5 Understanding Elementary Shapes

Learn and Remember

1. A line segment is a portion of a line. If A and B are two points in a plane, the part AB of the line through A and B is called a line segment $\overline{AB}$. The points A and B are called the end-points of this segment.
2. A line segment has two end points and a line has no end point.
3. There is a unique line segment joining two given points A and B.
4. The line segment $\overline{AB}$ is the same as the line segment $\overline{BA}$.
5. The length of a line segment $\overline{AB}$ is denoted by AB.
6. Two or more line segments having the same length are said to be congruent or equal.
7. 1 m = 100 cm
   1 cm = 10 mm
   1 km = 1000 m
   1 yard = 3 ft
   1 ft = 12 inches
   1 mile = 1760 yard.
8. The distance between two points is the same as the length of the line segment joining these points.
9. The part of a line that extends indefinitely in one direction from a given point O, is called a ray.
10. A ray has only one end point and has no definite length.

TEXTBOOK QUESTIONS SOLVED

EXERCISE 5.1

Q1. What is the disadvantage in comparing line segments by mere observation?

Sol. There may be chance of error due to improper viewing.

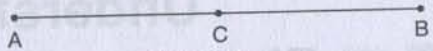
Q2. Why is it better to use a divider than a ruler, while measuring the length of a line segment?

Sol. The thickness of the ruler may cause difficulties in reading off the length. However divider gives up accurate measurement.

Q3. Draw any line segment, say $\overline{AB}$. Take any point C lying in between A and B. Measure the lengths of AB, BC and AC. Is AB = AC + CB?

[Note : If A, B, C are any three points on a line, such that AC + CB = AB, then we can be sure that C lies between A and B.]

Sol. Yes.



AB = 6.5 cm, AC = 3 cm, CB = 3.5 cm

AC + CB = 3 cm + 3.5 cm = 6.5 cm = AB.

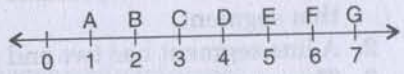
Q4. If A, B, C are three points on a line such that AB = 5 cm, BC = 3 cm and AC = 8 cm, which one of them lies between the other two?

Sol. $\overline{AC}$ is the longest line segment, thus B is the point between A and C.

Q5. Verify whether D is the mid point of $\overline{AG}$.

Sol. AD = 3 units, DG = 3 units

AD = DG. Thus D is mid-point.



Q6. If B is the mid point of $\overline{AC}$ and C is the mid point of $\overline{BD}$, where A, B, C, D lie on a straight line, say why AB = CD?

Sol. B is mid point of $\overline{AC}$

$\therefore$ AB = BC ...(1)

C is mid point of $\overline{BD}$

$\therefore$ BC = CD ...(2)

From (1) and (2)

AB = CD.

Q7. Draw five triangles and measure their sides. Check in each case, if the sum of the lengths of any two sides is always less than the third side.

Sol. Yes, sum of two sides of a triangle is always greater than the third side.

EXERCISE 5.2

Q1. What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from

(a) 3 to 9 **(b) 4 to 7** **(c) 7 to 10**

(d) 12 to 9 **(e) 1 to 10** **(f) 6 to 3**

Sol. (a) $\frac{1}{2}$ or two right angles. (b) $\frac{1}{4}$ or one right angle.

(c) $\frac{1}{4}$ or one right angle. (d) $\frac{3}{4}$ or three right angles.

(e) $\frac{3}{4}$ or three right angles. (f) $\frac{3}{4}$ or three right angles.

Q2. Where will the hand of a clock stop if it

(a) Starts at 12 and makes $\frac{1}{2}$ of a revolution, clockwise?

(b) Starts at 2 and makes $\frac{1}{2}$ of a revolution, clockwise?

(c) Starts at 5 and makes $\frac{1}{4}$ of a revolution, clockwise?

(d) Starts at 5 and makes $\frac{3}{4}$ of a revolution, clockwise?

Sol. (a) At 6 (b) At 8 (c) At 8 (d) At 2.

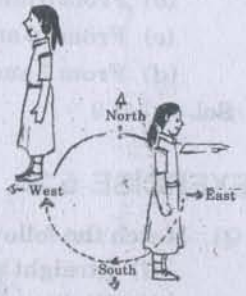
Q3. Which direction will you face if you start facing

(a) East and make $\frac{1}{2}$ of a revolution clockwise?

(b) East and make $1\frac{1}{2}$ of a revolution clockwise?

