. The face of a square is ----------

ASSIGNMENT

1. Draw a circle of radius 3cm and indicate the following parts:

a) Diameter b) chord c) sector d) segment.

2. State two properties each of:

a) isosceles triangle b) parallelogram c) rhombus

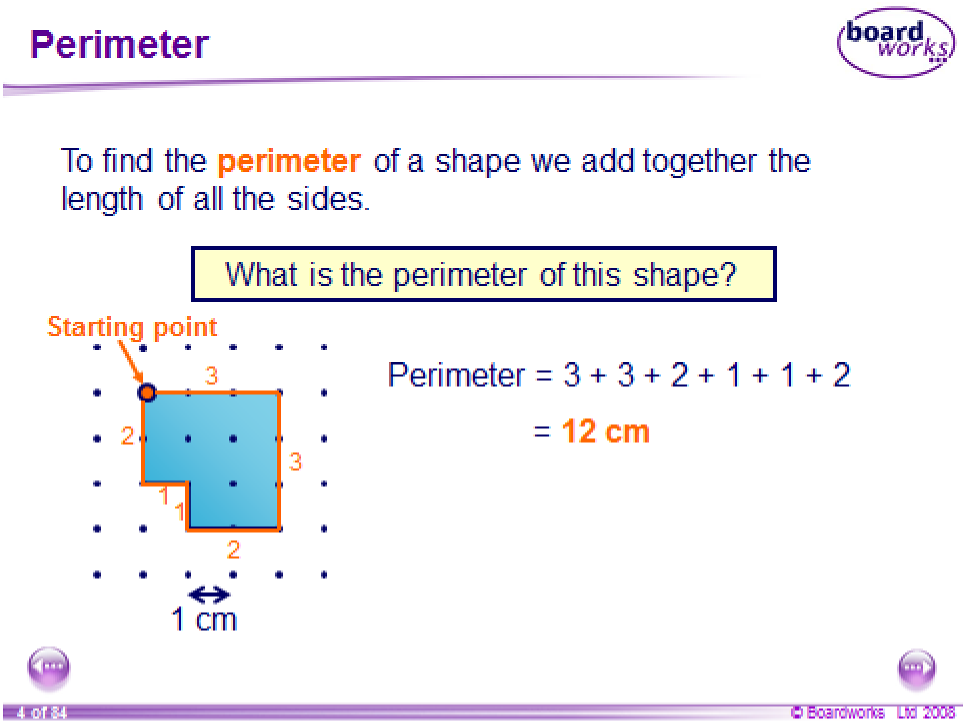
3. State two differences between square and rhombus
4. A polygon which has equal angles and sides is called -----------
5. Name 3 things in the kitchen that is circular in shape.

Week 2
TOPIC: PLANE SHAPES
CONTENTS:

- Perimeter of circles and triangles.
- Perimeter of regular quadrilaterals and polygon
- Perimeter of irregular shapes.

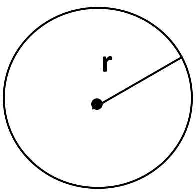
MEASURING PERIMETERS

Perimeter is the outside boundary or edge of a plane shape. For example, the boundary fence of your school compound is its perimeter. We also use the word perimeter to mean the length of the boundary.



For example, if you take 200 paces to walk your school boundary, you could say its perimeter is 200 paces.

CIRCLE



The Perimeter of a circle is called its CIRCUMFERENCE = 2∏r Where r = radius of a circle and ∏ = 22/7 or 3.14.

EXAMPLE:

The circumference of a Circle is 44cm. Find its diameter.

SOLUTION

Circumference = 2πr

2∏r = 44cm

2 x 22/7 x r = 44

44/7 x r = 44

Divide through by 44/7

r = 44 ÷ 44/7

r = 44 x 7/44

r =7cm

The diameter of a circle = 2 x radius, r.

= 2 x 7cm

= 14cm.

2. The circumference of a Circle is 44cm. Find its diameter.

SOLUTION

Circumference = 2πr

2∏r = 44cm

2 x 22/7 x r = 44

44/7 x r = 44

Divide through by 44/7

r = 44 ÷ 44/7

r = 44 x 7/44

r =7cm

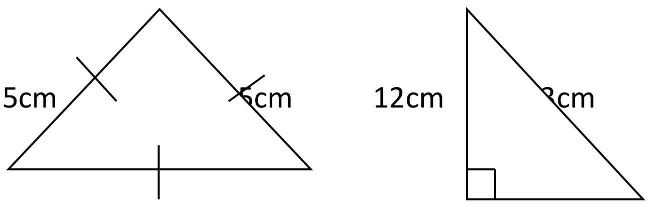
The diameter of a circle = 2 x radius, r.

= 2 x 7cm

= 14cm.

TRIANGLE

EXAMPLE: Find the perimeter of these triangles:



Solution

i. Equilateral triangles has equal sides.

Perimeter = 5cm x 3 sides = 15cm

ii. Perimeter of the triangle = 12cm + 5cm + 13cm

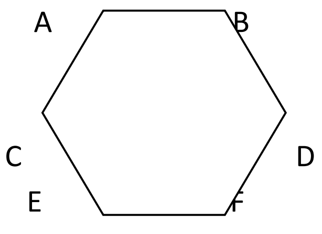
= 30cm

PERIMETER OF A REGULAR/IRREGULAR POLYGON

The simplest way to find a perimeter of any regular shape is to measure it directly with a ruler. Or tape measure.

Examples:

Find, in cm the perimeter of the regular hexagon ABCDEF in Fig. 1.0.



Length of side AB = 1.6 cm.

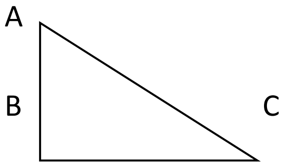
There are 6 equal sides, so

Perimeter = 6 × 1.6cm

=9.6 cm

If a shape has a curved side, use a piece of thread to get the shape of the curve. Make the thread to get the shape of the curve. Make the thread straight and measure its length against a ruler.

2. Measure the Perimeter of the shape in fig 2.0



Straight edges: AB = 14 mm =1.4 cm

BC =14 mm =1.4 cm

Curved edge: CA =22mm approximately

=2.2cm

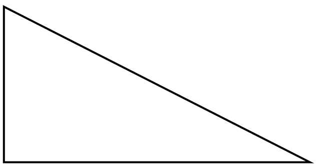
Perimeter (tota)l = 50 mm approximately

= 5.0 cm

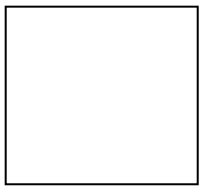
Evaluation:

Use a ruler to measure the perimeters of the shapes. Give your answers in cm.

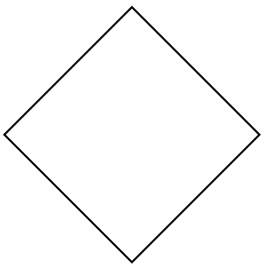
(a)



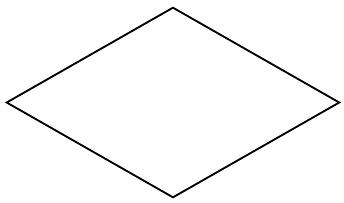
(b)



(c)



(d)



PERIMETER OF A SQUARE

A square is a regular four- sided shape. If the length of one side of a square is l, then,

Perimeter of square = $l \times 4 = 4l$

As perimeter of square =$4l$,

Length of side of square = perimeter of a square/4

Examples

(1) Calculate the perimeter of a square of side 12.3cm.

Solution

Perimeter = 12.3cm × 4

Perimeter = 49.2 cm

(2) A square assembly area has a perimeter of 56m. Find the length of the assembly area.

Solution

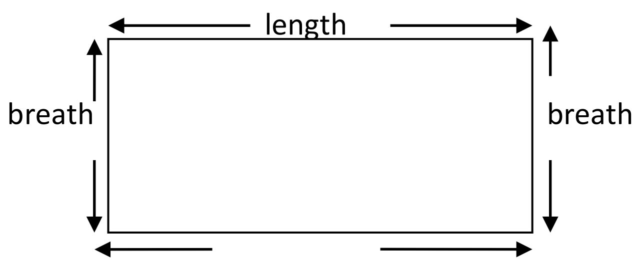
Length = $\frac{56}{4}$

= 14m.

Note: The formulae for perimeters of rectangles and squares can be useful. However, if you find it difficult to remember formulae, always sketch the given shape and work from that.

PERIMETER OF RECTANGLES

The longer side of a rectangle is called length , and the shorter side is called breath . We use the letter l and b to stand for the length and the breath.



Perimeter of rectangle = l + b + l + b

= (l + b) + (l + b)

= 2 × (l + b)

= 2(l + b)

this formula can be used to calculate the perimeter of a rectangle.

Example:

Calculate the perimeter of a football field which measures 80m by 50m.

Solution

Perimeter of field = 2(l+ b)

= 2 × (80 + 50) m

= 2 × 130m

= 260m.

(3) A rectangular piece of land measures 57 m by 42m. What is the perimeter of the perimeter of the land?

Perimeter of land = 2(l+ b)

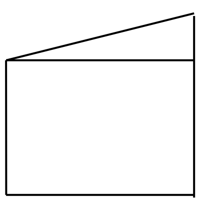
= 2(57+ 45)m

= 2× 99m

= 198m.

TRAPEZIUM

EXAMPLE 7: Find the perimeter of the Trapezium below.



2cm 5cm

4cm

Solution:

Perimeter of the rectangular bottom

= 2(L + B)

=2 (4 + 2)

= 2 X 6

= 12cm

Perimeter of the triangular top

Solution:

Let the unknown side be x. By Pythagoras's rule;

$x^2 = 3^2 + 4^2$

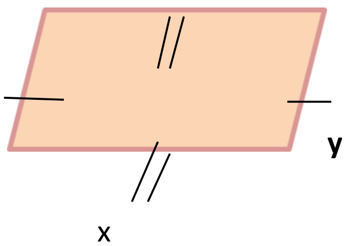
$X^2 = 9 + 16$

$X^2 = 25$

$X = \sqrt{25}$cm

X = 5cm

PARALLELOGRAM



Perimeter of a parallelogram = x + y + x + y = 2 (x + y)

EXAMPLE 5: The perimeter of a parallelogram is 48cm. If one side is 15cm, find the adjacent side.

Solution

Perimeter = 48cm, x = 15cm, y= adjacent side.

Perimeter = 2(x+y)

48 = 2(15 + y). Divide both sides by 2:

24 = 15+y

24 – 15 = y

Y = 9cm

Therefore the adjacent side = 9cm.

CLASS ACTIVITY

1. Calculate the perimeter of a circle of radius 70cm. (use the value $3\frac{1}{7}\ for\ \pi$)
2. Two sides of a parallelogram are of lengths 5cm and 8cm. calculate the perimeter of the parallelogram.

PRACTICE EXERCISE

1. Calculate the circumference of a circle of radius 70m (3⅐ for π)
2. Find the perimeter of a rectangle of length 8.5cm and breadth 4.5cm
3. What is the perimeter of a square shaped field of sides 6m?
4. Two sides of a parallelogram are of lengths 7cm and 3cm. Calculate the perimeter of the parallelogram.
5. A rectangle has a perimeter of 120m; find the length of the rectangle if its breadth is 15m.

ASSIGNMENT

1. A rectangular courtyard has a perimeter of 100m. If the side is 30m long, find the length of the other side.
2. The length of a rectangle is 10cm greater than its width. Its perimeter is 70cm. Find a) its width b) its length.
3. Calculate the circumference of a circle whose diameter is 14cm
4. The diameter of a circular wheel is 60cm. how far will the bicycle travel in 140 turns of the wheel?
5. Calculate the perimeter of an equilateral triangle of side 7cm.

WEEK 3

TOPIC: AREA OF SHAPES

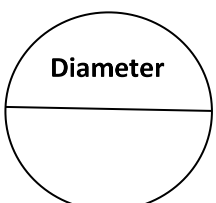
CONTENTS:

- Area of circles and triangles
- Area of regular quadrilaterals
- Area of irregular shapes

AREA OF CIRCLES

- ✓ Area of a circle = πr^2

  Where π = 22/7



Diameter = 2r, where r = radius

Example:

1. Find the area of a circle whose radius is 3½m. (Taken ∏to be 22/7)

Solution:

Area of a circle = πr^2

$= 22/7 \times (3½)^2 = 22/7 \times 7/2 \times 7/2$

$= \frac{11 \times 7}{2}$

$= 77/2\ m^2 = 38.5m^2$

2. The area of a circle is $126.5cm^2$. Find its radius correct to 2 decimal places.

Solution

Area of circle = πr^2

- $126.5\ cm^2 = 22/7\ r^2$

  $253/2 = 22/7\ r^2$

  $253 \text{ X } 7 = 22 \text{ X } 2 \text{ X } r^2$

  $r^2 = 161/4$

  $r = \sqrt{161/4}$

  r = 12.689/2

  r = 6.345

  r = 6.35 (2 d. p.)

AREA OF TRIANGLES

Any diagonal of a rectangle divided it into two equal right- angled triangles forms a right angled triangle.

Thus:

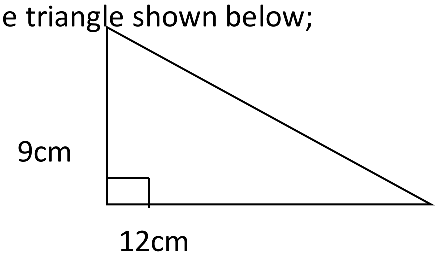
Area of a right – angled triangle

= ½ × product of sides containing the right angle.

Area of triangle = ½ × base × height.

Example:

Calculate the area of the triangle shown below;

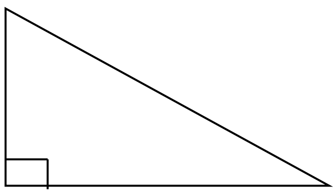


The two sides containing the right angle measure 9 cm and 12cm.

Area of triangle = ½ × 9cm × 12cm

$= 54cm^2$

(2) Calculate the height of a triangle whose base and area is 8cm and $20cm^2$ respectively.



Solution:

Area of triangle = ½ ×base × height

$20cm^2$ = ½ x 8cm x h

$20cm^2$ = 4hcm

h = $20cm^2$/4cm

h = 5cm.

Therefore, height of the triangle = 5cm.

CLASS ACTIVITY

1. Using π = 22/7, calculate the area of a circle whose diameter is 21m.
2. Find the base of a triangle whose area is $270cm^2$ and height 18cm.

AREA OF A SQUARE

A square is a shape whose length and breadth are equal

Area of a square = L^2 = (length of side)^2

Therefore

LENGTH OF SIDE = $\sqrt{AREA}$ $OF\ SQUARE$

Example

1. Find the area of a square whose side is 5cm.

Solution:

Formula for area of a square = L^2

= 5cm× 5cm

= $25cm^2$.

2. The area of a square field is $100m^2$, find the length of its side.

Solution:

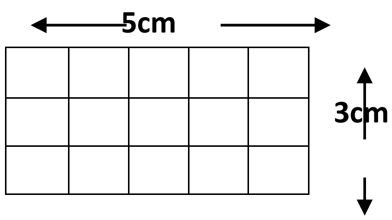
LENGTH OF SIDE = $\sqrt{AREA}$ $OF\ SQUARE$

= $\sqrt{100m^2}$

= 10m.

