Chapter 5

Understanding Elementary Shapes

SOLUTIONS:

Exercise 5.1

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

Solution:

We can't say which line segment is of greater length and it will not be accurate.

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

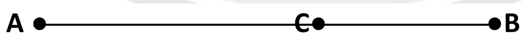
Solution:

Chances of error occur while using ruler due to thickness of the ruler and angular viewing. Thus, divider is the accurate measurement.

3. Draw any line segment, say AB. Take any point C lying in between A and B. Measure the length 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.)

Solution:



AB is a line segment of length 6 cm and C is a point between A and B such that AC = 4 cm and CB = 2 cm.

Hence, AC + CB = 6 cm

Since, AB = 6 cm

∴ AB = AC + CB is verified.

4. 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?

Solution:

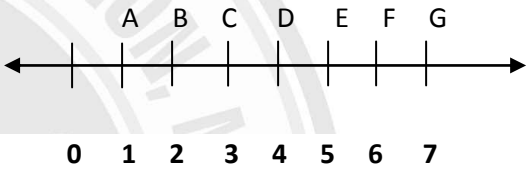
Here, we have AB = 5 cm

BC = 3 cm

∴AB + BC = 8 cm, but AC = 8 cm

Hence, B lies between A and C.

5. Verify, whether D is the midpoint of $\overline{AG}$.



Solution:

From the above figure, we have AG = 6 cm

AD = 3 cm and DG = 3 cm

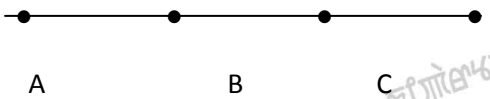
∴ AG = AD + DG

= 3 cm + 3 cm = 6 cm

Hence, **D is the mid point of $\overline{AG}$.**

6. If B is the mid point of AC and C is the mid point of BD, where A, B, C, D lie on a straight line, say why AB = CD?

Solution:



Here, B is the mid point of AC. Hence AB = BC -------- 1

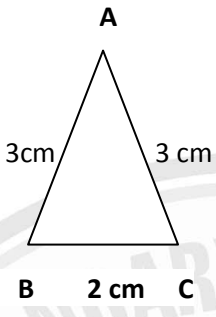
and C is the mid point of BD. Hence BC = CD ----------2

Thus, from 1 and 2, AB = CD.

7. 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.

Solutions:

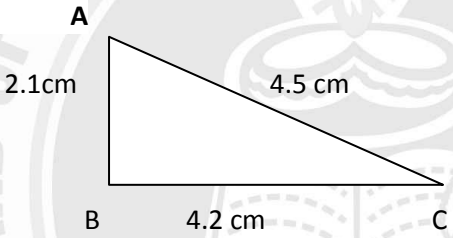
1.



Here AB = 3 cm AC = 3cm BC = 2 cm

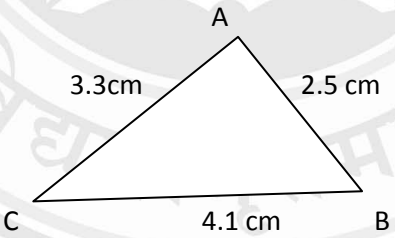
AB + AC = 3 cm + 3 cm = 6 cm which is greater than BC

2.



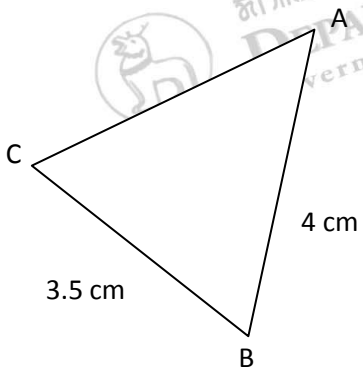
Here AB + AC = 2.1 cm + 4.5 cm = 6.6 cm which is greater than BC.

3.



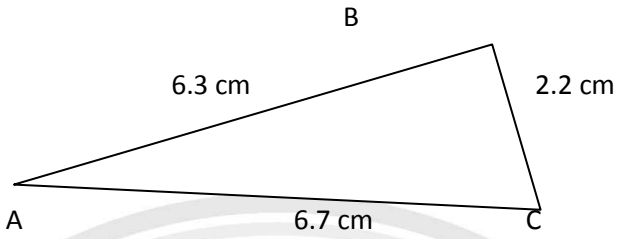
Here AB + BC = 2.5 cm + 4.1 cm = 6.6 cm which is greater than CA

4.



