7 The World of Shapes

Let's Recall

In previous classes, we have learnt some basic geometric shapes as given below.

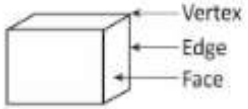
Types of lines: There are three different types of lines.

a. Horizontal line b. Vertical line c. Slanting line

Face: The surface of a solid shape is called its **face**.

Edge: An **edge** is a line segment where two faces meet.

Vertex: A **vertex** is a point where the edges meet.



1. Identify the point, line, line segment and ray.

a. A B b. .B c. E F d. C D

Line Point Line Segment Ray

2. Identify the plane figures and write their names.

a. b. c. d. e.

Rectangle Triangle Circle Square Oval

3. Write the number of faces, edges and vertices for the following figures.

a. b. c. d. e.

a.	b.	c.	d.	e.
Faces 6	Faces 3	Faces 2	Faces 1	Faces 6
Edges 12	Edges 2	Edges 1	Edges 0	Edges 12
Vertices 8	Vertices 0	Vertices 1	Vertices 0	Vertices 8

Maths Around Us

Aakriti is very keen to learn about different shapes in our surroundings. To show her interesting and practical examples of shapes, her parents decided to take her to Agra to visit historical monuments.

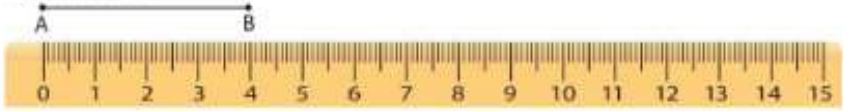
On reaching the Taj Mahal in Agra, Aakriti was very excited as she could instantly connect the shapes she has read in the books with the different parts of the monument. Aakriti quickly pointed out to her younger brother, Nikhil, about the different shapes visible there.

She informed Nikhil, that the pillar is an example of cylinder, the graves of Mughal Emperors were cuboidal in shape, the roof was spherical in shape and so on. Both of them were pleased to see real-life examples of various shapes.

Measuring and Drawing a Line Segment

Measuring

We use a ruler to measure and draw a line segment. Each big division on a ruler is divided into 10 smaller divisions. 1 big division represents 1 cm. 1 small division represents 1 millimetre (mm). So, 10 mm = 1 cm. To measure a line segment, keep the 0 mark of the ruler at one end of the line segment and read the marking on the ruler where the line segment ends.



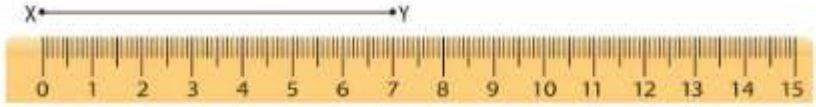
The given line segment AB measures 4 cm.

Let us see how much the line segment CD measures.

We can see that the marking on the ruler at D is 5 cm 2 mm. Thus, the length of CD is 5 cm 2 mm.

Drawing

To draw a line segment of length 7 cm, place the ruler on your notebook and mark a point, say X, at the 0 mark and another point, say Y, at the 7 mark of the scale. Join the points along the edge of the ruler. XY is the required line segment.



Exercise 7.1

1. Measure the length of each line segment.

a. A B — 2 cm

b. C D — 1cm 3mm

c. E F — 3.5 cm or 3 cm 5 mm

d. G H — 2.8 cm

e. I J — 2 cm 7mm

f. K L — 3 cm

2. Draw the line segments of the following measures using a ruler. (Need to do in Notebook)

a. 5 cm b. 6 cm 4 mm c. 3 cm 7 mm d. 9 cm e. 8 cm 5 mm
f. 10 cm 9 mm g. 5 cm 8 mm h. 7 cm 3 mm i. 2 cm 9 mm j. 4 cm 6 mm

H.W

Curve

A line that is not straight is a curve. There are two types of curves.

Closed curve

If a curve begins and ends at the same point, it is known as a **closed curve**.

Examples:

If a closed curve does not cross itself, it is a simple closed curve. The first four figures are examples of simple closed curves.

Open curve

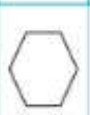
If a curve does not end at the starting point, it is known as an **open curve**.

Examples:

Polygons

A closed plane shape made up of three or more line segments is called a **polygon**.