AREA OF A RECTANGLE

A rectangle 5cm long by 3cm broad can be divided into squares of side 1cmas shown below:



By counting, the area of the rectangle = $15cm^2$.

Notice also that $5\times3 = 15$. Thus in general:

Area of rectangle = length$\times$ breadth.

Also notice that $5 = 15 \div 3$ and $3 = 15 \div 5$

Hence,

Length of rectangle = area $\div$ breadth

Breadth of rectangle = area $\div$ length.

EXAMPLES:

1. Calculate the area of rectangle 6cm by 3.5cm

Solution:

Area of a rectangle = length $\times$ breadth

= 6cm$\times$ 3.5cm

2. The area of a rectangle is $224cm^2$. if its length is 16cm, calculate the breadth.

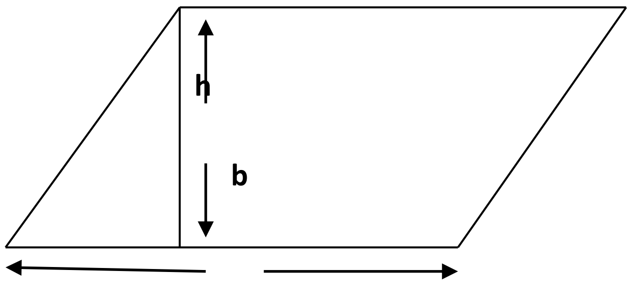
Solution:

Breadth = $\frac{area}{length}$

= $\frac{224}{16}cm$

= 14cm.

AREA OF A PARALLELOGRAM



The Area of the parallelogram, P = area of rectangle, R

= b x h

In the diagram above, the height of the parallelogram is h and its base is b.

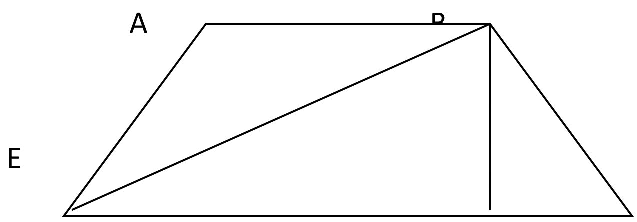
In general,

Area of parallelogram = base x height

Base of parallelogram = area $\div$ height

Height of parallelogram = area x base

AREA OF TRAPEZIUM



ABCD is a trapezium in which AB is parallel to DC. The diagonal AD divides the trapezium into two triangles. The height, h, is the same for both triangles.

area of trapezium ABCD

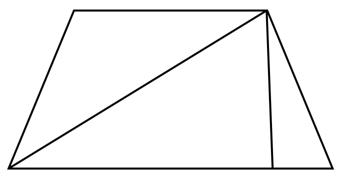
= area of $\triangle$ ABD + area of $\triangle$DC

= ½ AB × h + ½ DC × h

= ½ (AB + DC)h

Example:

Calculate the area of the trapezium ABCD in figure below;



The diagonal AC divides the trapezium into two triangles. The height of each triangle is 8 cm.

Area of $\triangle$ ACB = ½ × 13cm × 8cm =52cm^2

Area of $\triangle$ ACD = ½ × 6cm × 8cm = 24cm^2

Area of trapezium = 52cm^2 + 24cm^2 =76cm^2

CLASS ACTIVITY

1**. Copy and complete the tables of rectangles below.**

	length	**Breadth**	**Area**
A	3cm	2cm	
B	5cm	4cm	
C	5m		5m^2
D		3m	12m^2
E	5.2m	3m	
F		6cm	48cm^2
G	14cm		84cm^2

2. A floor 4m long and $3\frac{1}{2}$m wide is to be concreted. Find the

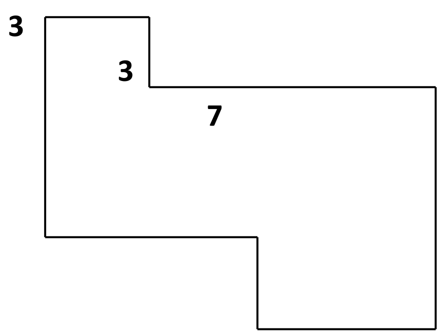
(a) The area of the floor

(b) The cost, if concrete cost N200 per m^2.

Area of irregular shapes.

(c) Example:

(d) Calculate the area of the shape below. All measurements are in meters and all angles are in right angles.

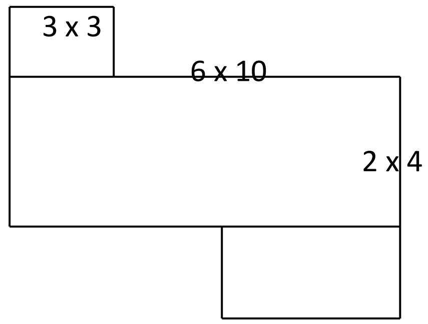


8

2

Solution: 4

The shape can be split into a 3x3 square and 6x10 and 2x4 rectangles



Area = area of square + area of the 2 rectangles = $(3 \times 3 + 6 \times 10 + 2 \times 4)m^2$

$= (9 + 60 + 8)m^2$

$= 77m^2$

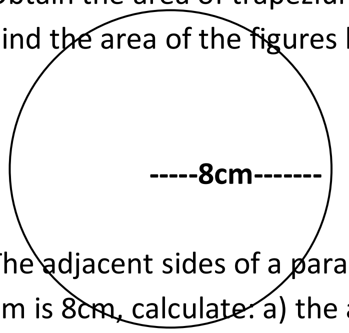
PRACTICE EXERCISE

1. The area of a parallelogram is $20cm^2$, the base is 16cm. Find its height.
2. Ada has a small square garden of 250cm. What is its area in m^2?
3. Find the area of a circle whose circumference is 154cm
4. The area of a trapezium is $81cm^2$ and its height is 6cm. Find the longer side if the shorter side is 11cm.
5. Find the area of a tank which measures 25cm by 10cm.

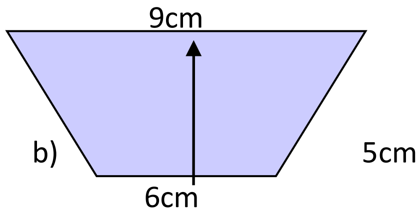
ASSIGNMENT

1. Find the area of a circular disc of diameter 28cn
2. Calculate the area of parallelogram whose base is 6cm and height is 2.5cm
3. Obtain the area of trapezium whose lengths of parallel sides are 3cm and 7cm and height is 6cm.
4. Find the area of the figures below:

a)



b)



5. The adjacent sides of a parallelogram are 16cm and 12cm. If the height corresponding to the base 12cm is 8cm, calculate: a) the area of parallelogram;

b) The height corresponding to the base 16cm.

WEEK 4

TOPIC: Three dimensional shapes (solids)

Content:

(a) Identification and naming of solids.

(b) Basic properties of prism (cubes, cuboids and cylinders)

(c) Basic properties of pyramids and cones

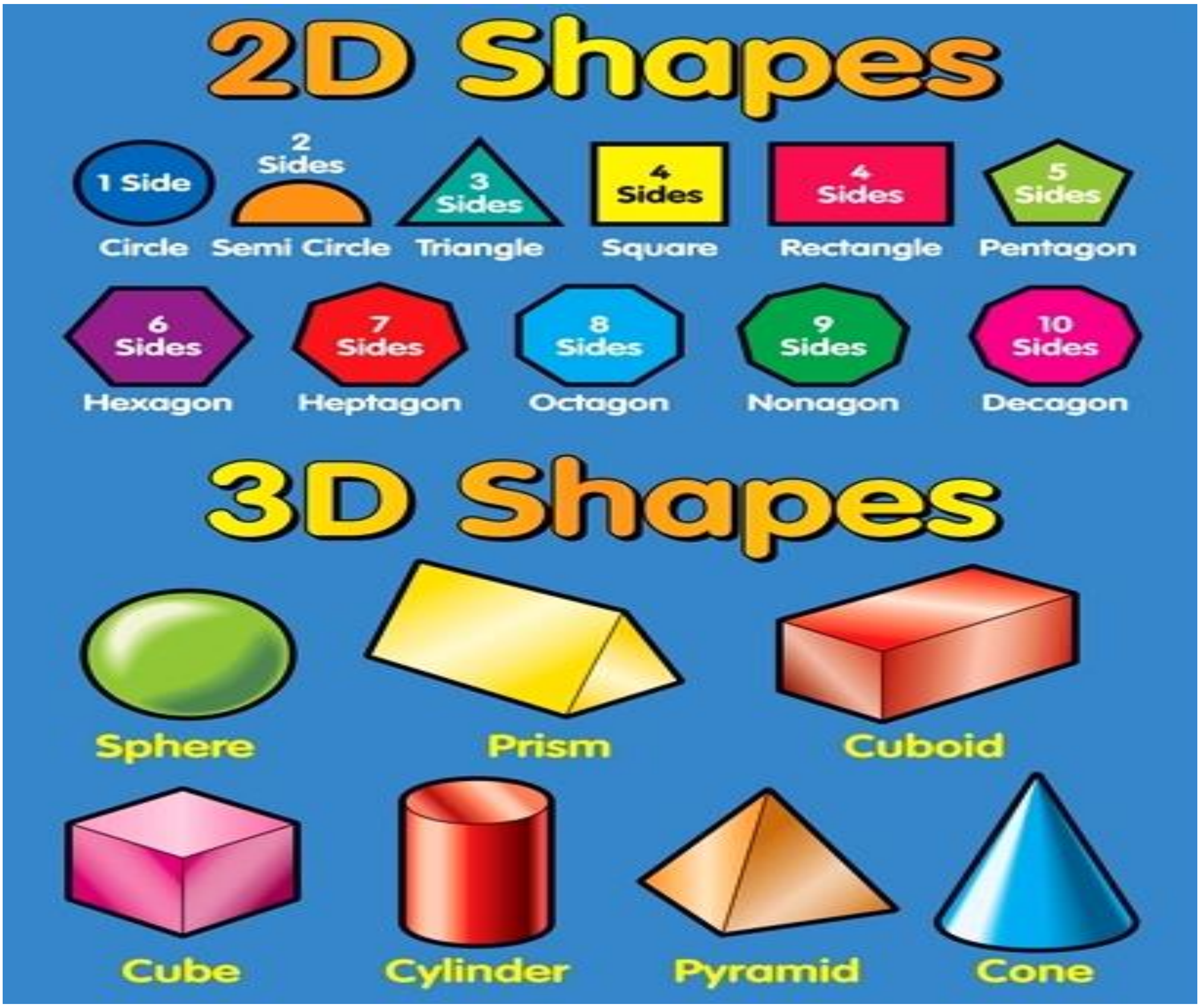
(d) Basic properties of spheres

(e) Net of shapes: drawing and making the models of solids

(f) Volume of cubes and cuboids

IDENTIFICATION AND NAMING OF SOLIDS

Solid figures are often called **3 – dimensional shapes** or **3 – D shapes**. A solid figure is simply anything that occupies space and also has a definite shape. Most solids, or 3 – D shapes, such as stones and trees, have rough and **irregular** shapes. However, some solids, such as boxes, tins, football, etc. have **regular** shapes. These are often called **geometrical solids.**



Examples of 2-D and 3–D shapes

BASIC PROPERTIES OF PRISMS

A **Prism** is a solid figure with ends. It has base and top (opposite) faces that are parallel and are of the same size and shape. Its sides have opposite edges that are equal and parallel. The common prisms are cubes, cuboids and cylinders. Other are named after the shape of their top and bottom faces e.g. a prism with a triangle as its base is a triangular based prism, etc.

A **face (f)** is any plane surface that makes up prism.

An **edge(E)** is a line where two faces meet. it may be straight or curved.

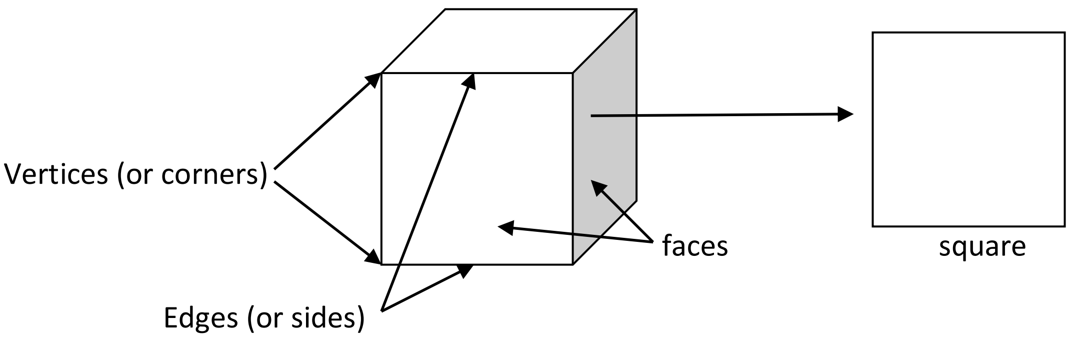
A **vertex(V)** is a point or corner where three or more edges meet. The plural of vertex is **vertices**.

A prism with n-sides has the following properties:

(i) n + 2 number of faces
(ii) 3n edges
(iii) 2n vertices

CUBE

Examples: a cube of sugar, maggi cube, dice, etc.

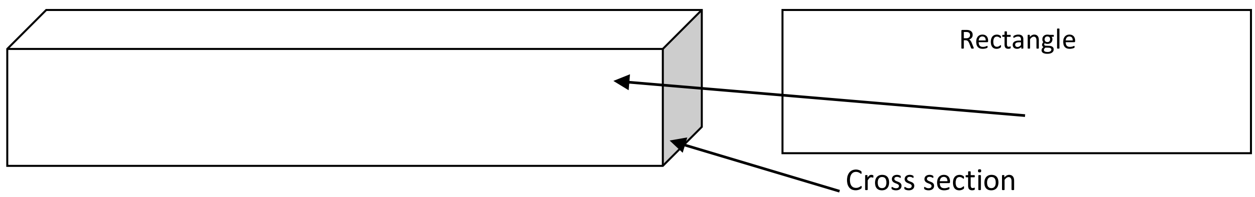


<u>**Properties**</u>

(i) A cube is a special cuboids which has all its edges (sides) equal in length.
(ii) They have 6 equal faces in the shape of a shape.
(iii) Cubes have 12 edges.
(iv) They have 8 vertices.

Cuboid

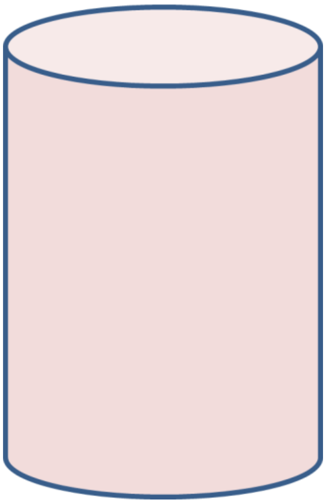
Examples: toothpaste box, Desk (locker), etc.



(i) A cuboid has 6 plane faces in the shape of a rectangle.
(ii) At least two opposite faces are equal.
(iii) Cuboids have 12 edges.
(iv) They have 8 vertices.

CYLINDER

Examples: Milk tin, water drum, etc.



(i) A cylinder is a prism whose cross-section is a circle
(ii) Three faces: Two circular flat faces and one curved face.
(iii) Two circular edges.
(iv) No vertex.