Here AB + BC = 4 cm + 3.5 cm = 7.5 cm which is greater than CA

5.



Here AB + BC = 6.3 cm + 2.2cm = 8.5 cm which is greater than CA.

Hence the lengths of any two sides of a triangle can never be less than the length of the third side.

Exercise 5.2

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

a) **3 to 9**

Solution:

In one complete clockwise revolution, hour hand will rotate by 360°

When hour hand goes from 3 to 9 clockwise, it will rotate by 2 right angles or 180°

∴Fraction = $\frac{180^0}{360^0} = \frac{1}{2}$

b) 4 to 7

Solution:

In one complete clockwise revolution, hour hand will rotate by 360°

When hour hand goes from 4 to 7 clockwise, it will rotate by 1 right angles or 90°

∴Fraction = $\frac{90^0}{360^0} = \frac{1}{4}$

c) 7 to 10

Solution:

In one complete clockwise revolution, hour hand will rotate by 360°

When hour hand goes from 7 to 10 clockwise, it will rotate by 1 right angles or 90°

∴Fraction = $\frac{90^0}{360^0} = \frac{1}{4}$

d) 12 to 9

Solution:

In one complete clockwise revolution, hour hand will rotate by 360°

When hour hand goes from12 to 9 clockwise, it will rotate by 3 right angles or 270°

∴Fraction = $\frac{270^0}{360^0} = \frac{3}{4}$

e) 1 to 10

Solution:

In one complete clockwise revolution, hour hand will rotate by 360°

When hour hand goes from 1 to 10 clockwise, it will rotate by 3 right angles or 270°

∴Fraction = $\frac{270^0}{360^0} = \frac{3}{4}$

f) 6 to 3

Solution:

In one complete clockwise revolution, hour hand will rotate by 360°

When hour hand goes from 6 to 3 clockwise, it will rotate by 3 right angles or 270°

∴Fraction = $\frac{270^0}{360^0} = \frac{3}{4}$

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

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

Solution:

Here the hand of a clock will stop at 6.

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

Solution:

Here the hand of a clock will stop at 8

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

Solution:

Here the hand of a clock will stop at 8

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

Solution:

Here the hand of a clock will stop at 2.

3. 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?

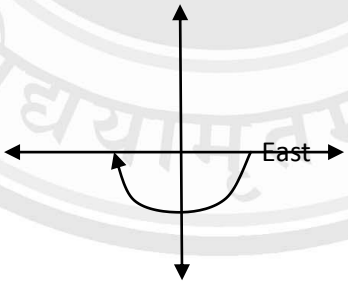
(d) south and make one full revolution?

(Should we specify clockwise or anti – clockwise for this last question? Why not?)

Solutions:

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

North

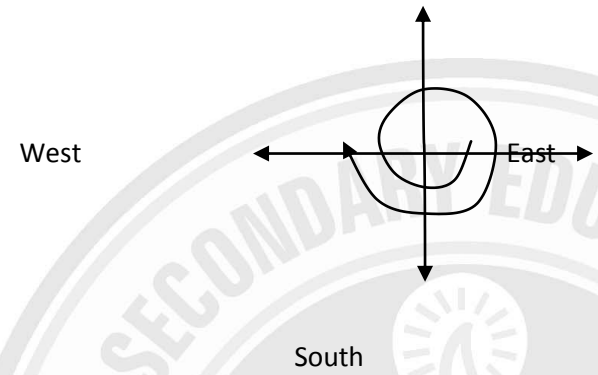


South

If we start facing towards East and make $\frac{1}{2}$ of a revolution clockwise, we will face towards West direction.

(b) east and make 1 ½ of a revolution clockwise?

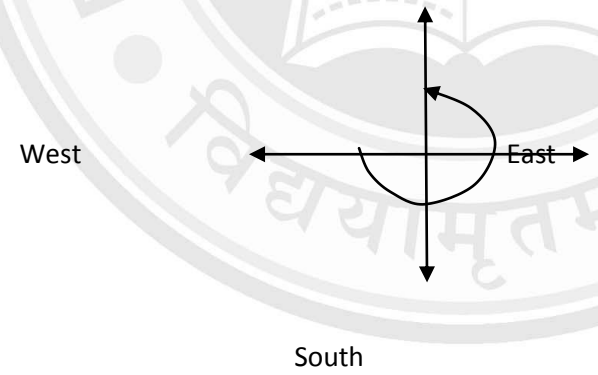
North



If we start facing towards East and make 1 ½ of a revolution clockwise, we will face towards West direction.

