

MATHEMATICS

PLANE SHAPES.

- i. Similarities and differences between plane shapes.
- ii. Perimeter of Polygons. E.g, Square.

SIMILARITIES AND DIFFERENCES BETWEEN PLANE SHAPES.

Similarities

1. All plane shapes have straight sides.
2. All plane shapes have flat/plane surfaces/faces.
3. All plane shapes have straight edges.

Differences

1. Not all plane shapes have equal sides.
2. Not all plane shapes have equal surfaces/faces.
3. Some of the plane shapes, their edges are not equal.

2. PERIMETER OF POLYGONS

Square: copy and complete the table below:

Square.	Sides.	Perimeter
i.	8cm.	-----
ii.	-----	19.6cm

Solution:

i. Perimeter = $4L = 4 \times 8 = 32\text{cm}$
 $P = 32\text{cm}$

ii. perimeter = $4L$
 $19.6/4 = 4L/4$
 $4.9 = L$
 $L = 4.9$

Rectangle: the length of a rectangle is 5cm longer than its breadth. Find the length and breadth, if the perimeter is 26cm. Solution; perimeter = $2(L+B)$

Given $P=26$,

$$B=?, L= 5+B$$

$$26=2(5+B+B)$$

$$26=2(5+2B)$$

$$26=10+2B$$

$$26-10=2B$$

$$16=4B, 16/4=4B/4$$

$$4=B, B=4$$

$$L=5+B, 5+4=9, L=9\text{cm}.$$

3. **Triangle:** calculate the perimeter of the triangle with the given sides; 9.6cm, 7.5cm and 6cm

$$\text{Perimeter} = 9.6 + 7.5 + 6 \\ = 23.1\text{cm}$$

AREAS OF PLANE SHAPES.

Area is the total space occupied by an object or plane shape.

Example 1: calculate the length of a rectangle whose area is 108sq. cm and width is 24m.

Solution

Area of a rectangle = $L \times W$

$$108 = L \times 24$$

$$108/24 = 24L/24$$

$$L = 4.5\text{m}$$

Example 2: the area of a right-angled triangle is 32sq.cm, if its height is 6.4cm, find the base of the triangle.

Solution

Area of a triangle = $\frac{1}{2} \times b \times h$

Given: Area = 32cm^2 base =? height = 6.4cm

$$A = \frac{1}{2}bh,$$

$$32 = \frac{1}{2} \times b \times 6.4\text{cm}$$

$$32 = 6.4 \times \frac{b}{2}$$

$$b = \frac{32 \times 2}{6.4}$$

$$= 10\text{cm}$$

(3) The perimeter of a circle is 44cm. What is the area of the circle? (Take $\pi = 22/7$)

Solution

1st step, find the perimeter of the circle:

$$\text{Perimeter} = 2\pi r,$$

$$44 = 2 \times \frac{22}{7} \times r$$

$$44 = 44 \times \frac{r}{7}$$

$$1 \times 44r = 44 \times 7$$

$$r = 7$$

2nd step: find the area

$$\text{Area} = \pi r^2 = \frac{22}{7} \times 7^2$$

$$= 22 \times 7 \times 7$$

$$= 154\text{cm}^2$$

Dimensional Figures/Shapes

These are solid shapes. They are calculated in three dimensions i.e., length, breadth and height.

Three Dimensional Figures:

- (i) Basic properties of pyramids and cone,
- (ii) Basic properties of cubes and cuboids,
- (iii) Basic cylinders and spheres,
- (iv) Volume of cubes and cuboids.

Properties of Pyramids.

The properties of pyramids are divided into three major parts depending on the types/shapes;

(1) Pyramids have faces that depends on the shapes of their bases.

- (a) A rectangular-based pyramid has a rectangle as its base.
- (b) It has five faces (four triangular faces and one rectangular face).
- (c). It has eight edges.
- (d). It has five vertices.

2. The number of sides the base of a pyramid has determines the number of faces, for instance,

- (a). When the base of pyramid has five sides, the number of faces is six.
- (b) When the base of a pyramid has six sides, the number of faces is seven, etc.

3. The number of sides of the base also determines the number of edges.

Basic properties of Cubes and cuboids

Cube	Cuboid
It has 6 squares	It has 6 rectangles
Flat faces	Flat faces
It has 12 edges	It has 12 edges
It has eight vertices	It has eight vertices

Cylinders

A cylinder has the following properties:

- (a) Two circular flat faces
- (b) One curved faces
- (c) No vertex
- (d) Two circular edges.