Types of Polygons

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

Exercise 7.2

1. Classify as open curve or closed curve.

a.  Open Curve

b.  Closed Curve

c.  Open Curve

d.  Open Curve

e.  Open Curve

f.  Closed Curve

g.  Closed Curve

h.  Open Curve

2. Draw.

a. A simple closed curve:  b. An open curve : 

3. Draw four polygons with different number of sides.

H.W. 4. Form a polygon with

a. 2 matchsticks b. 3 matchsticks c. 4 matchsticks d. 5 matchsticks

In which case was it not possible for you to form a polygon? Record your findings in your notebook. **(No need to stick matchsticks in NB)**

5. What is a quadrilateral? Give two examples of a quadrilateral.

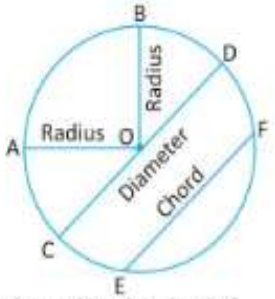
Circle

A **circle** is a simple closed curve. 

Place a bangle on paper and trace around it to get a circle.

A circle is a curved shape in which all the points on the curve are at the same distance from a fixed point called the **centre.**

O is the centre of the circle.



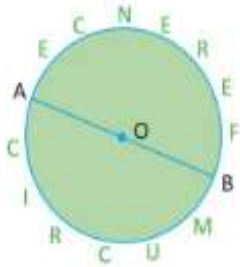
The distance between the centre and any point on the circle is called the **radius**. OA and OB are the radii of the circle. Note that radii is the plural of radius.

If any two points on a circle are joined with a line, it is called a **chord**. EF is a chord. A chord of a circle which passes through the centre is called its **diameter**. CD is the diameter of the circle.

A diameter is the longest chord of a circle. A circle can have many chords, radii and diameters.

If you walk around a circular park starting from a point and come back to the same point, the distance you have walked is called the **circumference** of the park. In other words, circumference is the length of the boundary of a circle.

Look at the figure below.



As learnt, AB is the diameter and OA and OB are the radii of the circle.

AB = OA + OB = radius + radius = 2 × radius

Thus, **diameter = 2 × radius**

Or, **radius** = $\frac{\textbf{diameter}}{\textbf{2}}$

So, radius of a circle is half of the diameter, and diameter of a circle is twice the radius.

Drawing a Circle

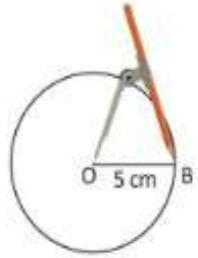
A circle can be drawn with the help of compasses.

Step 1: Keep the metal pointed end of the compasses firmly on paper.

Step 2: Stretch the other arm having pencil and rotate the pencil arm.

You can draw circles with defined measures.

Suppose you have to draw a circle with radius 5 cm. Draw a line segment OB of length 5 cm with the help of a ruler on a paper. Stretch the arms of the compasses as wide as the length of the line segment and draw the circle. Here, O is the centre and OB is the radius.



The radius of this circle is 5 cm.

Diameter = 2 × radius = 2 × 5 cm = 10 cm.

Exercise 7.3

1. Find the diameter for the given radii.

a. 8 cm b. 15 cm c. 17 cm d. 30 cm e. 100 cm

2. Find the radius for the given diameters.

a. 6 cm b. 22 cm c. 48 cm d. 50 cm e. 200 cm

3. A round clock has a radius 15 cm. Find its diameter.

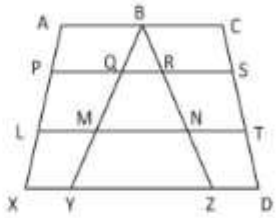
4. The diameter of a wheel is 70 cm. Find its radius.

5. Draw circles with the given radii.

a. 2 cm b. 4 cm c. 6 cm d. 7 cm 3 mm e. 9 cm

FUN WITH MATHS

Count the number of triangles and quadrilaterals in the given figure.



Number of triangles is _____ .

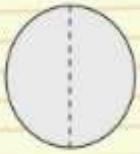
Number of quadrilaterals is _____ .

TRY THIS!

Put a tick mark (✓) for the polygons.

My Project

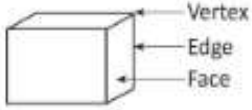
1. Use any cylindrical object. Trace its boundary on a piece of paper. Take a thread and wrap it around the traced boundary. Measure the length of thread traced. The length of the thread is the circumference of the object.
2. Cut out a circle from a sheet of paper. Fold it into half vertically, crease the fold and open up. Can you see a line segment along the crease? It is called the diameter.