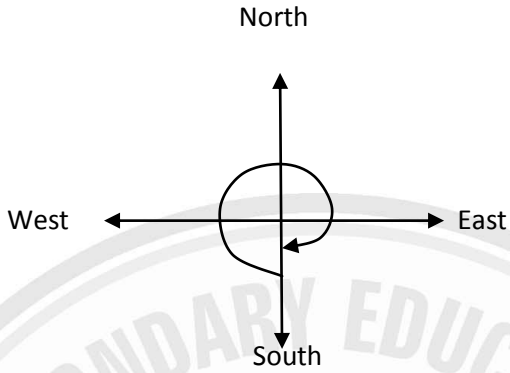
(c) west and make $\frac{3}{4}$ of a revolution anti – clockwise?

North



If we start facing towards West and make $\frac{3}{4}$ of a revolution anti – clockwise, we will face towards North direction

(d) south and make one full revolution?



If we start facing South and make one full revolution, again we will face the South direction.

In case of revolving 1 complete revolution, either clockwise or anti-clockwise we will be back at the original position.

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

(a) east and turn clockwise to face north?

Solution:

To start from east and turn clockwise to face north we will have to make $\frac{3}{4}$ of revolution.

(b) south and turn clockwise to face east

Solution:

To start from south and turn clockwise to face east we will have to make $\frac{3}{4}$ of revolution.

(c) west and turn clockwise to face east?

Solution:

To start from west and turn clockwise to face east we will have to make $\frac{1}{2}$ of revolution.

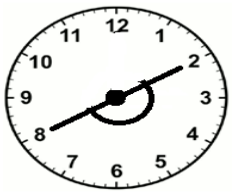
5. Find the number of right angles turned through by the hour hand of a clock when it goes from

(a) 3 to 6

Solution :

If hour hand of a clock goes from 3 to 6, it revolves by 90° or 1 right angle

(b) 2 to 8



Solution: **If hour hand of clock goes from 2 to 8, it revolves by 180˚ or 2 right angles.**

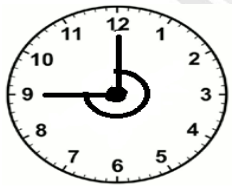
(c) 5 to 11

Solution: **If hour hand of clock goes from 5 to 11, it revolves by 180˚ or 2 right angles.**

(d) 10 to 1

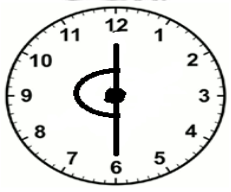
Solution: If hour hand of a clock goes from 10 to 1, it revolves by 90˚ or 1 right angle.

(e) 12 to 9



Solution: If hour hand of a clock goes from 12 to 9, it revolves by 270˚ or 3 right angles.

(f) 12 to 6



Solution: **If hour hand of clock goes from 6 to 12, it revolves by 180˚ or 2 right angles.**

6. How many right angles do you make if you start facing

(a) south and turn clockwise to west?

Solution: By turning clockwise from south to west we will make 1 right angle.

(b) north and turn anti – clockwise to east?

Solution: By turning anti-clockwise from south to west we will make 3 right angles.

(c) west and turn to west?

Solution: By turning anti-clockwise from south to west we will make 4 right angles.

(d) south and turn to north?

Solution: By turning anti-clockwise from south to west we will make 2 right angles.

7. Where will the hour hand of a clock stop if it starts

(a) from 6 and turns through 1 right angle?

Solution: The hour hand will be at 9 if it starts from 6 and turns through 1 right angle.

(b) from 8 and turns through 2 right angles?

Solution: The hour hand will be at 2 if it starts from 8 and turns through 2 right angles.

(c) from 10 and turns through 3 right angles?