(c) West and make $\frac{3}{4}$ of a revolution anti-clockwise?

(d) South and make one full revolution? (Should we specify clockwise or anti-clockwise for this last question? Why not?)



Sol. (a) West (b) West (c) North (d) South.

(To answer (d), it is immaterial whether we turn clockwise or anticlockwise, because one full revolution will bring us back to the original position.)

Q4. What part of a revolution have you turned through if you stand facing

(a) East and turn clockwise to face north?

(b) South and turn clockwise to face east?

(c) West and turn clockwise to face east?

Sol. (a) $\frac{3}{4}$ (b) $\frac{3}{4}$ (c) $\frac{1}{2}$

Q5. Find the number of right angles turned through by the hour hand of a clock when it goes from

(a) 3 to 6 **(b) 2 to 8** **(c) 5 to 11**

(d) 10 to 1 **(e) 12 to 9** **(f) 12 to 6**

Sol. (*a*) One right angle. (*b*) Two right angles. (*c*) Two right angles.
(*d*) One right angle. (*e*) Three right angles. (*f*) Two right angles.

Q6. How many right angles do you make if you start facing
(*a*) South and turn clockwise to west?
(*b*) North and turn anti-clockwise to east?
(*c*) West and turn to west?
(*d*) South and turn to north?

Sol. (*a*) One right angle. (*b*) Three right angles.
(*c*) Four right angles. (*d*) Two right angles.

Q7. Where will the hour hand of a clock stop if it starts?
(*a*) From 6 and turns through 1 right angle?
(*b*) From 8 and turns through 2 right angles?
(*c*) From 10 and turns through 3 right angles?
(*d*) From 7 and turns through 2 straight angles?

Sol. (*a*) At 9 (*b*) At 2 (*c*) At 7 (*d*) At 7

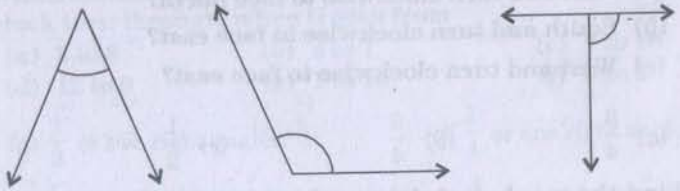
EXERCISE 5.3

Q1. Match the following:

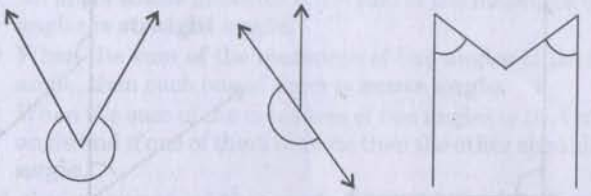
(*i*) Straight angle	**(*a*) Less than one-fourth a revolution**
(*ii*) Right angle	**(*b*) More than half a revolution**
(*iii*) Acute angle	**(*c*) Half of a revolution**
(*iv*) Obtuse angle	**(*d*) One-fourth a revolution**
(*v*) Reflex angle	**(*e*) Between $\frac{1}{4}$ and $\frac{1}{2}$ of a revolution**
	(*f*) One complete revolution.

Sol. (*i*) → *c*, (*ii*) → *d*, (*iii*) → *a*, (*iv*) → *e*, (*v*) → (*b*).

Q2. Classify each one of the following angles as right, straight, acute, obtuse, or reflex:



(*a*) (*b*) (*c*)



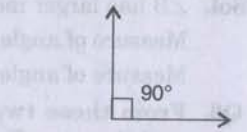
(*d*) (*e*) (*f*)

Sol. (*a*) acute angle (*b*) obtuse angle (*c*) right angle
(*d*) reflex angle (*e*) straight angle (*f*) acute angle.

EXERCISE 5.4

Q1. What is the measure of (*i*) a right angle? (*ii*) a straight angle?

Sol. (*i*) A right angle is of 90°.



(*ii*) A straight angle is of 180°.

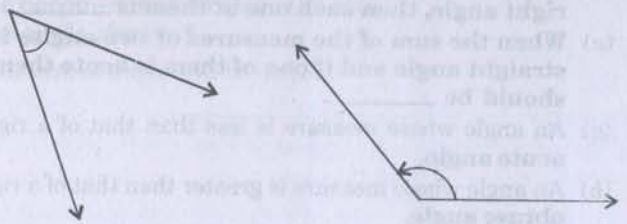
Q2. Say True or False:
(*a*) The measure of an acute angle < 90°.
(*b*) The measure of an obtuse angle < 90°.
(*c*) The measure of a reflex angle > 180°.
(*d*) The measure of one complete revolution = 360°.
(*e*) If $m\angle A = 53°$ and $m\angle B = 35°$, then $m\angle A > m\angle B$.