CLASS ACTIVITY

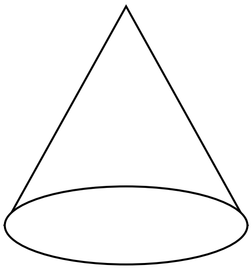
3- D Shape	No. of faces	No. of edges	No. of vertices	V – E + F
Triangular prism				
Heptagonal prism				
Decagonal prism				
Cylinder				

BASIC PROPERTIES OF PYRAMIDS AND CONES

A **Pyramid** is a solid figure whose base is a polygon and whose lateral faces (surfaces) are triangles with a common vertex called a pyramid. Pyramids are classified according to their bases and named after the shape of their bases e.g. a pyramid with a triangle as its base is a triangular based pyramid, etc.

CONE

Examples: Sharpened point of a crayon or pencil, mound of groundnut, ice-cream, etc.



(i) A cone has only one vertex
(ii) A circular edge.
(iii) One vertex
(iv) One curved surface
(v) A circular flat face
(vi) A cone has two faces

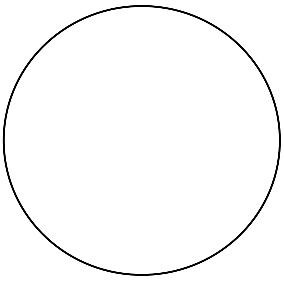
CLASS ACTIVITY

3- D Shape	No. of faces	No. of edges	No. of vertices	V – E + F
Cone				
Square-based pyramid				
Hexagonal prism				
Tetrahedron				

PROPERTIES OF SPHERES

Sphere

Examples: a Ball, table tennis egg, etc.



A tennis ball

Sphere

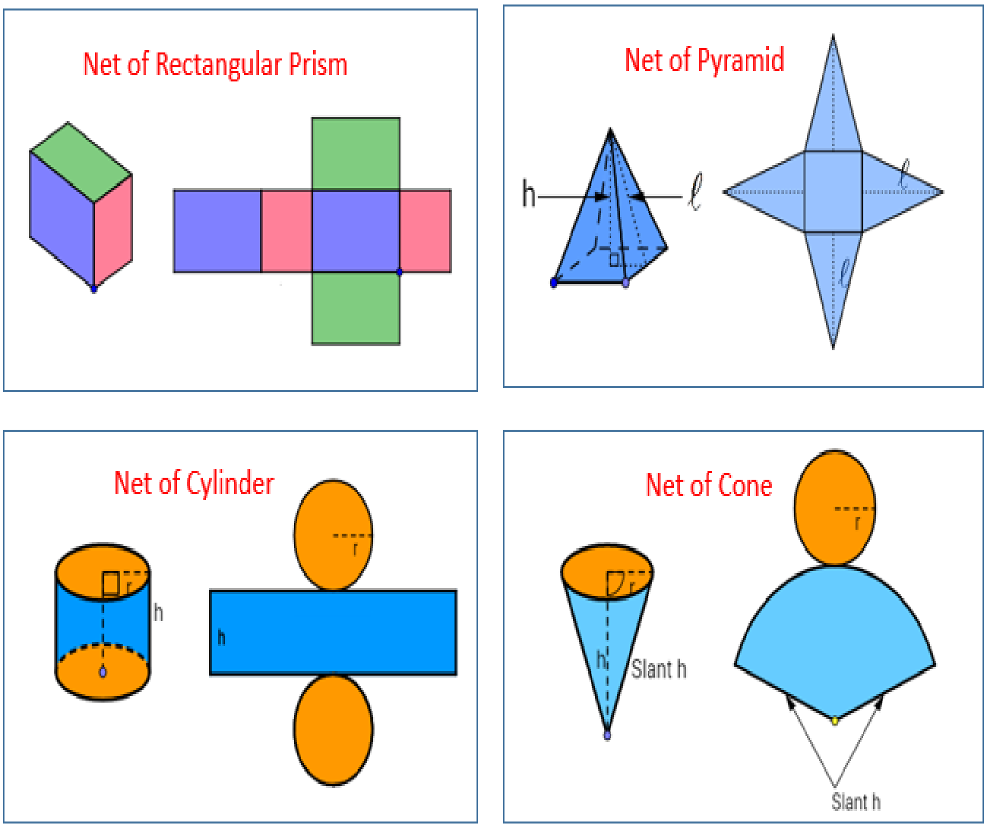
Properties of a sphere

(i) It has only one spherical face in its entire surface

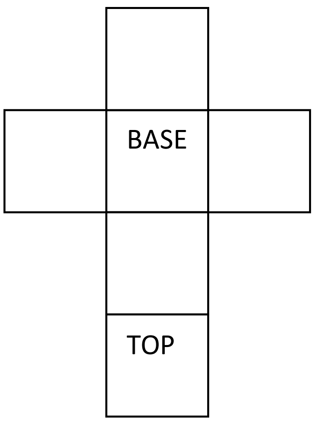
(ii) It has no edges and no vertex

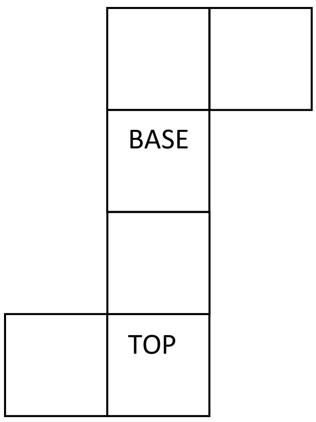
3- D Shape	**No. of faces**	**No. of edges**	**No. of vertices**	**V – E + F**
Sphere				

Nets of Solids

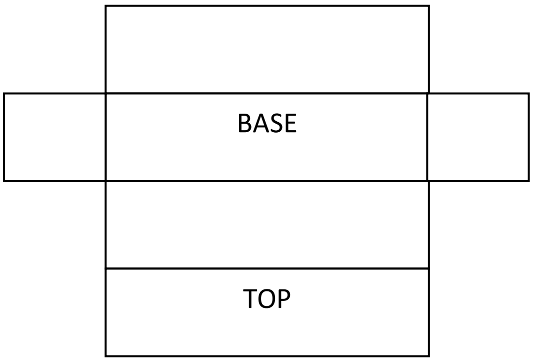


CUBES



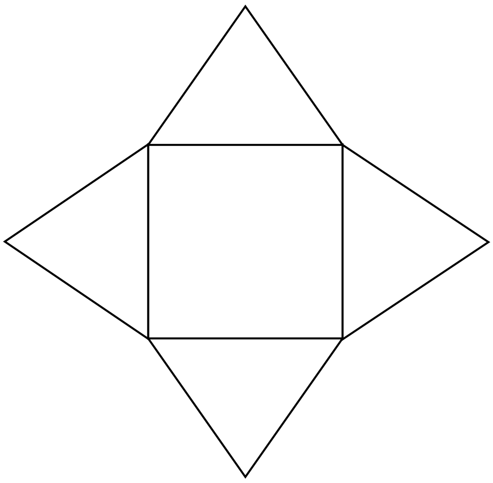


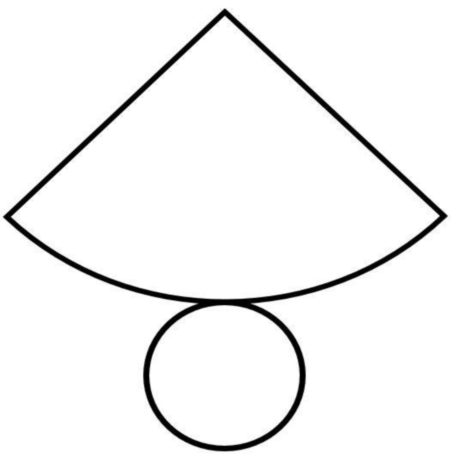
CUBOIDS



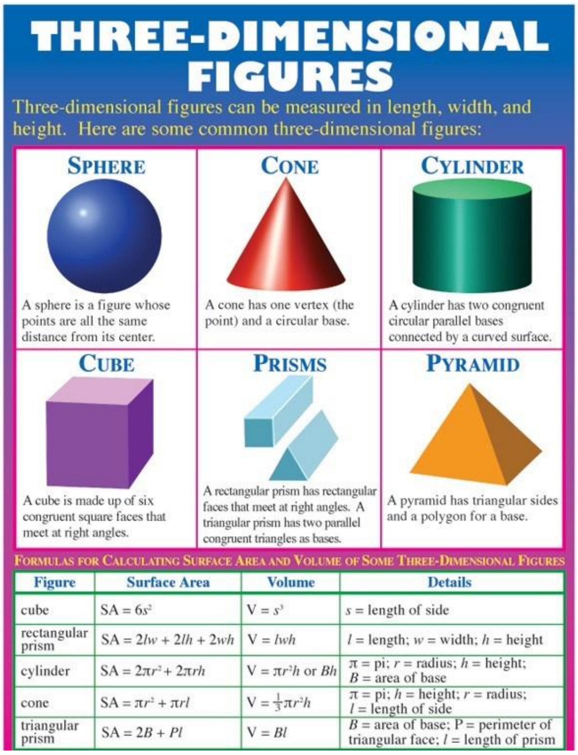
CLASS ACTIVITY

Mention two properties each of the solids which have the following nets:





VOLUME OF CUBES AND CUBOIDS.



The volume of a solid is a measure of the amount of space it occupies. The cube is used as the basic shape to estimate the volume of a solid. Therefore, volume is measured in cubic units.

CUBES

If one edge of a cube is s unit long, then

Volume of a cube = side x side x side

i.e. $V = s \times s \times s$

$= s^3$

WORKED EXAMPLES

1. Calculate the volume of a cube of an edge 4cm.

Solution

Volume of a cube = length x height x width

= s x s x s

= 4 x 4 x 4

= $64cm^3$

NOTE: The above formula can be used to find the edge of a cube when the volume is given.

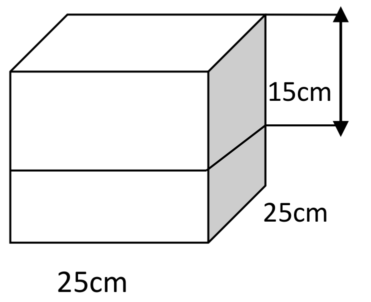
$S^3 = V$

S = $\sqrt[3]{V}$

e.g. A cube of volume of $27cm^3$ has an edge of

s = $\sqrt[3]{s} = \sqrt[3]{27} = \sqrt[3]{3\ x\ 3\ x\ 3}$ = 3cm

2. A container in the shape of a cube is used to store a liquid. One edge of the container is 25cm long. The depth of the liquid in the container is 15cm as shown in the diagram below.
   a. calculate the volume of liquid in the container
   b. calculate the volume of the container not filled with liquid.



Solution

a. Base area of the container = 25 x 25

= $625cm^2$

Depth of liquid in the container = 15cm

Volume of liquid in the container = 625 x 15 = $9375cm^3$

b. Volume of the cube = S^3 = 25 x 25 x 25

= 15 $625cm^3$

Volume of the container not filled liquid

= 15 625 − 9 375

= 6 $250cm^3$

CUBOIDS

A cuboid is also called a **rectangular prism**. It has length, width (breadth) and height (thickness).

The volume of a cuboid = length x breadth x height

$$V = l \times b \times h$$

The volume of the above solid is

$$V = 6 \times 4 \times 2 = 48cm^3$$

Note: In the above formula, l x b = A. Where A = base area of the cuboid.

Hence: Volume of a cuboid = Area of base x height

= Area of any face x thickness of the face.

WORKED EXAMPLES

1. A box has a square base of side 9cm. Calculate the volume of the box if it is 10cm deep.

<u>Solution</u>

Volume of the box = Area of Square base x depth of the box

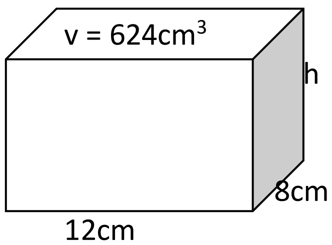
Area of Square base = 9cm x 9cm

= $81cm^2$

Volume of the box = 81 x 10

= $810cm^3$

2. A cuboid is 12cm long and 8cm wide as shown in the diagram below. If the volume of cuboid is $624cm^3$, find the height of the cuboid.



Solution

Length x width x height = volume

i.e l x w x h = V

Substituting V =$624cm^3$, l = 12cm and w = 8cm

12 x 8 x h = 624

96h = 624

$h = \frac{624}{96} = 6.5cm$

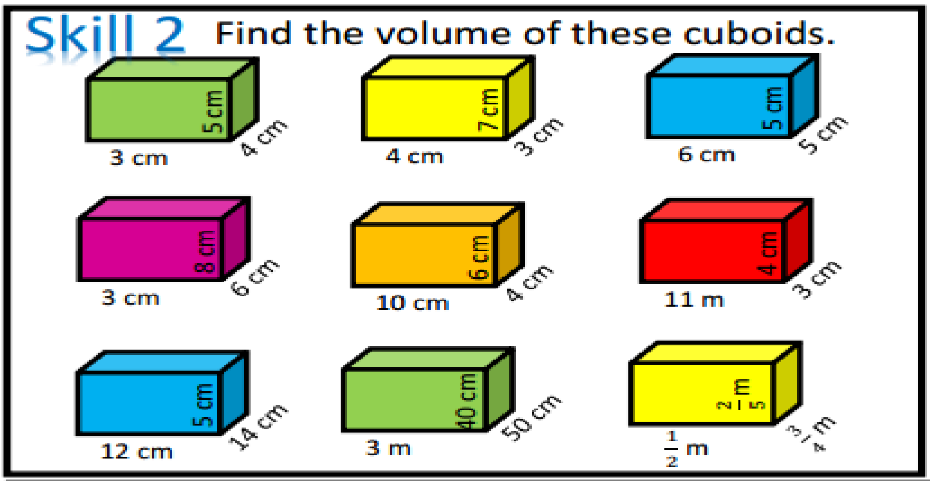
Hence, the height of the cuboid = 6.5cm.