Now, fold it into half horizontally and unfold to get another creased line. It is also a diameter. The point of intersection of the two diameters is called the centre.

Three-dimensional Shapes

Three-dimensional shapes or solid shapes are the objects having three measurements, that is, length, breadth and height. A **face** is a surface of a solid shape.
An **edge** is a line segment where two faces meet.
A **vertex** is a point where the edges meet.



Cube

A cube has 6 faces, 8 vertices and 12 edges.

Examples:


Ice cube


Die


Gift box

Cuboid

A cuboid has 6 faces, 8 vertices and 12 edges.

Examples:


Pencil box


Cupboard


Book

Cone

A cone has 2 faces (1 flat and 1 curved), 1 edge and 1 vertex.

Examples:


Ice cream cone


Birthday cap


Traffic pylon

Cylinder

A cylinder has 3 faces (2 flat and 1 curved), 2 edges and no vertex.

Examples:

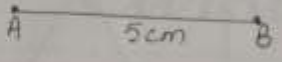

Water tank


Fire extinguisher

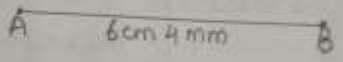
Exercise -7.1 (Answers)

Q2. Draw the line segments of the following measures using a ruler (scale).

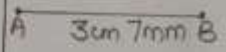
a.) 5 cm



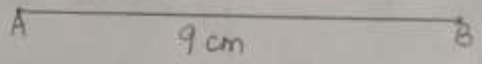
b) 6cm 4mm or 6.4cm



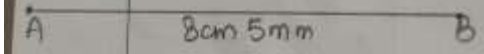
c.) 3cm 7mm



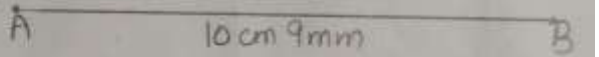
d.) 9 cm



e.) 8cm 5mm

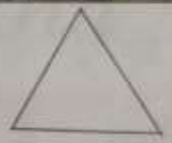
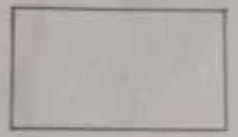


f.) 10cm 9mm



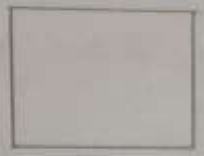
Exercise - 7.2 (Answers)

Q3. Draw four polygons with different number of sides.

	No. of Sides	Name of the polygon	Shape of the polygon
1)	3	Triangle	
2)	4	Quadrilateral	
3)	5	Pentagon	
4)	6	Hexagon	

Q4

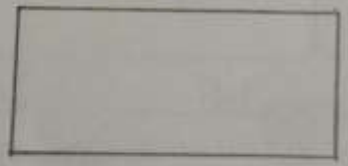
	No. of Matchsticks	Polygon formed
a)	2 matchsticks	It is not possible to form a polygon.
b)	3 matchsticks	Triangle 

	No. of Matchsticks	Polygon formed
c)	4 matchsticks	 Square
d)	5 matchsticks	 Pentagon

Q5. **Quadrilateral**: It is closed figure made up of four line segments.

Example: 1) Square (4 equal sides)

2) Rectangle (4 sides, opposite sides are equal)



Exercise - 7.3 (Answers)

Q1. a) Radius = 8 cm

Diameter = Radius × 2

= 8 × 2 = 16 cm

b) Radius = 15 cm

Diameter = Radius × 2

= 15 cm × 2 = 30 cm

c) Radius = 17 cm

Diameter = Radius × 2

= 17 cm × 2 = 34 cm

d) Radius = 30 cm

Diameter = Radius × 2

= 30 × 2 = 60 cm

e) Radius = 100 cm

Diameter = Radius × 2

= 100 × 2

= 200 cm

Q2. a) Diameter = 6 cm

Radius = Diameter ÷ 2

= 6 ÷ 2 = 3 cm

b.) Diameter = 22 cm

Radius = Diameter ÷ 2

= 22 ÷ 2 = 11 cm

c.) Diameter = 48 cm

Radius = Diameter ÷ 2

= 48 ÷ 2 = 24 cm

d.) Diameter = 50 cm

Radius = Diameter ÷ 2

= 50 ÷ 2

= 25 cm

e.) Diameter = 200 cm

Radius = Diameter ÷ 2

= 200 ÷ 2

= 100 cm

Q3. Radius of round clock = 15 cm

Diameter = Radius × 2

= 15 × 2

= 30 cm

Thus, the diameter is 30 cm.