Sol. (*a*) True (*b*) False (*c*) True (*d*) True (*e*) True.

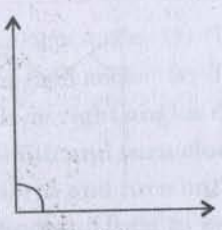
Q3. Write down the measures of
(*a*) Some acute angles. **(*b*) Some obtuse angles.**
(give at least two examples of each.)

Sol. (*a*) 35°, 20° (*b*) 110°, 135°.

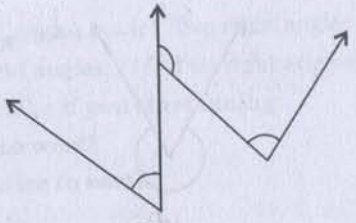
Q4. Measure the angles given below, using the protractor and write down the measure.



(*a*) (*b*)



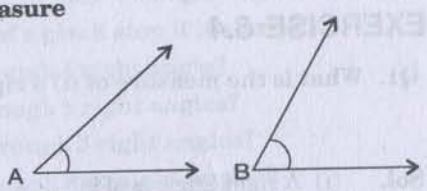
(c)



(d)

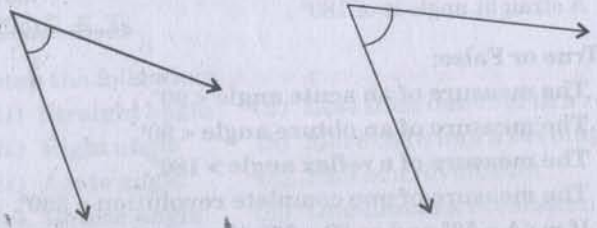
Sol. (a) 40° (b) 130° (c) 90° (d) 60°.

Q5. Which angle has a large measure?
First estimate and then measure
Measure of Angle A =
Measure of Angle B =



Sol. ∠B has larger measure.
Measure of angle A = 40°
Measure of angle B = 65°.

Q6. From these two angles which has larger measure? Estimate and then confirm by measuring them.



Sol. Second angle has larger measure.

Q7. Fill in the blanks with acute, obtuse, right or straight:

(a) An angle whose measure is less than that of a right angle is _____.

(b) An angle whose measure is greater than that of a right angle is _____.

(c) An angle whose measure is the sum of the measures of two right angles is _____.

(d) When the sum of the measures of two angles is that of a right angle, then each one of them is _____.

(e) When the sum of the measures of two angles is that of a straight angle and if one of them is acute then the other should be _____.

Sol. (a) An angle whose measure is less than that of a right angle is **acute angle.**

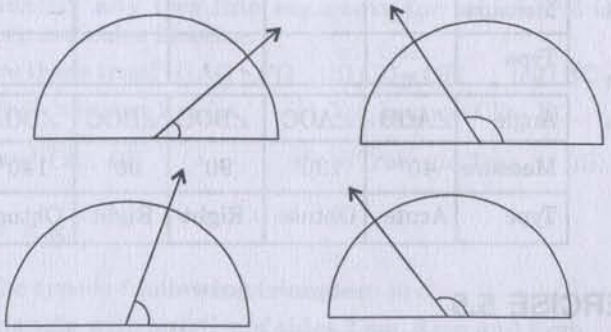
(b) An angle whose measure is greater than that of a right angle is **obtuse angle.**

(c) An angle whose measure is the sum of the measures of two right angles is **straight angle.**

(d) When the sum of the measures of two angles is that of a right angle, then each one of them is **acute angle.**

(e) When the sum of the measures of two angles is that of a straight angle and if one of them is acute then the other should be **obtuse angle.**

Q8. Find the measure of the angle shown in each figure. (First estimate with your eyes and then find the actual measure with a protractor).



Sol. (i) 30° (ii) 120° (iii) 60° (iv) 150°.

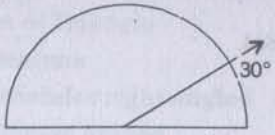
Q9. Find the angle measure between the hands of the clock in each figure.

9.00 a.m. 1.00 p.m. 6.00 p.m.

Sol. (i) 90° (right angle) (ii) 30° (acute angle) (iii) 180° (straight angle).