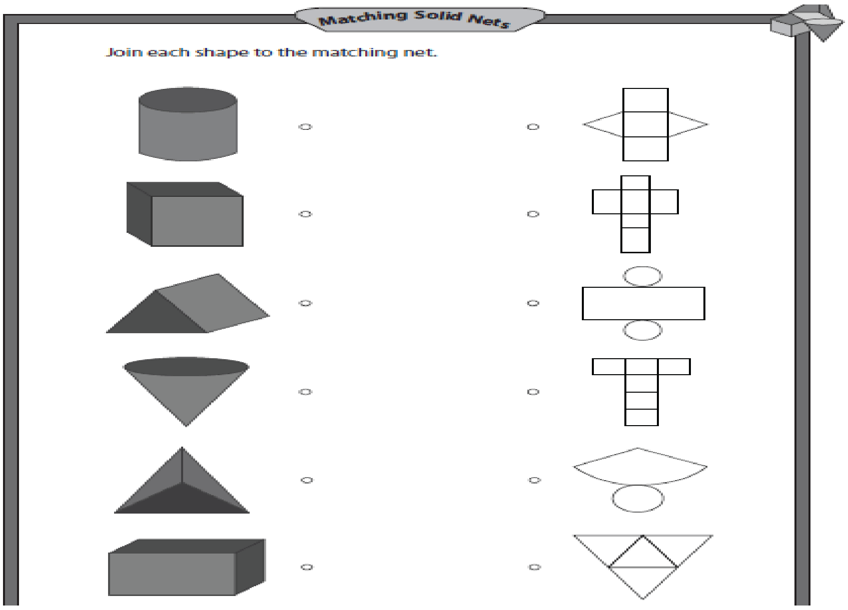
CYLINDER

CLASS ACTIVITY

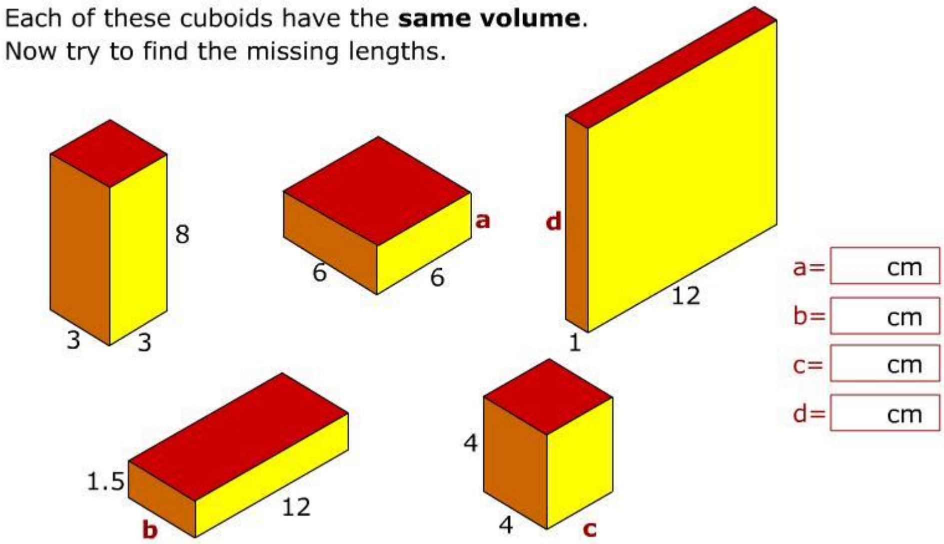
1. A book measures 18cm by 12cm by 3cm. Calculate its volume.
2. The volume of a cube is given as 512cm^3
   a. What is the length of one edge of the cube?
   b. How many small cubes of edge 2cm can be placed together to make this cube?
3. The base of a cuboid has one side equal to 10cm, and the other side is 5cm longer. If the height of the cuboid is 7cm, find the volume of the cuboid.
4. Calculate the volume of air in a dormitory 10cm long, 5m wide and 3m high.

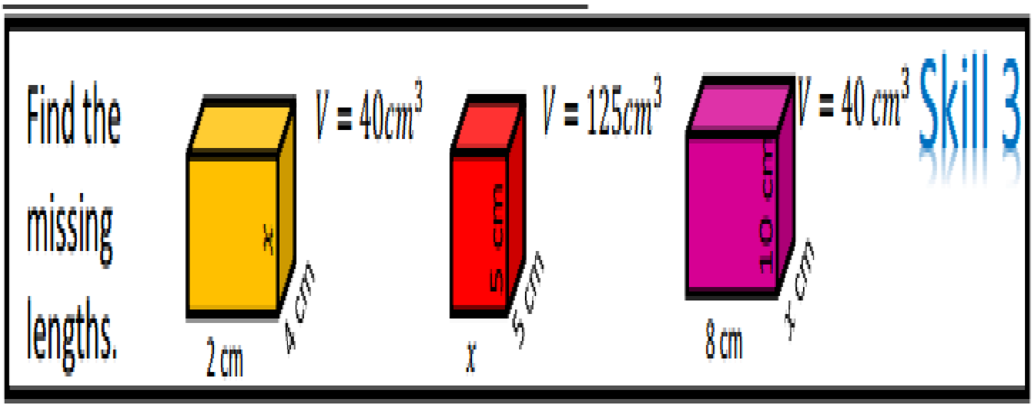
ASSIGNMENT





PRACTICE QUESTIONS





WEEK 5

TOPIC: CONSTRUCTION

CONTENT:

- ✓ **Construction of parallel lines and perpendicular line**
- ✓ **Bisection of a given line segment**
- ✓ **Construction of angles 90 and 60 degrees**

Construction

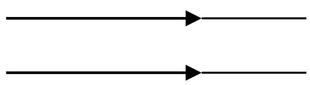
To **construct** a figure in geometry implies to draw it accurately. The proper use of measuring and drawing instruments such as protractor, ruler, sets square, pencil, etc will enhance accurate construction.

NOTE:

- ✓ Always make a **rough sketch** of what you are going to draw before starting construction questions.
- ✓ The teacher should introduce all the instrument of geometric construction to the students and students should be able to identify each and know their uses.

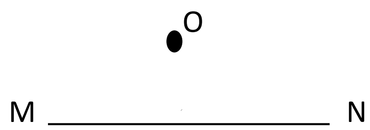
CONSTRUCTION OF PARALLEL LINES

Parallel lines are lines that do not meet. They always have the same distance apart and are in the same direction.



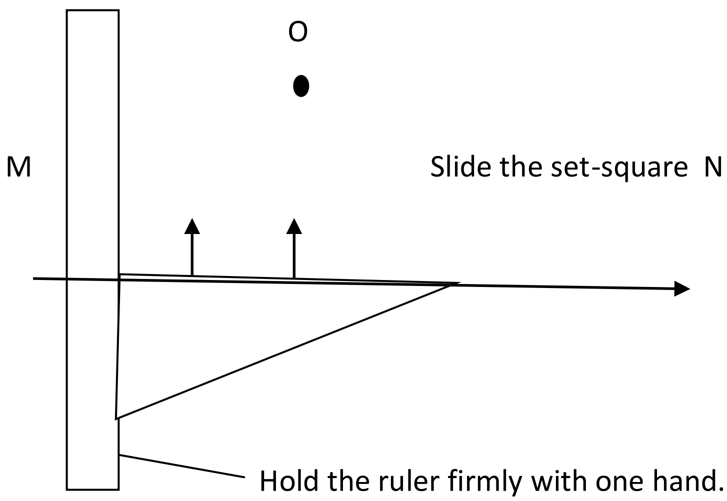
Examples

1. Construct accurately a line through O so that it is parallel to line MN.



Solution

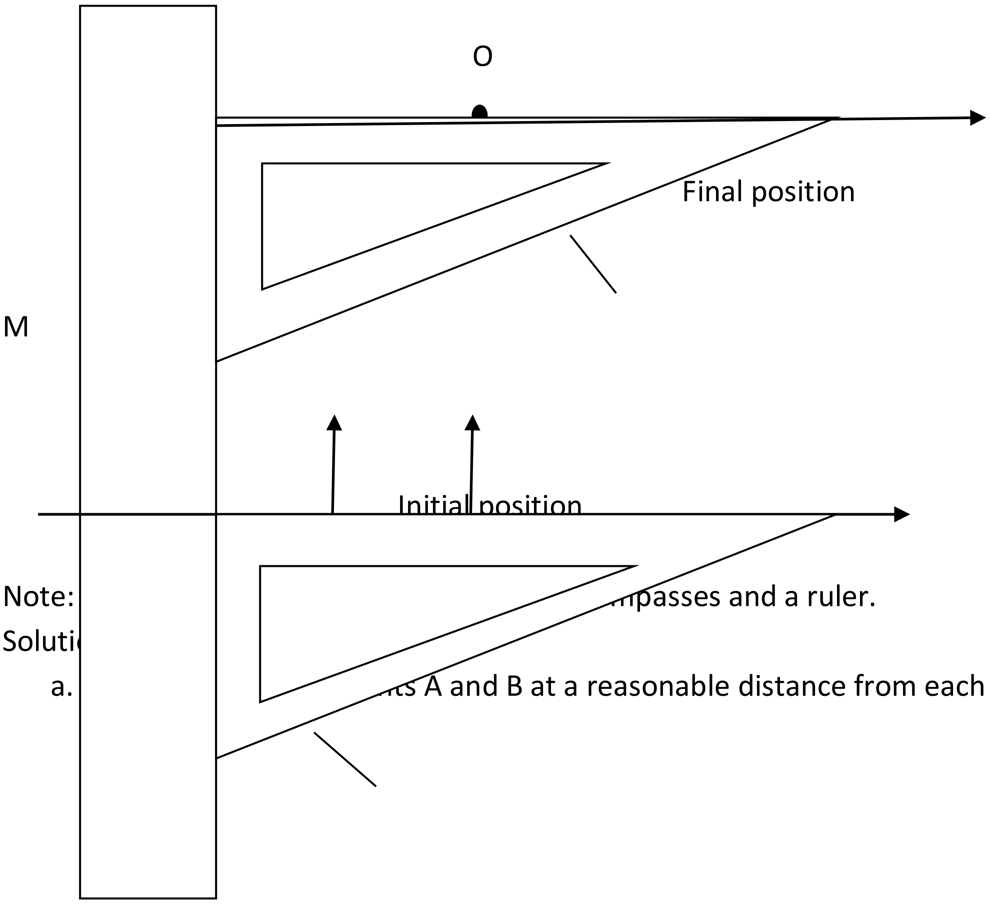
a. Place one edge of the set-square along the given line (i.e. MN) as shown in the diagram below.



b. Place a ruler along one of the other edges of the set square as shown in the diagram.

c. Hold the ruler firmly with one hand and then slide the set -square with the second hand along the edge of the ruler until you reach point O.

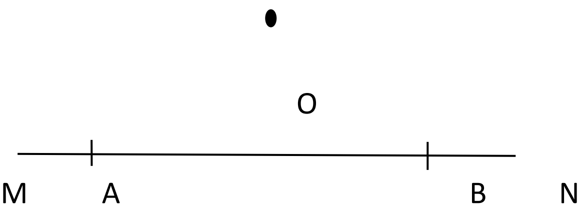
d. Draw the line with a sharp pencil.



Note: ... mpasses and a ruler.

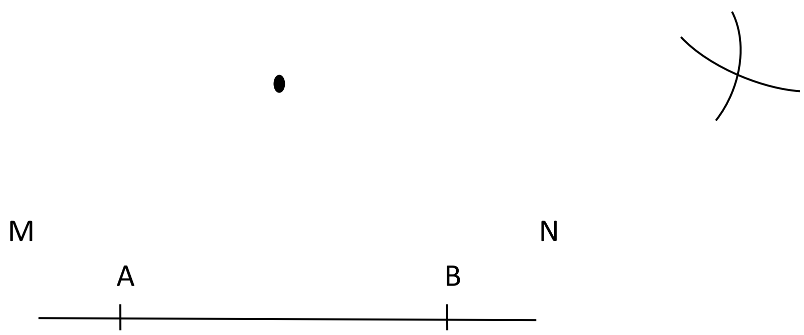
Soluti...

a. ... ts A and B at a reasonable distance from each other on line MN.

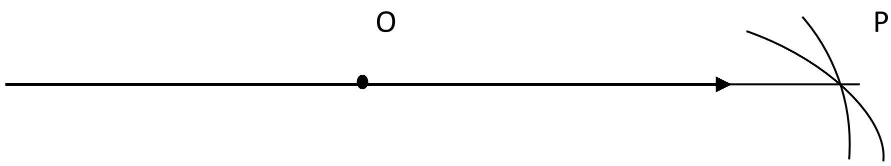


b. Open the compasses to radius AB. Then, place the compasses at O and draw an arc above B.

c. Open the compasses to radius AO. Then, place the compasses at B and draw an arc to cut the first one at P.



d. Draw a straight line passing through O and P. Thus OP // MN.

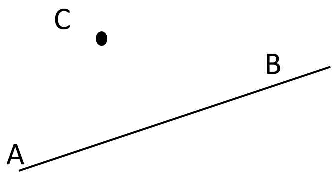


M N

A B

CLASS ACTIVITY

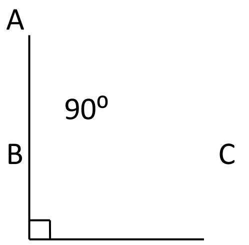
1. Draw accurately a line through C parallel to AB in the diagram below.

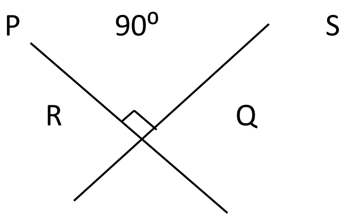


2. Draw lines parallel to each of the following lines using the given distances.
   a. RS = 7 cm, 4cm apart
   b. EF = 6.5 cm, 3 cm apart.

CONSTRUCTION OF PERPENDICULAR LINES

Two lines are said to be perpendicular to each other if they intersect at right angles (i.e. 90^o)



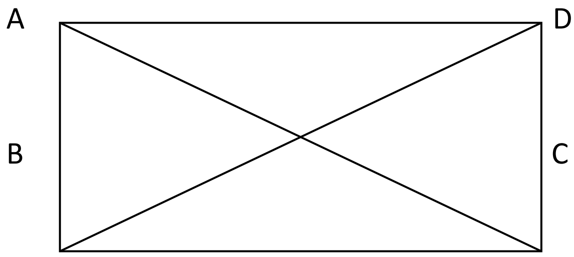


$AB \perp BC$ $PQ \perp RS$

EXAMPLE 1

Using ruler and set-squares only, construct a rectangle of sides 6cm by 4cm. Measure the diagonals. It is obtained by drawing the line AB and CD

perpendicular to AD and equal to 4cm each. The diagonals are 7.3cm long each as shown below

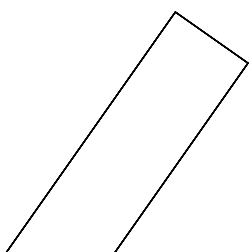


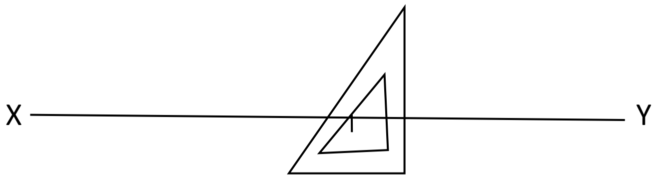
TO DRAW A PERPENDICULAR LINE FROM A POINT ON A LINE

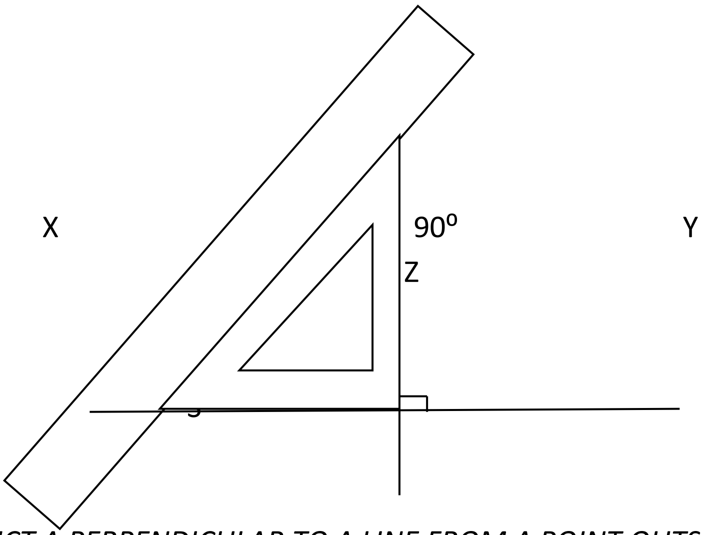
a. Place one edge of the right angle of the set-square along the given line (i.e. XY).

b. Place a ruler along the hypotenuse as shown below.

c. Hold the ruler firmly with one hand and then slide the set-square with the second hand along the edge of the ruler until the required position Z is reached as shown in the diagram below. Then draw a line through R.