Q4. Diameter of a wheel = 70 cm

Radius = Diameter ÷ 2

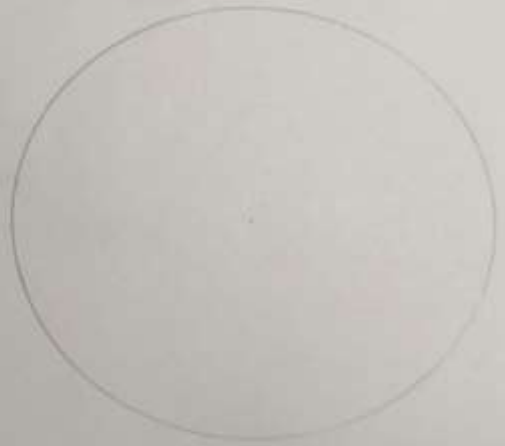
= 70 cm ÷ 2

= 35 cm

Thus, the radius of a wheel is 35 cm.

Q5 a) Radius = 2 cm

b) Radius = 4 cm



Sphere

A sphere has 1 curved surface, no edge and no vertex.

Examples:


Orange


Ball


Globe

Net of a Three-dimensional Shape

A net of a three-dimensional shape can be obtained by unfolding the shape.

Net of a Cube


Cube

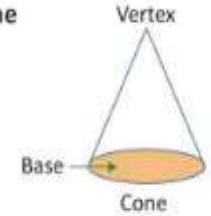

Net of a cube

Net of a Cuboid

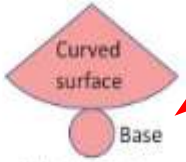

Cuboid


Net of a cuboid

Net of a Cone

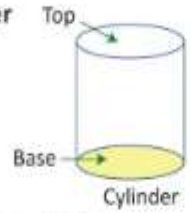


Cone

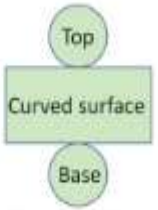


Net of a cone

Net of a Cylinder



Cylinder



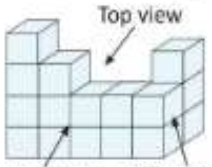
Net of a cylinder

A sphere does not have a net.

Different Views of Three-dimensional Shapes

A three-dimensional shape may look different when viewed from different positions.

Let us observe the given three-dimensional shape from different positions.



Three-dimensional view


Front view (appearance of the object from the front)


Side view (appearance of the object from the side)


Top view (appearance of the object from the top)

Exercise 7.4

1. Write the shape of the following objects.

   a. Geometry box **Cuboid** b. A smiley ball **Sphere** c. Ice cream cone **Cone**

   d. A road roller **Cylinder** e. A matchbox **Cuboid** f. An ice cube **Cube**

2. Name a solid shape with

   a. only one vertex **Cone** . b. no flat surface **Sphere** .

   c. exactly two flat faces **Cylinder** . d. six identical faces **Cube** .

3. Draw nets of the following:

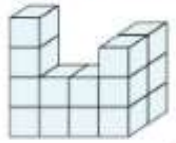
   a. Cuboid b. Cylinder c. Cone d. Cube

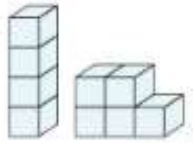
4. Write the number of faces, edges and vertices of the following figures. **(Refer pg. no. 109)**

   a. Cuboid b. Cube c. Cylinder d. Cone

5. Draw the top view, front view and side view of the following solid shapes.

   a. 

   b. 

   c. 

   d. 

   e. 

   f. 

(Need to do in N.B.)

Tangram

Tangram is an intellectual game consisting of seven pieces—two large triangles, one medium-sized triangle, two small triangles, one square and one parallelogram.

You can cut out these pieces and put them together in different ways to make some interesting shapes.

Now try making these shapes using tangram pieces.

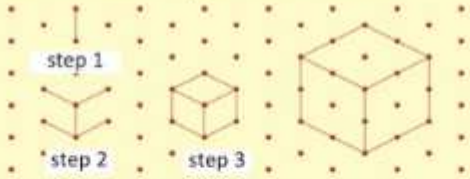
Arrow Bunny Duck Gun Fan House

MATHS LAB ACTIVITY

Objective: To draw solid shapes on isometric dotted paper

Materials required: A sheet of isometric dotted paper, ruler and pencil

Method: An isometric dotted paper is a special paper consisting of dots marked at equal distances which help to draw three-dimensional shapes. Connect the dots to draw a solid shape. A cube drawn on an isometric paper will look like this.