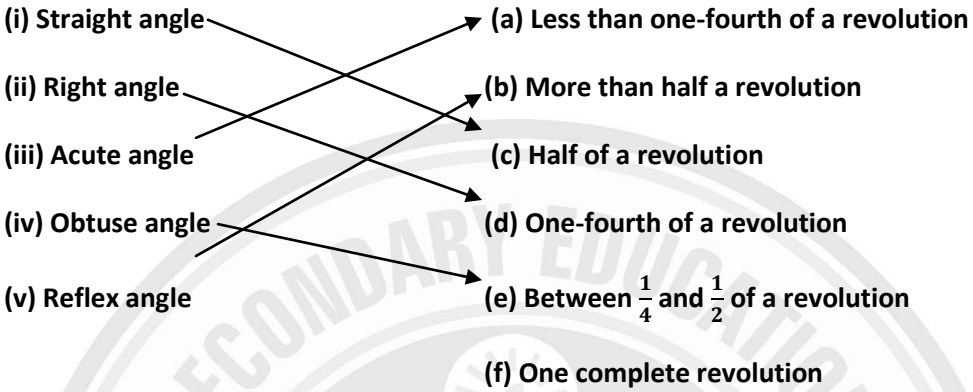
Solution: The hour hand will be at 7 if it starts from 10 and turns through 3 right angles.

(d) from 7 and turns through 2 straight angles?

Solution: The hour hand will be at 7 if it starts from 7 and turns through 2 straight angles.

Exercise 5.3

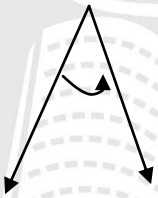
1. Match the following:



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

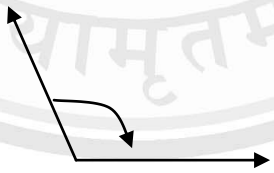
(a)

Solution: **Acute angle**

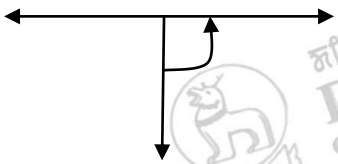


(b)

Solution: **Obtuse angle**

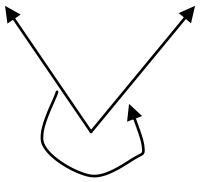


(c)



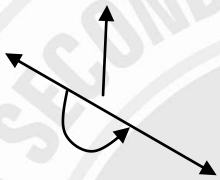
Solution: Right angle

(d)



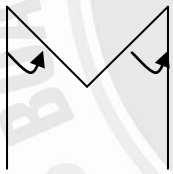
Solution: Reflex angle

(e)



Solution: Straight angle

(f)



Solution: Acute angle

Exercise 5.4

1. What is the measure of

(i) a right angle?

Solution: The measure of a right angle is 90^0

(ii) a straight angle

Solution: The measure of a straight angle is 180^0

2. Say True or False:

(a) The measure of an acute angle < 90^0 (True)

(b) The measure of an obtuse angle < 90^0 (False)

(c) The measure of a reflex angle > 180^0 (True)

(d) The measure of one complete revolution = 360^0 (True)

(e) If m ∠A = 53^0 and m ∠B = 35^0, then m ∠A > m ∠B. (True)

3. Write down the measures of

(a) some acute angles

(b) some obtuse angles

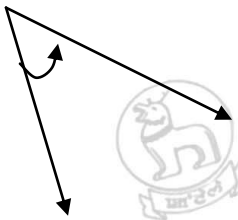
(give at least two examples of each)

Solution: (a) The measures of an acute angle are 30^0, 55^0

(b) The measures of obtuse angle are 120^0, 155^0

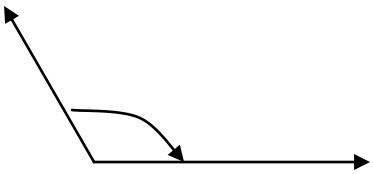
4. Measures the angles given below using the protractor and write down the measure.

(a)



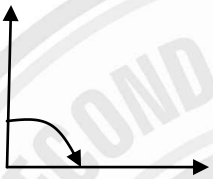
Solution: The measure of this angle is 45^0

(b)



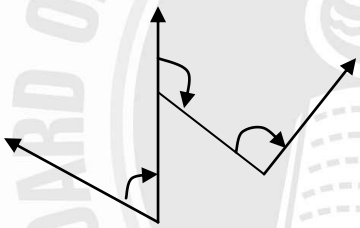
Solution: The measure of this angle is 120^0

(c)



Solution: The measure of this angle is 90^0

(d)