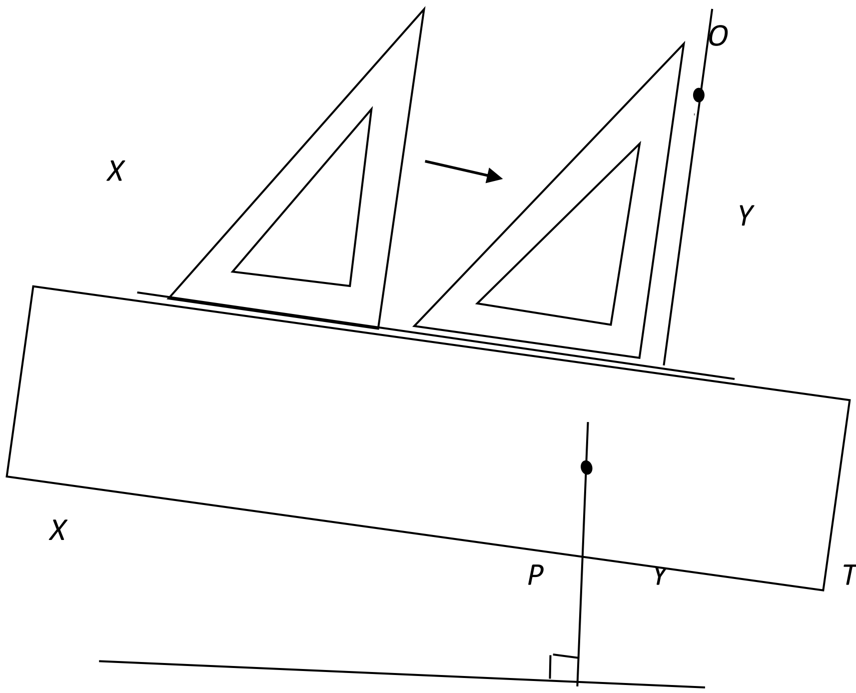






TO CONSTRUCT A PERPENDICULAR TO A LINE FROM A POINT OUTSIDE THE LINE

To draw a line through O perpendicular to XY in the diagram below



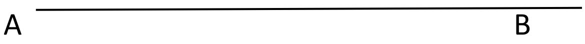
Thus, OP $\perp$ *XY.*

a. *Place a ruler along line XY.*
b. *Place one edge of the right angle of the set-square along XY.*
c. *Hold the ruler firmly and then slide the set-square along the ruler until the vertical edge reaches the point O.*
d. *Hold the set-square firmly and use a pencil to draw a line through O to meet XY at P.*

EVALUATION QUESTIONS

1. Draw a line RS = 6cm.
   a. Mark three points A, B and C at the same distance apart on the line.
   b. Using a ruler and set-square, draw a perpendicular to the line RS at each of these points.
   c. What do you notice about the three lines?
2. a. Construct a rhombus of sides 5cm with an obtuse angle of size 100^0.
   b .Measure the diagonals and the angles between them. What do you notice?

Bisection of a given line segment



The line segment AB is the part of the line between A and B, including the points A and B.

To bisect the line segment AB means to divide it into two equal parts.

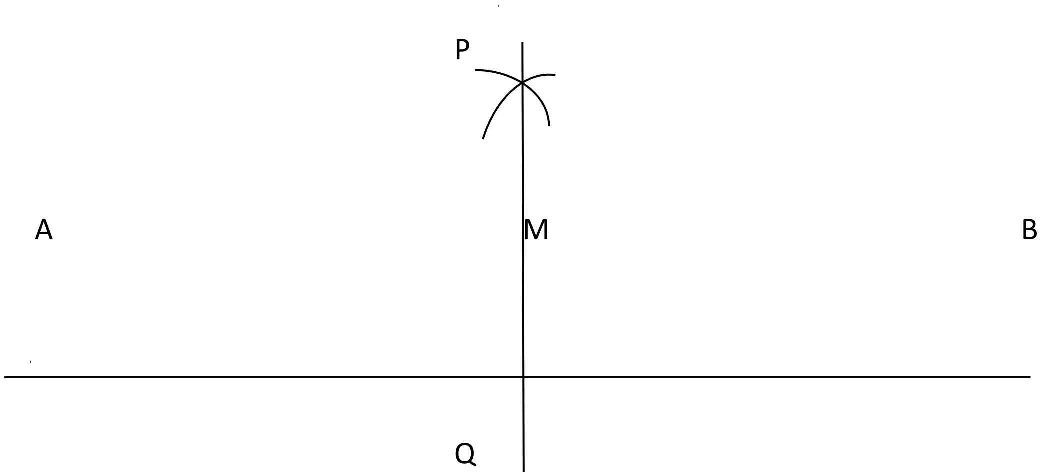
Steps to bisect a straight line segment

(i) Open a pair of compasses using a convenient radius of the length of AB

(ii) Place the sharp point of the compasses on A. Draw two arcs, one above, the other below the middle of AB.

(iii)Keep the same radius and place the sharp point of the compasses on B. Draw two arcs so that they cut the first arcs at P and Q.

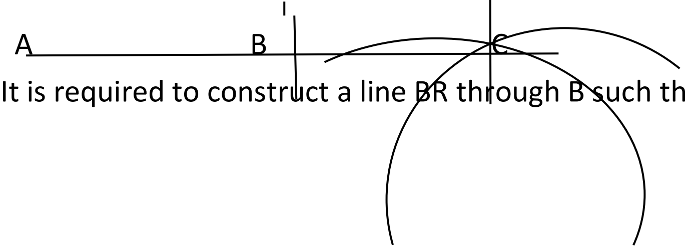
(iv) Draw a straight line through P and Q so that it cuts AB at M



Construction of angles 90 and 60 degrees

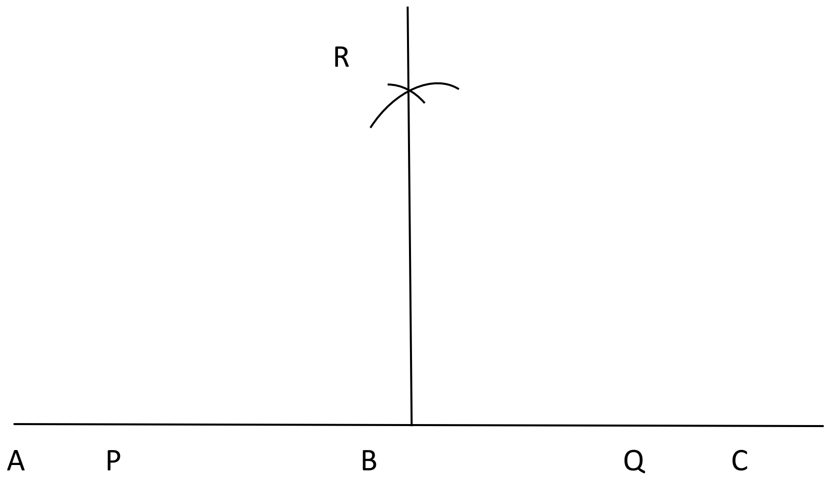
Angle 90 degree

Given a point B on a line AC



It is required to construct a line BR through B such that $R\hat{B}A = R\hat{B}C = 90°$

(i) With Centre B and a radius draw arcs to cut AC at P and Q
(ii) With centre P, Q and equal radii, draw arcs to cut each other at R
(iii) Join BR



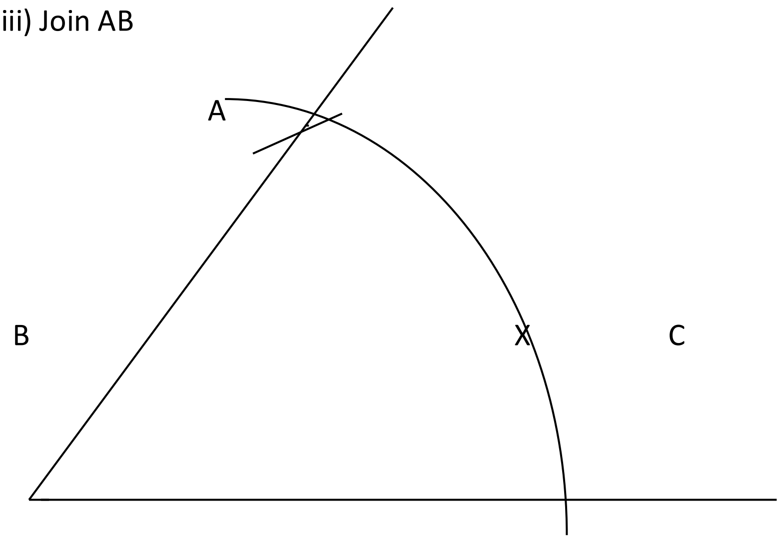
BR is perpendicular to AC .Thus R$\hat{B}$A =R$\hat{B}$C =90°. Use a protractor to check this result.

Angle 60 degree

Given a straight line B

A C

To construct a point A such that A$\hat{B}$C = 60°
(i) With centre B and any radius, draw an arc to cut BC at X .
(ii)With centre X and the the same radius as in (i), draw an arc to cut the first arc at A.
(iii) Join AB



<ABC = 60°. Use a protractor to check that A$\hat{B}$C

PRACTICE EXERCISE

1. Which mathematical set instrument is used for drawing arcs, curves and circles?
2. Draw the following angles using your set squares: a) 30^0 b) 150^0 c) 135^0
3. Use a ruler and set square to construct a pair of parallel lines that are 4cm apart
4. Construct <BAC = 60^0
5. Construct <XYZ = 90^0

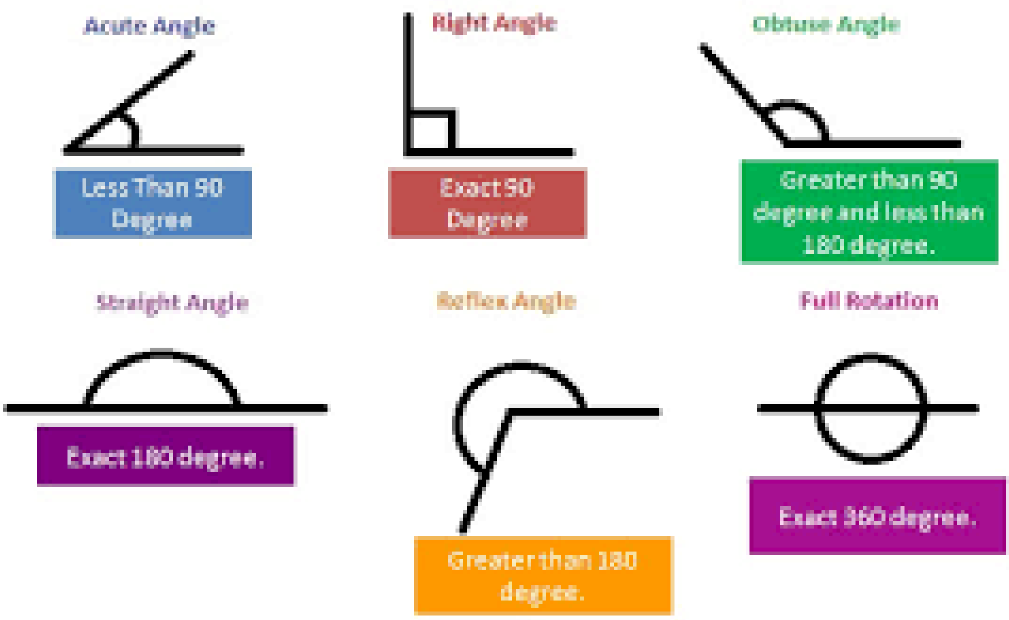
WEEK 6.
TOPIC: ANGLES
CONTENTS

- Naming of angles (acute, right, complementary, obtuse, straight, supplementary reflex angles and angle at a point
- Units and measurement of angles
- Angles between lines (vertically opposite, angle on a straight line and angle at a point).
- Angles between parallel lines (adjacent, alternate and corresponding angles).

Names of Angles

As the Angle Increases, the Name Changes:

Type of Angle	Description
Acute Angle	an angle that is less than 90°
Right Angle	an angle that is 90° exactly
Obtuse Angle	an angle that is greater than 90° but less than 180°
Straight Angle	an angle that is 180° exactly
Reflex Angle	an angle that is greater than 180°



SUPPLEMENTARY ANGLES

Two Angles are Supplementary when they add up to 180 degrees.
They don't have to be next to each other, just so long as the total is 180 degrees.
Examples:
60° and 120° are supplementary angles.
93° and 87° are supplementary angles.

COMPLEMENTARY ANGLES

Two Angles are Complementary when they add up to 90 degrees (a Right Angle).
They don't have to be next to each other, just so long as the total is 90 degrees.
Examples:
60° and 30° are complementary angles.
5° and 85° are complementary angles.

CLASS ACTIVITY

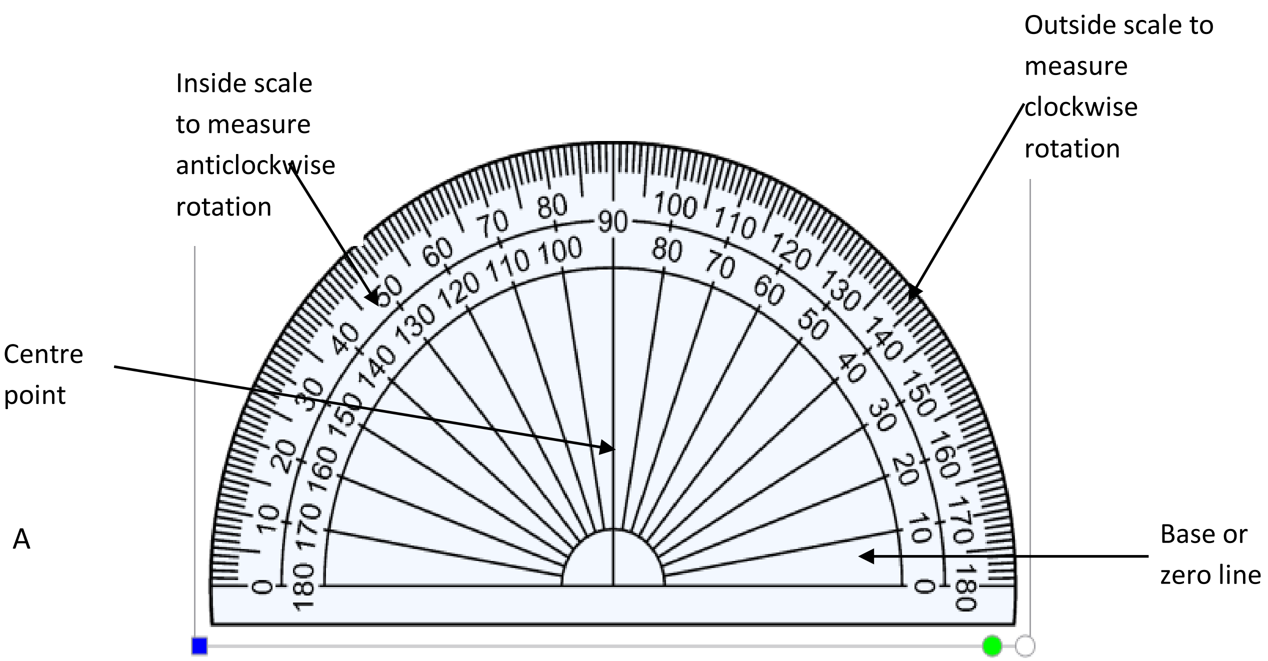
1. Find the angle that is complementary to a) 75^0 b) 105^0.