Now, draw a cuboid, cylinder and a cone on an isometric sheet.

My Project

Use tangram pieces to make a poster on 'Save Wildlife.'

Present your poster in the class and speak a few lines on the topic 'Endangered Wildlife.'

H.W.

REVISION STATION

1. Draw line segments of the following measures using a ruler.

   a. 4 cm 6 mm b. 5 cm 1 mm c. 7 cm 8 mm d. 6 cm 6 mm

   e. 11 cm 3 mm f. 13 cm g. 14 cm 3 mm h. 9 cm 8 mm

2. Classify as an open curve or a closed curve.

   a. b. c. d. e.

   _____ _____ _____ _____ _____

3. Draw three different polygons with each one having 4 sides.

4. Draw circles with the given radii.

   a. 3 cm b. 5 cm 5 mm c. 7 cm d. 8 cm 8 mm e. 10 cm

5. Draw nets of the following shapes.

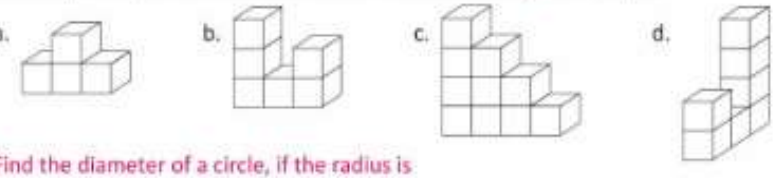
   a. Cube b. Cuboid c. Cone d. Cylinder

6. Draw the following solid shapes. Mark and write the number of corners, edges and faces of

   a. Cuboid b. Cone c. Cylinder d. Cube

7. Draw top view, front view and side view of the following solid shapes.

   a. b. c. d.

8. Find the diameter of a circle, if the radius is

   a. 4 cm b. 6 cm c. 5 cm

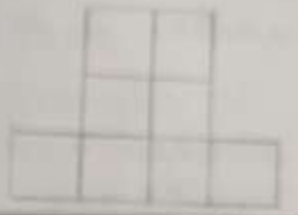
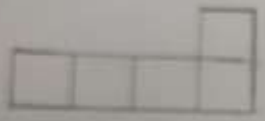
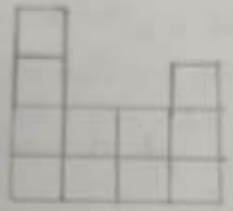
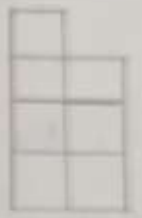
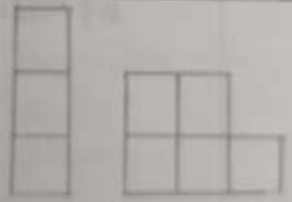
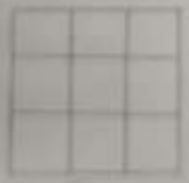
   d. 8 cm e. 15 cm f. 21 cm

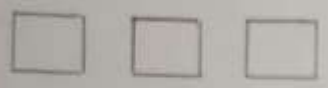
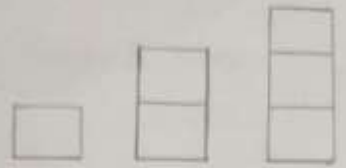
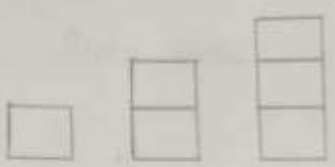
9. The radius of the circular bottom of a flower pot is 19 cm. Find its diameter.

10. The diameter of a giant wheel is 30 m. What will be its radius?

Exercise - 7.4 (Answers)

Q.5.

	Top View	Front View	Side View
a)			
b)			
c)			
d)			
e)			

	Top View	Front View	Side View
f)			

REVISION STATION

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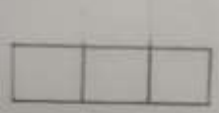
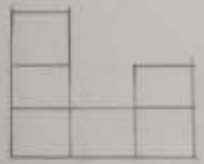
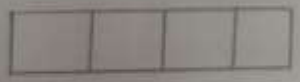
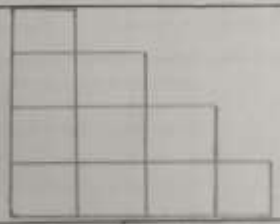
a)   

b)   

c)   

d)