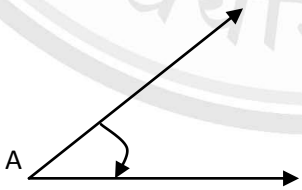


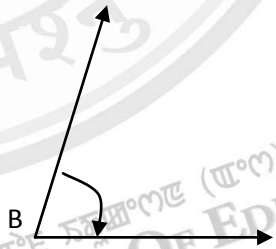
Solution: The measure of this angle is 60^0, 125^0,90^0

5. Which angle has a large measure? First estimate and then measure.

Measure of Angle A =

Measure of Angle B =





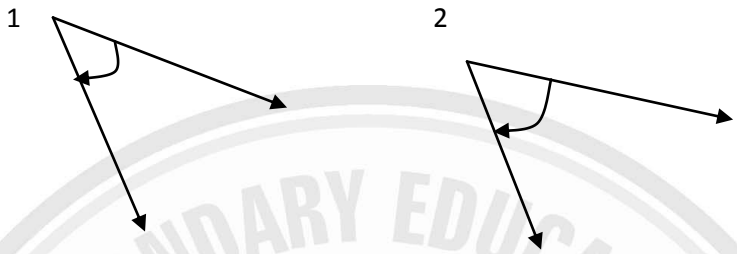
Solution:

The measure of angle A is 40^0

The measure of angle B is 70^0

Therefore ∠B has a large measure than ∠A.

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



The measure of angle 1 is 45° and measure of angle 2 is 55°. Angle 2 has larger measure.

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

(a) An angle whose measure is less than that of a right angle is <u>acute angle</u>

(b) An angle whose measure is greater than that of a right angle is <u>obtuse angle</u>

(c) An angle whose measure is the sum of the measures of two right angles is <u>straight angle</u>

(d) When the sum of the measures of two angles is that of a right angle, then each one of them is <u>acute angle</u>

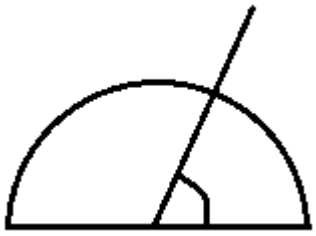
(e) When the sum of the measures of two angles is that of a straight angle and if one of them is acute then the other should be <u>obtuse angle.</u>

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

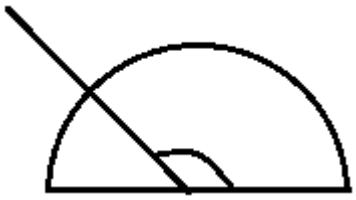
Solutions:

This angle is 40°.

This angle is 130°.



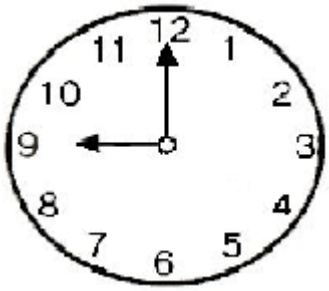
This angle is 65°.



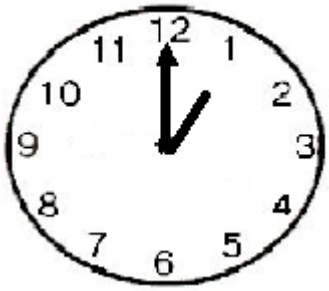
This angle is 135°.

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

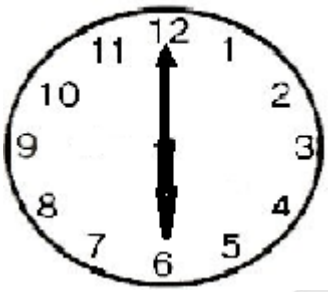
Solutions:



Here the angle measure between the hands of the clock is 90°.



Here the angle measure between the hands of the clock is 30°.



Here the angle measure between the hands of the clock is 180°.