2. Classify each of the following angles into its appropriate type:

a) 125^0, b) 198^0 c) 86^0

Measurement of angles

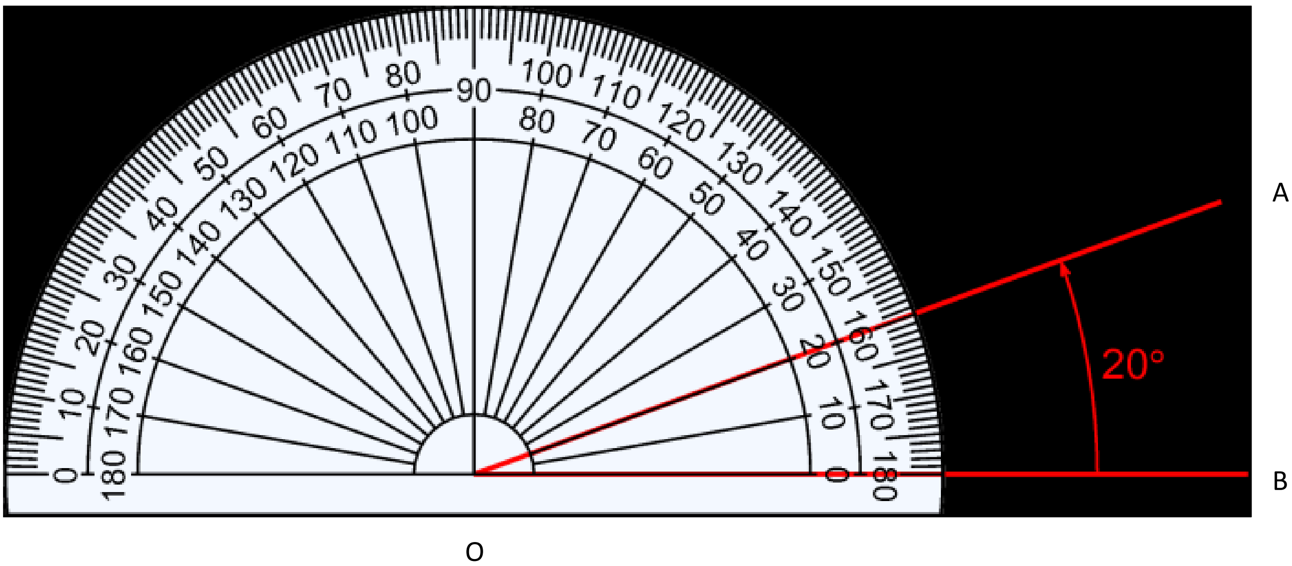
The **protractor** is a mathematical instrument used for measuring and drawing angles. Angles are measured in degrees.



protractor may be semicircular (i.e. 180 protractor) or circular (i.e. 360 protractor)in shape. There are two types of scales shown on a protractor, one is clockwise scale and the other is anticlockwise scale as shown above.

Example

Measure angle AOB with your protractor



SOLUTION

a. *Place* the centre point, O, of the protractor on the vertex (i.e. where the two arms of the angle meet) in such a way that the zero line of the protractor coincides with line OA of the angle. Yo*u may* need to extend lines OA and OB.

b. *Count round the nu*mbers from *point B as shown above.*

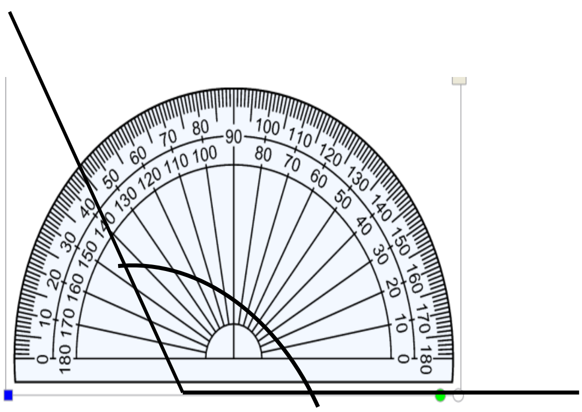
c. *Read off the measurement from the inner scale to obtain 20* .^{0}

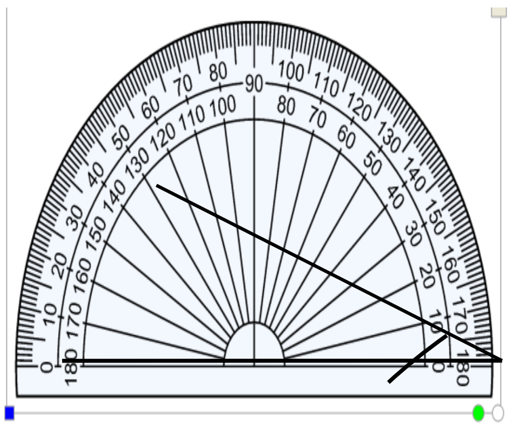
CLASS ACTIVITY

1. Draw an angle 110 with a protractor.

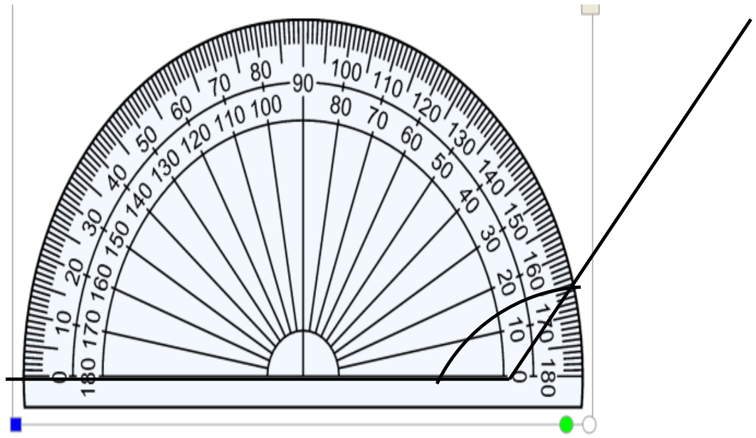
2. Write down the sizes of these angles.

a.

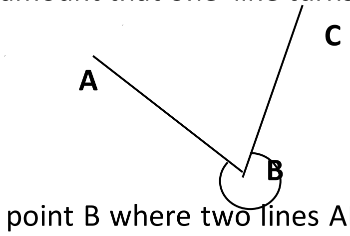




c)



IDENTIFICATION OF ANGLES: When two lines meet at a point, they form an angle. An angle is defined as the amount that one line turns through to meet the other line.



The point B where two lines AB and CB meet is called the vertex. Lines AB and BC are called the arms of the angle. If the direction (turning) of a line is same as the direction of a clock then such rotation is called clockwise rotation. If the direction is in the opposite direction it is called as anti-clockwise or counter -clockwise rotation. In the drawing above, the angle at point B can be expressed as $A\widehat{B}C$ or $\hat{B}$ or $\langle ABC \quad or \ \langle CBA$. (teacher to explain these notations).

(ii). Properties of angles.

Definitions:

(i) Any line drawn across set of parallel lines is referred to as a transversal.

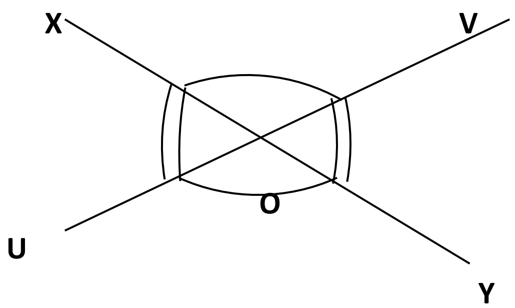
(ii) Angles are said to be supplementary if their sum gives two right angles (180^0)

(iii) Angles are said to be complementary if their sum gives one right angle (90^0).

When a transversal cuts across a set of parallel lines we have the following three principles or laws of angles in display: Corresponding angles, Alternate angles, Co-Interior or Allied angles. Notes: Corresponding angles are equal. Alternate angles are equal, but Co-interior or allied angles are supplementary. These three laws require parallelism.

Vertically opposite angles

When two straight lines intersect, they form four angles; two angles opposite to each other are said to be vertically opposite.



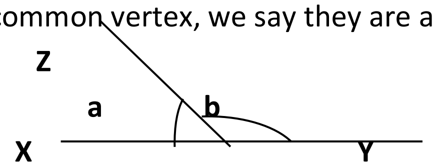
Vertically opposite angles are equal. Hence, <XOV = <UOY; <XOU = <VOY.

CLASS ACTIVITY

a. Use your protractor to measure the following angles; <XOU, <XOV, <UOY and <VOY.
b. What do you notice?

Adjacent angles on a straight line

In the diagram below, <XOY is a straight line, <XOZ and <YOZ lie next to each other, and they are referred to as adjacent angles on a straight line. In other words, when two angles lie beside each other and have a common vertex, we say they are adjacent to each other.



Since the sum of angles on a straight line is 180^0, <XOZ + <YOZ = 180^0 . i.e. $a + b = 180^0$

The sum of adjacent angles on a straight line is 180^0 .

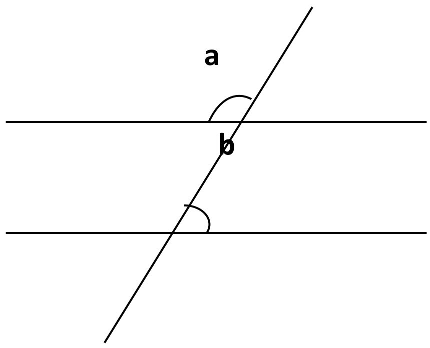
CLASS ACTIVITY

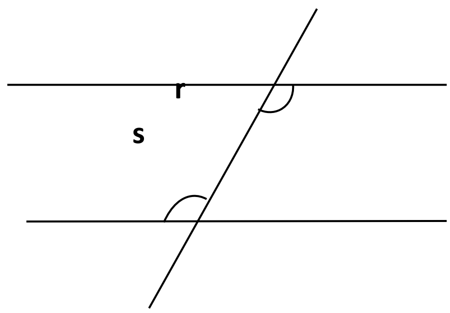
a. Use your protractor to measure angles labeled a and b.
b. Add angles a and b. What do you notice?

NOTE: Adjacent angles are said to be supplementary.

Alternate angles

Alternate angles are equal.





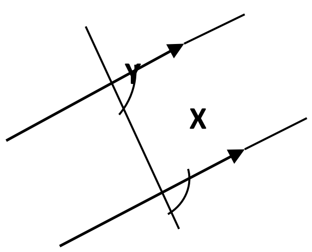
In the diagram drawn above a is alternate to b and r is alternate to s

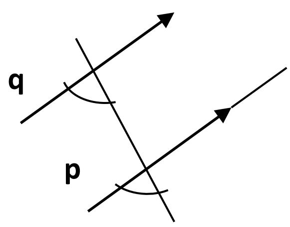
CLASS ACTIVITY

a. Use your protractor to measure the angles labeled a, b, r and s.
b. What is your observation?

Corresponding angles

Corresponding angles are equal.





CLASS ACTIVITY

Use your protractor to measure the angles labeled x and y and then p and q in the in the diagram above. What do you notice?

NOTE: Angles x and y are called corresponding angles. Also angles p and q are called corresponding angles.

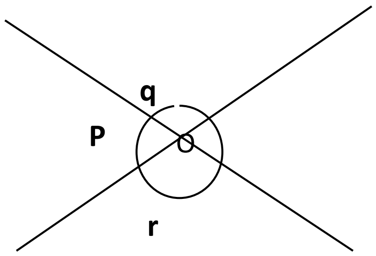
Therefore, when a transversal cut parallel lines corresponding angles formed are equal.

IDENTIFICATION OF ANGLES AT A POINT AND ANGLES ON A STRAIGHT LINE AND SUM OF ANGLES IN A TRIANGLE.

IDENTIFICATION OF ANGLES AT A POINT

The sum of angles at a point is 360^0.

In the diagram below all the lines intersect at a point O.

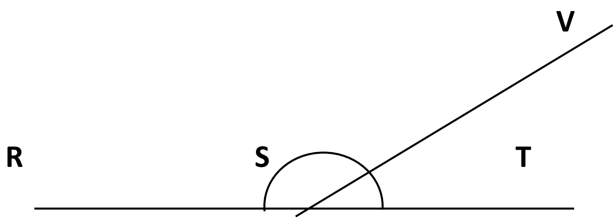


CLASS ACTIVITY

a. Use your protractor to measure angles labeled p, q, r and s.
b. Add angles p, q, r and s. what is your observation?

Note: From the activity above, your result should add up to 360^0.

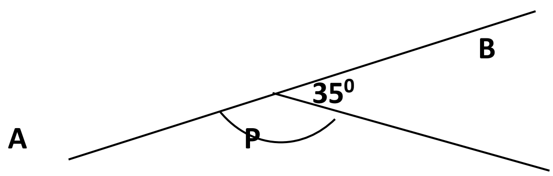
IDENTIFICATION OF ANGLES ON A STRAIGHT LINE.



When a straight line stands on another straight line, two adjacent angles are formed. The sum of two adjacent angles in the case shown above is 180^0 .

Worked Example

Find the value of the unknown angle in the diagram below



Solution

$35^0 + P = 180^0$ (angles on a straight line)

$P = 180^0 - 35^0$

$P = 145^0$

CLASS ACTIVITY

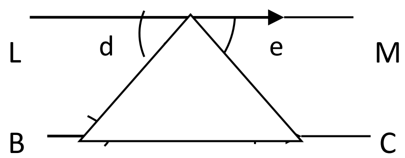
(i). what do you understand by the following principles?

- Corresponding angles
- Alternate angles
- Co-Interior or Allied angles
- Vertically opposite angles
- Sum of angles on a straight line
- Angles at a point.

(ii) Make rough sketches to explain them.

THE SUM OF ANGLES IN A TRIANGLE IS 180^0.

To show this, draw line LM through the top vertex of the triangle, parallel to the base BC. Label each angle as shown in the diagram below.



From the above diagram:

b = d (alternate angles)

c = e (alternate angles)

But $d + a + e = 180^0$ (sum of angles on a straight line)

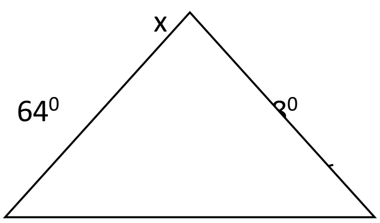
Since d + e = b + c

Hence: $a + b + c = d + a + e = 180^0$

Thus, the sum of angles of a triangle = 180^0.

<u>Worked Example</u>

Find the size of angle x in this triangle



Solution

$x + 64^0 + 88^0 = 180^0$ (sum of angles in a triangle)

$x + 152^0 = 180^0$

$x = 180^0 – 152^0 = 28^0$

PRACTICE QUESTION

Name : ____________________ Score : ________________

Pair of Angles

Find the complement and supplement of the given angles.

1) 63°

Complement of 63° = ________

2) 124°

Supplement of 124° = ________

3) 135°

Supplement of 135° = ________

4) 13°

Complement of 13° = ________

5) 154°

Supplement of 154° = ________

6) 28°

Supplement of 28° = ________

7) 32°

Complement of 32° = ________

8) 51°

Complement of 51° = ________

9) If $m\angle 2 = 42^\circ$ and $\angle 1$ and $\angle 2$ are complementary angles. Find $m\angle 1$.