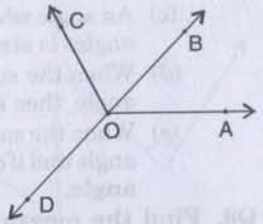
Q10. Investigate:

In the given figure, the angle measure 30°. Look at the same figure through a magnifying glass. Does the angle becomes larger? Does the size of the angle change?



Sol. No, the size of angle will be same.

Q11. Measure and classify each angle:



Angle	∠AOB	∠AOC	∠BOC	∠DOC	∠DOA	∠DOB
Measure						
Type						

Sol.

Angle	∠AOB	∠AOC	∠BOC	∠DOC	∠DOA	∠DOB
Measure	40°	130°	90°	90°	140°	180°
Type	Acute	Obtuse	Right	Right	Obtuse	Straight

EXERCISE 5.5

Q1. Which of the following are models for perpendicular lines:

(a) The adjacent edges of a table top.

(b) The lines of a railway track.

(c) The line segments forming the letter 'L'.

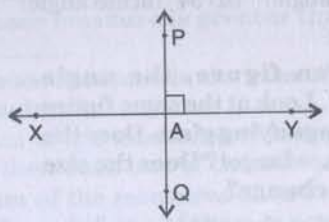
(d) The letter V.

Sol. (a) Perpendicular. (b) Not perpendicular.

(c) Perpendicular. (d) Not perpendicular.

Q2. Let $\overline{PQ}$ be the perpendicular to the line segment $\overline{XY}$. Let $\overline{PQ}$ and $\overline{XY}$ intersect in the point A. What is the measure of ∠PAY?

Sol.

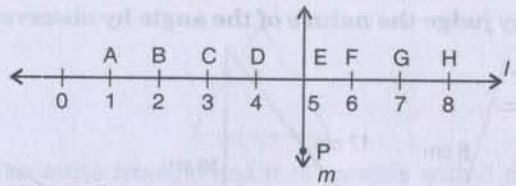


∠PAY = 90°.

Q3. There are two "set-squares" in your box. What are the measures of the angles that are formed at their corners? Do they have any angle measure that is common?

Sol. One has 45°—90°—45° angles and other has ∠60°—∠90°—∠30°. They have 90° as common angle.

Q4. Study the diagram. The line l is perpendicular to line m.



(a) Is CE = EG?

(b) Does PE bisect CG?

(c) Identify any two line segments for which PE is the perpendicular bisector.

(d) Are these true? (i) AC > FG (ii) CD = GH (iii) BC < EH.

Sol. (a) Yes, both measure 2 units. (b) Yes, because CE = EG.

(c) $\overline{DF}$ and $\overline{CG}$, $\overline{BH}$ (d) (i) True (ii) True (iii) True.

EXERCISE 5.6

Q1. Name the types of following triangles:

(a) Triangle with lengths of sides 7 cm, 8 cm and 9 cm.

(b) ΔABC with AB = 8.7 cm, AC = 7 cm and BC = 6 cm.

(c) ΔPQR such that PQ = QR = PR = 5 cm.

(d) ΔDEF with $m\angle D = 90°$.

(e) ΔXYZ with $m\angle Y = 90°$ and XY = YZ.

(f) ΔLMN with $m\angle L = 30°$, $m\angle M = 70°$ and $m\angle N = 80°$.

Sol. (a) Scalene triangle. (b) Scalene triangle.

(c) Equilateral triangle. (d) Right-angled triangle.

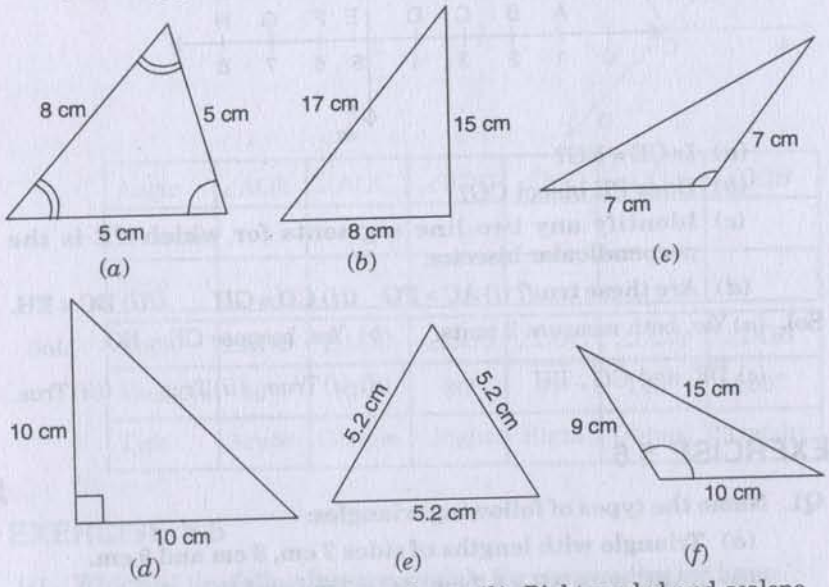
(e) Isosceles right-angled triangle. (f) Acute-angled triangle.