Spheres

A Sphere has the following properties:

- (a) Has no edges
- (b) Has no vertices
- (c) Has a spherical surface.

Volume

Examples 1: the volume of a box is 19cm cube and its base area is 20cm squared. What is the height of the whole box?

Solution

$$\text{Volume} = L \times B \times H$$

$$\text{Volume} = \text{base area} \times \text{height}$$

$$90 = 20 \times h$$

$$90 = 20 \times h$$

$$90 / 20 = 20h / 20$$

$$h = 4.5\text{cm}$$

Example 2: A rectangular tank is 6.4m long, 4.8m wide and 2m high. What is the volume of the tank?

Solution

$$L \times B \times H$$

$$L = 6.4\text{m}, b = 4.8\text{m}, h = 2\text{m},$$

$$V = 6.4 \times 4.8 \times 2$$

$$V = 61.44\text{m}^2$$

(3). A box with a square base and a height of 8cm has a volume of 1352cm cube. Find the length of the sides of the base.

Solution

$$\text{Volume} = L \times B \times H$$

$$1352 = \text{Base area} \times h$$

$$1352 = \text{Base area} \times 8$$

$$1352/8 = \text{Base area} \times 8/8$$

$$\text{Base area} = L^2$$

$$L^2 = 169$$

$$\sqrt{L^2} = \sqrt{169}$$

$$L = 13\text{cm}$$

CONSTRUCTION

Hints for construction

- (1) Your pencil must be sharpened with a pointed end to show the fine lines.
- (2) You should sketch the figures to be constructed. It will give a rough idea of what to expect after construction.
- (3) All the lines and acts that lead to the final result must be left to visible, they should not be erased.

Parallel Lines

Parallel lines are lines that have the same distance between them. They can never meet at any point.

Steps for the construction of parallel lines

(Using a ruler and a pair of compass)

Step 1. With your ruler, draw a line segment, mark off AB. On the line AB, mark two other points P and Q, as shown below;

Step 2: With M as the centre and radius PQ, draw an arc above Q at Y.

Step 3. With Q as the centre and of radius PM, draw another arc to intersect the first arc at Y. Draw a line through M and Y, and extend YM to X. The line XY is parallel to AB as shown below.

Perpendicular Lines

Two lines are said to be perpendicular to each other when they meet at a right angle i.e. 90° .

Step 1. Draw a line AB. Mark a point Q on the line.

Step 2: place the edge of the set square on line AB, let the edge of the ruler meet the hypotenuse of the set square.

Step 3: pressing firmly on the ruler, slide the set square down along the hypotenuse side until third edge touches point Q. Draw a line XY.

Bisecting a Given Line Segment

Midpoint and perpendicular bisector of a line segment.

Step 1: Open the compasses to a little more than half the length of AB. With the point first on A and then on B, draw arcs to meet at P and Q.

Step 2: draw a line through P and Q. M is the midpoint of AB, and PQ is the perpendicular bisector of the line segment AB.

Construction of 90°

Step 1: draw any line AB. With A as the centre, open the compass to a convenient radius and draw an arc to cut AB at E.

Step 2: with the same radius in step 1, place the compass at E, draw another arc to cut the first arc at C. Then with C as the centre, cut through the same first arc at D.

Step 3: you may adjust the radius of the compass. Then with C as the centre, draw an arc at F. With D as the centre, draw another arc to cut F. Then join F to A. Therefore $\angle FAB = 90^{\circ}$

Construction of 60° Angle.

Step 1: Draw any line AB, with A as the centre and a radius more than half of AB, draw an arc to cut AB at P.

Step 2: With P as centre and the same radius in step 1, draw an arc to cut the first arc at C.

Step 3: Join A to C.

Angle = 60° , i.e. the required angle.

ANGLES

Measurement of angles: angles are the amount of distance formed between straight lines that stand apart but meet at a point.

Measurement of Angles.

We use the protractor to measure angles. The protractor is semi-circular in shape. It is divided into 180° equal divisions (parts), i.e. 180° . It is divided into two scales i.e. inner and outer scales

which can be used to measure in either clockwise or anti-clockwise direction. The inner scale is read clockwise while the outer scale is read anti-clockwise.

Classification of Angles

These angles are classified according to their sizes as follows;

- (a) Acute: is an angle that is less than 90° .
- (b) Right angle; is an angle that is equal to 90° .
- (c) Obtuse; is an angle that is greater than 90° but less than 180° .
- (d) Straight line angle is an angle that is half of a turn, it is equal to 180° .
- (e) Reflex; is an angle that is greater than 180° but less than 360° .