____

10) If $m\angle 1 = 92^\circ$ and $\angle 1$ and $\angle 2$ form a linear pair. Find $m\angle 2$.

____

11) If $\angle 1$ and $\angle 2$ are supplementary angles and $m\angle 2 = 131^\circ$. Find $m\angle 1$.

____

12) If $\angle 1$ and $\angle 2$ form a right angle and $m\angle 1 = 55^\circ$. Find $m\angle 2$.

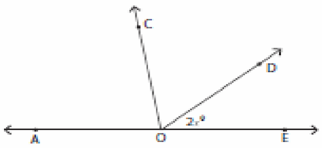
____

Name : ____________________ Score : ________________

Angles in a Straight Line

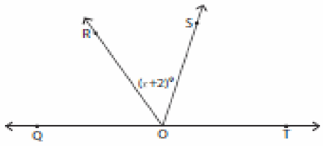
Find the value of x in each problem.

1)



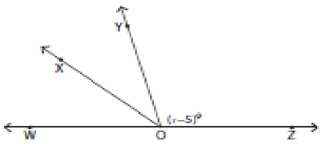
$\angle AOC = 80°$
$\angle COD = 60°$ $x =$ ______

2)



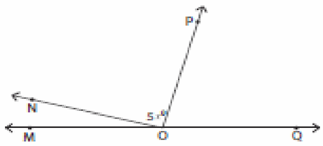
$\angle QOR = 60°$
$\angle SOT = 75°$ $x =$ ______

3)



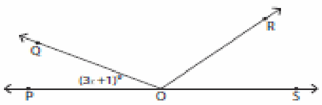
$\angle WOX = 40°$
$\angle XOY = 35°$ $x =$ ______

4)



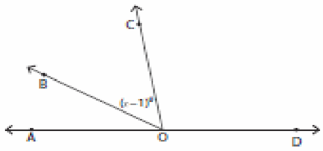
$\angle MON = 15°$
$\angle QOP = 75°$ $x =$ ______

5)



$\angle QOR = 115°$
$\angle ROS = 40°$ $x =$ ______

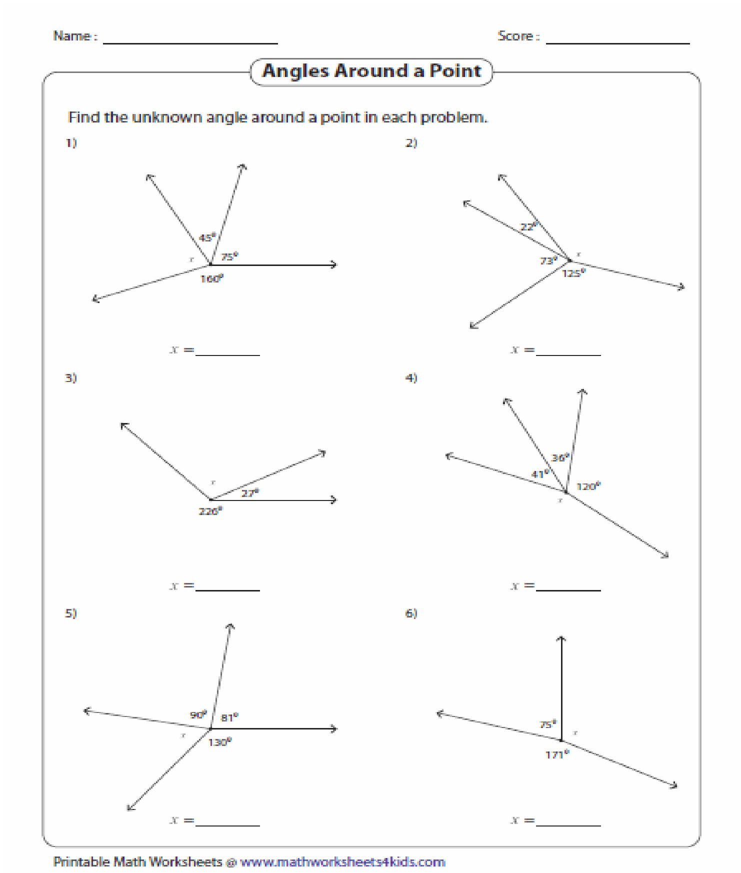
6)



$\angle COD = 100°$
$\angle AOB = 30°$ $x =$ ______

ASSIGNMENT

1.



Name : ____________ Score : ____________

Angles Around a Point

Find the unknown angle around a point in each problem.

1) 45°, 75°, 160°, x — $x =$ ______

2) 22°, 73°, 125°, x — $x =$ ______

3) 27°, 226°, x — $x =$ ______

4) 36°, 41°, 120°, x — $x =$ ______

5) 90°, 81°, 130°, x — $x =$ ______

6) 75°, 171°, x — $x =$ ______

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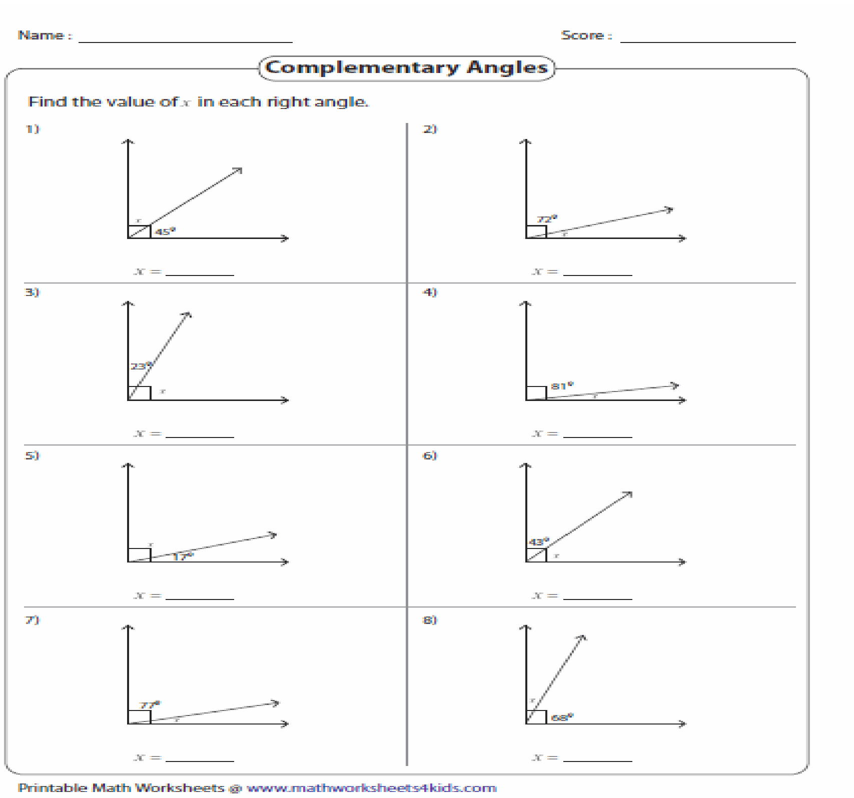
2.



Name : ____________ Score : ____________

Complementary Angles

Find the value of x in each right angle.

1) x, 45° — $x =$ ______

2) 72°, x — $x =$ ______

3) 23°, x — $x =$ ______

4) 81°, x — $x =$ ______

5) x, 17° — $x =$ ______

6) 43°, x — $x =$ ______

7) 77°, x — $x =$ ______

8) x, 68° — $x =$ ______

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WEEK 8

TOPIC: INTRODUCTION TO STATISTIC

CONTENT:

(a) Purpose of statistic

(b) Collection of data in class

(c) Presentation of Data : Rank-ordered list, Frequency tables, pictogram, bar chart, interpretation of pie chart

PURPOSE OF STATISTICS

Definition

Statistics is a branch of science that is concerned with the methods of collecting, organizing, presenting and analyzing data for a specific purpose.

Information in raw or unorganized form (such as alphabets, numbers, or symbols) that refer to, or represent, conditions, ideas, or objects. Data is limitless and present everywhere in the universe.

Statistics is the branch of mathematics, which deals with the study of data. It involves:

a. Gathering (i.e. collecting) data
b. Sorting and tabulating data
c. Presenting data visually by means of diagrams (charts, tables and graphs)
d. Interpreting results.

Statistics is known to provide useful information in our everyday life:

a. For record keeping
b. To forecast or predict future events
c. For decision making
d. For planning purposes
e. To gather useful information this can be passed from one source to another.

Collection of data for planning purposes

Planning is one of the reasons for collecting data.

Examples include

1) The Daily Export Report of barrels of petrol enables the government of Nigeria to plan the budgets. This is called economic planning.
2) Statistics about the availability of potable drinkable water can inform State and District planners whether or not to budget for pumps and pipelines.
3) Statistics about the trend in school enrolment could inform the school management about the schools where urgent expansions are needed.
4) Statistics about the prevalence of HIV/AIDS among the citizenry could inform the relevant agency as to how to arrest the spread of the virus/disease.

Class Activity:

A shop keeper makes record of his sales for the day. The records are as shown in the table below. This is an example of statistics used for planning purpose/decision making.

Size	**Number bought**	**Number sold**	**Profit (₦)**
Big size	20	10	7.50
Medium size	21	15	10.30

Which size sells more than the other?

Which size gives more profit for the day?

If you were the shop keeper, which size would you plan to buy more on the following day? Give reasons.

Need for Collecting Data for Analysis Purpose

Collection of data from time to time helps to analyze situations. For example, statistics shows that malaria is responsible for about half the deaths of African children under the age of five. The minister of health in Nigeria revealed that the number of tuberculosis in Nigeria increased from 31 264 in 2002 to 90 307 in 2008. The number of people who died of Aids in South Africa in 2007 is about 350 000. This means Aids claimed nearly 1000 lives every day.

Example 2:

The table below shows a survey of the favorite subjects of students in basic 2.

	English	**Math**	**Science**
Boys	25	30	20
Girls	35	25	15

i. What subject do the girls like most?
ii. How many more boys than girls like Math?
iii. What fraction of the girls like Math?
iv. What percentage of the students are girls?

Solution:

i. From the table above, English is the favourite subject of the girls.
ii. 30 boys like maths, while 25 girls like maths. Therefore, 5 more boys than girls like maths.
iii. The total number of girls = 35 + 25 + 15 =75

The fraction of the girls that like maths = $\frac{\text{no of girls who like maths}}{\text{The total number of girls}}$

$= \frac{25}{75} = \frac{1}{3}$

iv. The percentage of the students that are girls = $\frac{\text{total number of girls}}{} \times 100$

total number of students

Total number of boys = 25 + 30 + 20 = 75

Total number of students = 75 boys + 75 girls

= 150 students

The percentage of girls = $\frac{75}{150} \text{x } 100 = \frac{1}{2} \text{ x } 100 = 50\%$

CLASS ACTIVITY

The table below shows the distribution of Science teachers in a particular private senior secondary school in the suburb of Abuja.

SUBJECT	MATHS	PHYSICS	CHEMISTRY	BIOLOGY	AGRIC. SCIENCE	HOME ECONS
No. of Teachers	10	3	7	11	6	5

(a) Which subject has the highest number of teachers?
(b) Which subject has the least number of teachers?
(c) What is the total number of science teachers in the school?
(d) What is the average number of teachers per Science subject in the school?

Need for Collecting Data for Prediction Purposes

The statistical charts and tables we do see on television and in the newspapers (or magazines), provide useful information which can be used to make forecast and predictions for the future. For example, the number of students enrolment in secondary and post secondary schools this year can help the government plans the number of new jobs to be created in five years' time.

Example 3:

A food seller collects the following sales data for the week.

Type	**Number of plates sold**	**Profit ₦**
Rice and Beans	100	200
Tuwo	150	100
Gari	60	50
Yams	70	40

Will you support her decision to stop selling tuwo and yam? On what prediction do you think she based her decision?

CLASS ACTIVITY:

1. If your village played with another village 10 times in the past, with 9 wins and 1 loss, what is your prediction for the next match?
2. Give some reasons why you think a school principal should know the number of students in his school?

COLLECTION OF DATA IN CLASS

Since statistics cannot exist without data, you will need to collect data first. Collection of data involves counting and recording data clearly in a way that is useful.

EXAMPLE

Teacher should write down the names of students in his/her class against their individual ages.

CLASS ACTIVITY

1. Find out the number of students in your school. Make a table to show the number of students in each level.
2. How many males and female students do you have in your school?
3. How many male and female teachers are in your school?

DATA PRESENTATION

RANK-ORDERED LIST

Rank order means arranging data values from the highest to the lowest.

EXAMPLE

Some JCSE students scored these grades in a revision test: C, B, D, A, C, C, E, B, D, F, B, D, E, C, A, C, D, B. Represent the data in rank order.

Solution

Here is the rank order list from A to F:

A, A, B, B, B, B, C, C, C, C, C, D, D, D, D, E, E, F

FREQUENCY TABLE

A frequency table shows the number of times a value appears. A frequency table can be prepared for a give data set data either vertically or horizontally.

EXAMPLE

In a class of 30 students seated in six rows of five students each, the class monitor records the following dates of births, row by row.

Wed. Thur. Sun. Tue Fri.

Mon.	Wed.	Tues.	Fri.	Sun.
Sun.	Wed.	Mon	Tues.	Sat.
Fri.	Sat.	Sun.	Thur.	Wed.
Mon.	Sat.	Sun.	Fri.	Mon

(a) Represent the above data in a frequency table.
(b) How many students were born on Tuesdays?
(c) In what date were most students born?
(d) In what date were the least number of students born?

Solution:

DAYS	**TALLY**	**FREQUENCY**
MON.	~~IIII~~ I	**5**
TUES.	I I I I	**4**
WED.	I I I I	**4**
THURS.	I I	**2**
FRI.	~~IIII~~ I	**5**
SAT.	I I I I	**4**
SUN.	~~IIII~~ I I	**6**

Rank Ordered list versus Frequency Tables

Two students were asked to collect data about the type of vehicles, as they passed by. The data collected were presented in two different ways, as follows:

A. Car, Lorry, Lorry, Motorcycle, Car, Motorcycle Bicycle, Bus, Lorry, Car, Bus, Bus, Bus.

B.

Vehicle	**Tally**	**Total**
Bus	1111	4
Bicycle	1	1
Lorry	111	3
Car	111	3
Motorcycle	11	2
		13

The first student presented his data by listing the vehicles as they pass by. This method is not very reliable. The method adopted by the second student is the best because he cannot miss any vehicle in his recording, especially by 'TALLY'.