Q2. Match the following:

Measures of Triangle	Types of Triangle
(i) 3 sides of equal length	**(a) Scalene**
(ii) 2 sides of equal length	**(b) Isosceles right angled**
(iii) All sides are of different length	**(c) Obtuse angled**
(iv) 3 acute angles	**(d) Right angled**
(v) 1 right angle	**(e) Equilateral**
(vi) 1 obtuse angle	**(f) Acute-angled**
(vii) 1 right angle with two sides of equal length	**(g) Isosceles.**

Sol. (i) → (e), (ii) → (g), (iii) → (a), (iv) → (f), (v) → (d), (vi) → (c), (vii) → (b).

Q3. Name each of the following triangles in two different ways:
(You may judge the nature of the angle by observation)



Sol. (*a*) Acute-angled and isosceles (*b*) Right-angled and scalene
(*c*) Obtuse-angled and isosceles (*d*) Right-angled and isosceles
(*e*) Equilateral and acute angled (*f*) Obtuse-angled and scalene.

Q4. Try to construct triangles using match sticks. Some are shown here.

Can you make a triangle with

(*a*) 3 matchsticks?

(*b*) 4 matchsticks?

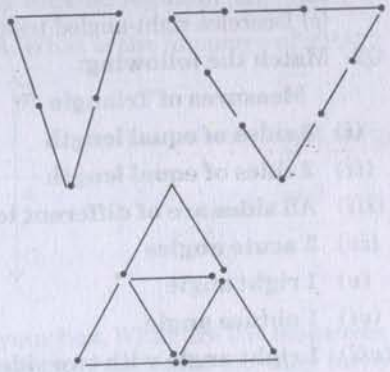
(*c*) 5 matchsticks?

(*d*) 6 matchsticks?

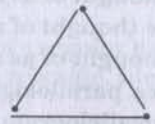
(Remember you have to use all the available matchsticks in each case)

Name the type of triangle in each case.

If you cannot make a triangle, think of reasons for it.

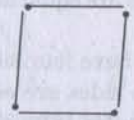


Sol. (*a*) 3 Matchsticks



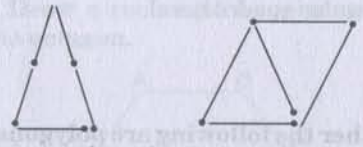
This is an acute triangle and it is possible with 3 matchsticks to make a triangle because sum of two sides is greater than third side.

(*b*) 4 Matchsticks



This is a square, hence with four matchsticks we cannot make triangle.

(*c*) 5 Matchsticks



This is an acute triangle and it is possible to make triangle with five matchsticks, in this case sum of two sides is greater than third side.

(*d*) 6 Matchsticks

This is an acute triangle and it is possible to make a triangle with help of 6 matchsticks because sum of two sides is greater than third side.

EXERCISE 5.7

Q1. Say True or False:

(*a*) Each angle of a rectangle is a right angle.

(*b*) The opposite sides of a rectangle are equal in length.

(*c*) The diagonals of a square are perpendicular to one another.

(*d*) All the sides of a rhombus are of equal length.

(*e*) All the sides of a parallelogram are of equal length.

(*f*) The opposite sides of a trapezium are parallel.

Sol. (*a*) True (*b*) True (*c*) True (*d*) True (*e*) False (*f*) False.

Q2. Give reasons for the following:

(a) A square can be thought of as a special rectangle.

(b) A rectangle can be thought of as a special parallelogram.

(c) A square can be thought of as a special rhombus.

(d) Squares, rectangles, parallelograms are all quadrilaterals.

(e) Square is also a parallelogram.

Sol. (a) Because its all angles are right angle and opposite sides are equal.

(b) Because its opposite sides are equal and parallel.

(c) Because its four sides are equal and diagonals are perpendicular to each other.