GRAPHS: a graph is a pictorial representation of statistical data clearly. Graphs are often more helpful than list or tables. For this stage, Graphs include:

a) Pictogram
b) Bar Chart
c) Pie chart

PICTOGRAM

In a pictogram, pictures represent the frequency of data values

Example:

Study the frequency below and represent the information in a Pictogram

GRADE	A	B	C	D	E	F
FREQUENCY	2	4	5	4	2	1

A ☺ ☺

B ☺ ☺ ☺ ☺

C ☺ ☺ ☺ ☺ ☺

D ☺ ☺ ☺ ☺

E ☺ ☺

F ☺

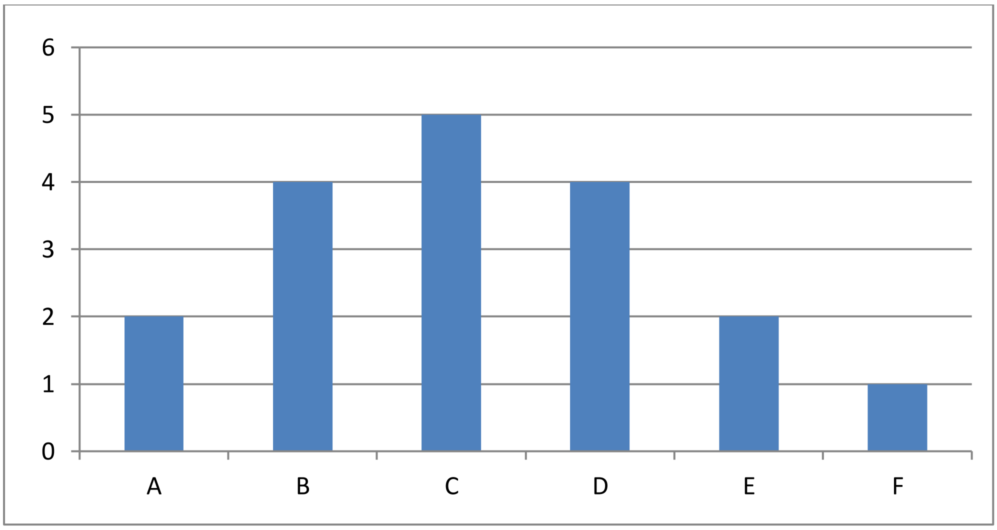
BAR CHART

In a bar chart, the height (or length) of a bar represents the frequency of the data values.

Examples:

Study the frequency below and represent the information in a Pictogram

GRADE	A	B	C	D	E	F
FREQUENCY	2	4	5	4	2	1

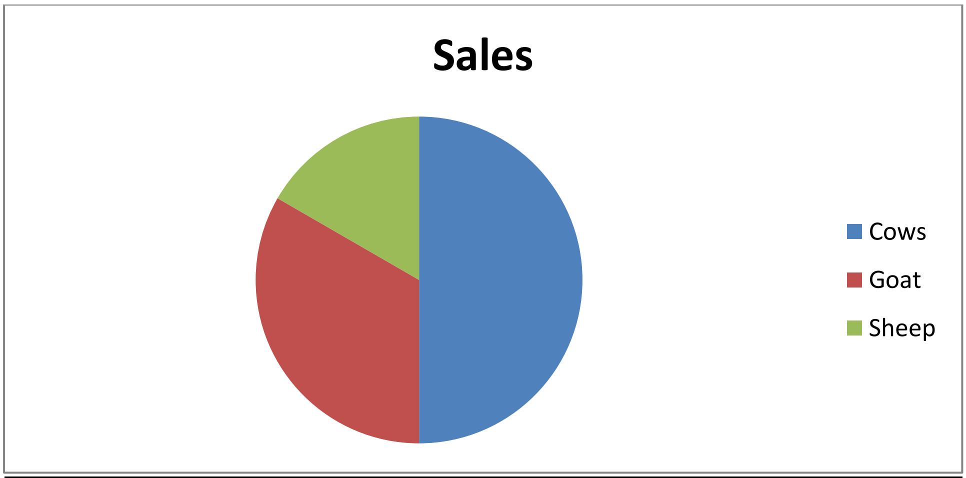


PIE CHART

In a pie chart, a circle represents all the data, and the sizes of its sectors are proportional to each item.

Examples:

A farmer has 120 animals as shown in the pie chart below:



a) Using a protractor, measure the angles representing each animal
b) Find the number of (i) Cows (ii) Goats (iii) Sheep

Solution

a) Cows = 180^o
Goats = 120^o
Sheep = 60^o
b) Number of cows = $\frac{180}{360} \times 120 = 60 \text{ cows}$
Number of Goats = $\frac{120}{360} \times 120 = 40 \text{ cows}$
c) Number of Sheep = $\frac{60}{360} \times 120 = 20 \text{ cows}$

CLASS ACTIVITY

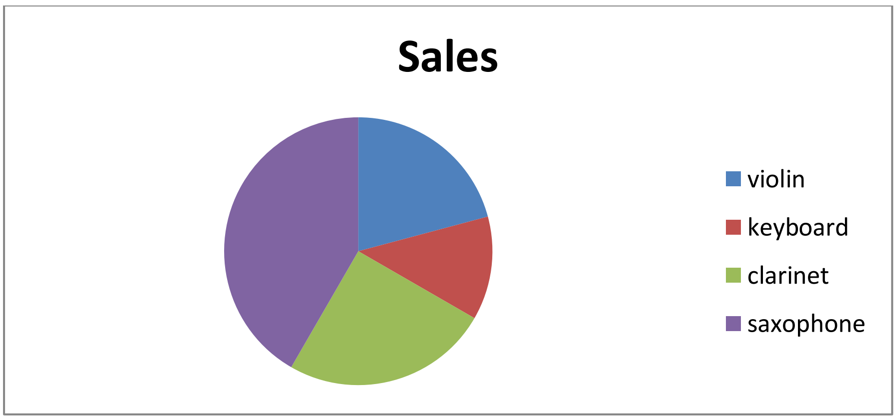
1. From the list of scores given below, create a (i) rank ordered list (ii) frequency table
29, 75, 36, 70, 37, 66, 39, 64, 47, 63, 47, 47, 58, 52, 54

2. Represent the information below in (i) pictogram (ii) bar chart

SHOE SIZE	6	7	8	9	10
FREQUENCY	4	5	9	4	2

ASSIGNMENT

3. The instruments played by240 members of a school choir is represented in the pie chart below



a) How many choristers played the violin?
b) What percentage of the choristers plays the saxophone?
c) What fraction of the students plays the keyboard?
d) Which instrument is played by the least number of choristers?
e) How many are they?
f) If more instrumentalists are to be trained, what do you think they will be selected to play?

PRACTICE QUESTIONS

1. From the list of scores given below, create a (i) rank ordered list (ii) frequency table

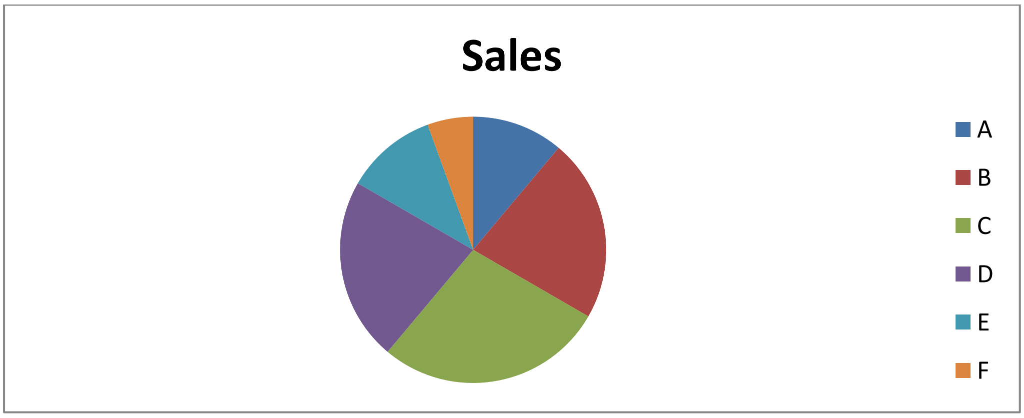
9, 5, 6, 7, 7, 6, 3, 4, 7, 6, 4, 4, 8, 2, 3

2. Represent the information below in (i) pictogram (ii) bar chart

VEHICLE	Car	Lorry	Bus	Taxi	Other
FREQUENCY	4	9	1	6	4

3. The table below was used to draw the pie chart that follows:

GRADE	A	B	C	D	E	F
FREQUENCY	2	4	5	4	2	1



WEEK 9

TOPIC: STATISTICS

CONTENT:

- Mean (listed and tabulated data values)
- Median
- Mode of given set of data

DETERMINING THE MEAN OF A GIVEN SET OF DATA

The mean sometimes called the arithmetic mean is the most common average.

If there are n numbers in a set, then

Mean = sum of numbers in the set/n.

When the set of data is tabulated, we use the formula: **Σfx/Σf**

Example: In a class test, a student had the following marks:

13, 17, 18, 8, 10. What is the average mark?

Solution:

Average (mean) = $\frac{sum\ of\ numbers\ in\ a\ set}{n}$

$= \frac{13 + 17 + 18 + 8 + 10}{5}$

$= \frac{66}{5}$

= 13.2

Example 2: A hockey team has played eight games and has a mean score of 3.5 goals per game. How many goals has the team scores?

Solution:

Mean score = $\frac{No\ of\ goals}{No\ of\ games}$

$1.5 = \frac{no\ of\ goals}{8}$

Multiply both sides by 8

3.5×8 = total number of goals

28 = total number of goals

MEAN: Mean simply refers to the middle item when the set of data is arranged in the right order. When the number of item is odd, the median will be a single item. When the number of items is even, two items will fall in the middle. In such case, the sum of the two items is obtained and divided by two.

Example 1:

Find the median of these numbers:

13, 15, 14, 12, 13, 15, 16, 10, 12, 14

Solution

Arrange the numbers in order of magnitude starting with the smallest value:

10, 12, 12, 13,	13, 14,	14, 15, 15, 16
4 value	middle values	4 values

Add the two middle numbers and **divide** the result by 2

Median = $\frac{\textbf{sum of the two middle number}}{\textbf{2}}$

$$= \frac{13 + 14}{2} = 13\frac{1}{2}$$

Example 2:

Find the median of 8.4, 7.8, 6.2, 13.4, 12.6, 10.5

Solution

Arrange the set of numbers in order of size

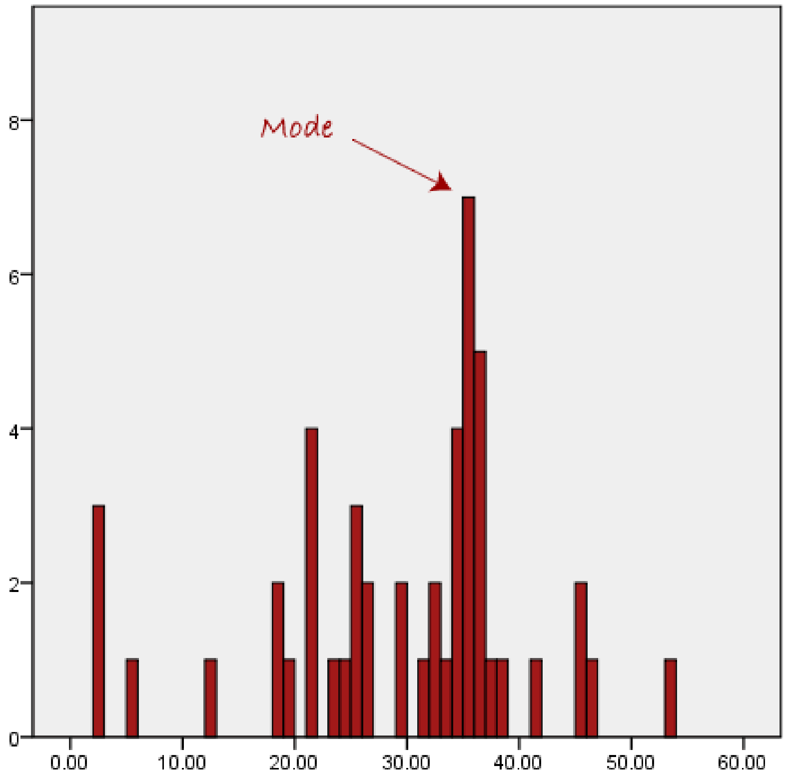
6.2, 7.8, 8.4, 10.5, 12.6, 13.4

There are 6 numbers. The median is the mean of the 3rd and 4th numbers.

$$\text{Median} = \frac{8.4 + 10.5}{2} = \frac{18.9}{2} = 9.45$$

MODE

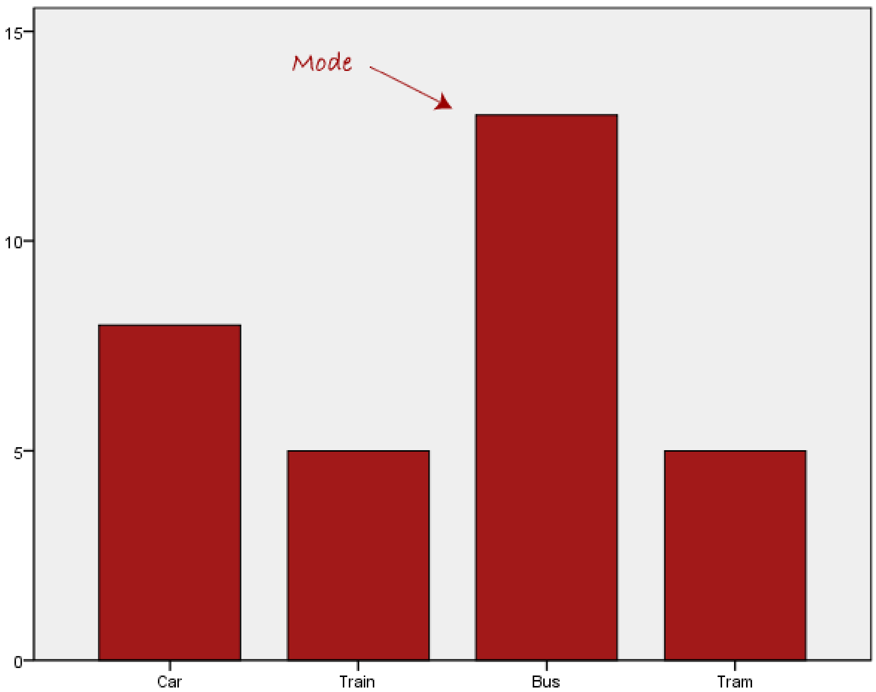
The mode is the most frequent score in our data set. On a histogram it represents the highest bar in a bar chart or histogram. You can, therefore, sometimes consider the mode as being the most popular option. An example of a mode is presented below:



Example1: Find the mode of the numbers 6,6,8,9,9,9,10

Solution: The most occurred item is 9, hence, the mode is 9.

Example 2: The chart shows the different means by which students of DLHS come to school. Find the modal means of transportation.



We can see above that the most common form of transport, in this particular data set, is the bus. However, one of the problems with the mode is that it is not unique, so whenever a set of data has two most occurring items, we pick both items. Such frequency is called **bi-modal** frequency.

PRACTICE EXERCISE

1. Find the median of these numbers:
   a. 5.5, 8.6, 4.8, 10.5, 6.8, 7.5, 8.2
   b. 50%, 55%, 60%, 70%, 65%
   c. -3^0C, -2^0C, 0^0C, 4^0C, -4^0C, -1^0C, 2^0C, -2^0C, 1^0C, -1^0C.
   d. 2, 8, 9, 12, 7, 5, 6, 4, 5, 10, 11, 3, 6.

2. The table below gives the ages and frequencies of girls in a choir. Find

a. the number of girls in the choir;

b. the modal and median ages of the choir;

c. the mean age of the choir.

Age in years	14	15	16	17
Frequency	3	4	5	3

ASSIGNMENT

1. Find the mean, mode and median of the following set of numbers

a) 6,2,3,5,2,4,1,6,2

b) 1,3,2,4,5,3,3,2

2. The table below shows the marks of students in a mathematics test.

Marks	1	2	3	4	5	6	7	8	9	10
Frequency	2	4	2	3	4	5	3	2	2	3

Find:

a) The number of students who took part in the test;

b) The number of students who scored at most 6;

c) The median mark;

d) The median mark;

e) The modal mark.

END OF THIRD TERM.