(d) Because all of them have four sides.

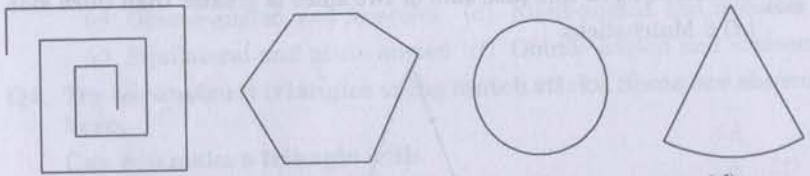
(e) Because its opposite sides are equal and parallel.

Q3. A figure is said to be regular if its sides are equal in length and angles are equal in measure. Can you identify the regular quadrilateral?

Sol. A square is a regular quadrilateral.

EXERCISE 5.8

Q1. Examine whether the following are polygons. If any one among them is not, say why?



(a) (b) (c) (d)

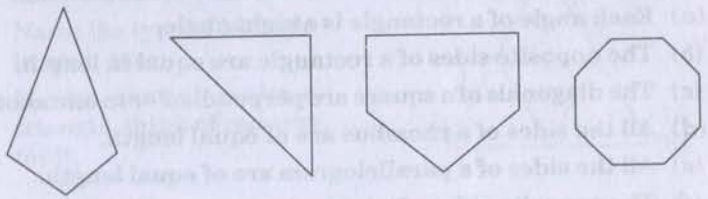
Sol. (a) It is not a closed figure.

(b) Only '*b*' is a polygon.

(c) Not made from line segment.

(d) Not made from only line segment, having curved surface.

Q2. Name each polygon:



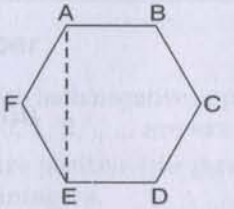
(a) (b) (c) (d)

Sol. (a) Quadrilateral (b) Triangle

(c) Pentagon (d) Octagon.

Q.3. Draw a rough sketch of a regular hexagon. Connecting any three of its vertices, draw a triangle. Identify the type of the triangle you have drawn.

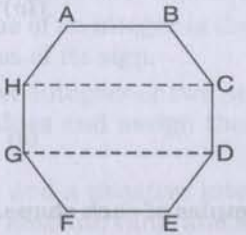
Sol.



ABCDEF is a regular hexagon and Δ thus formed by joining AEF is isosceles triangle.

Q4. Draw a rough sketch of a regular octagon. (Use squared paper if you wish) Draw a rectangle by joining exactly four of the vertices of the octagon.

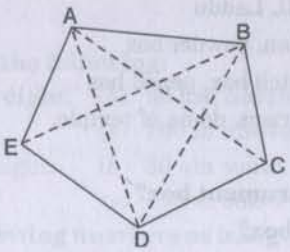
Sol.



ABCDEFGH is a regular octagon and CDGH is a rectangle.

Q5. A diagonal is a line segment that joins any two vertices of the polygon and is not a side of the polygon. Draw a rough sketch of a pentagon and draw its diagonals.

Sol.

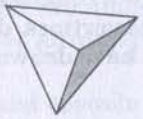


ABCDE is the required pentagon and its diagonals are AD, AC, BE, BD.

EXERCISE 5.9

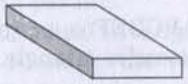
Q.1. Match the following:

(*a*) Cone **(*i*)**



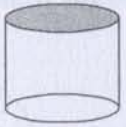
(*b*) Sphere **(*ii*)**

(*c*) Cylinder **(*iii*)**



(*d*) Cuboid **(*iv*)**

(*e*) Pyramid **(*v*)**



Give two new examples of each shape.

Sol. (*a*) ⟶ (*ii*) (*b*) ⟶ (*iv*) (*c*) ⟶ (*v*)
(*d*) ⟶ (*iii*) (*e*) ⟶ (*i*)

Example:

Cone ⟶ Ice cream, birthday cap.

Sphere ⟶ Ball, Laddu

Cylinder ⟶ Can, powder box

Cuboid ⟶ Match box, pencil box

Pyramid ⟶ Prism, dome of temple.

Q2. What shape is

(*a*) Your instrument box? **(*b*) A brick?**

(*c*) A match box? **(*d*) A road-roller?**

(*e*) A sweet laddu?

Sol. (*a*) Cuboid. (*b*) Cuboid.

(*c*) Cuboid. (*d*) Cylinder.

(*e*) Sphere.

❑❑