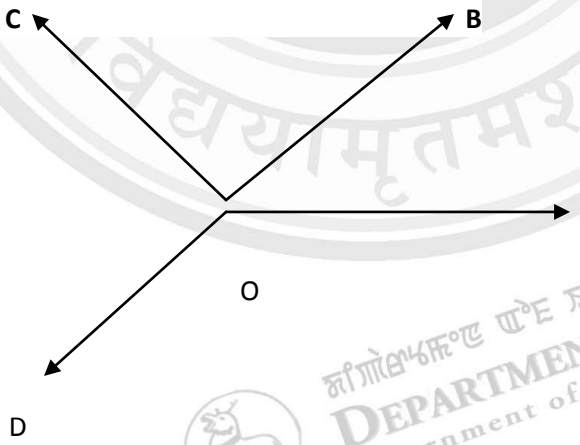
10. Investigate

In the given figure, the angle measure 30^0. Look at the same figure through a magnifying glass. Does the angle becomes larger? Does the size of the angle change?

30°

Solution: The angle will not change by looking through a magnifying glass

11. Measure and classify each angle:



Solutions:

Angles	Measure	Type
∠AOB	40^0	Acute
∠AOC	125^0	Obtuse
∠BOC	85^0	Acute
∠DOC	95^0	Obtuse
∠DOA	140^0	Obtuse
∠DOB	180^0	Straight

Exercise 5.5

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

(a) The adjacent edges of a table top.

Solution: The adjacent edges of a table top are perpendicular to each other.

(b) The lines of a railway track.

Solution: The lines of a railway track are not perpendicular.

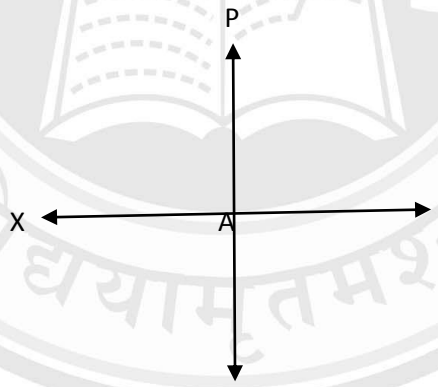
(c) The line segments forming the letter 'L'.

Solution: The line segments forming the letter 'L' are perpendicular to each other.

(d) The letter V.

Solution: The line of the letter V are not perpendicular to each other.

2. 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?

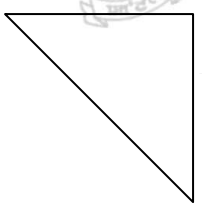


Solution: The measure of ∠PAY is 90^0.

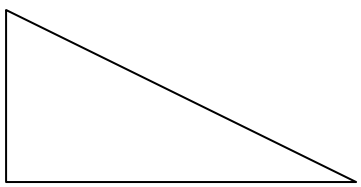
3. There are two set squares in your box. What are the measures of the angles that are formed at their corners? Do they have any angle measure that is common?

Solution:

1



2

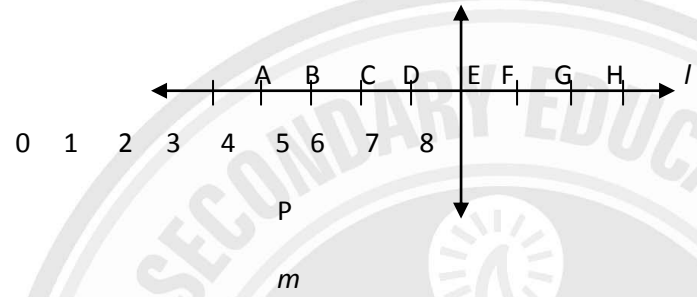


The measure of angles in triangle 1 are 45^0, 45^0 and 90^0

The measure of angles in triangle 2 are 30^0, 60^0 and 90^0

Both the triangle have common angle of 90°.

4. Study the diagram. The line *l* is perpendicular to line *m*



(a) Is CE = EG?

Solution: Yes, CE = EG, Since CE = 2 units and EG = 2 units.

(b) Does PE bisect CG?

Solution: Yes, PE bisects CG.

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

Solution: AH and DF

(d) Are these true?

(i) AC > FG

Solution: Yes, since AC is 2 units and FG is 1 unit.

(ii) CD = GH

Solution: Yes, since CD is 1 unit and FG is also 1 unit.

(iii) BC < EH.

Solution: Yes, since BC is 1 unit and EH is 3units.

Exercise 5.6

1. Name the types of following triangles:

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

Ans: Scalene triangle

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

Ans: Scalene triangle

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

Ans: Equilateral triangle

(d) ΔDEF with m D∠ = 90°

Ans: Right angled triangle.

(e) ΔXYZ with m ∠Y = 90° and XY = YZ.

Ans: Right angled isosceles triangle.

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

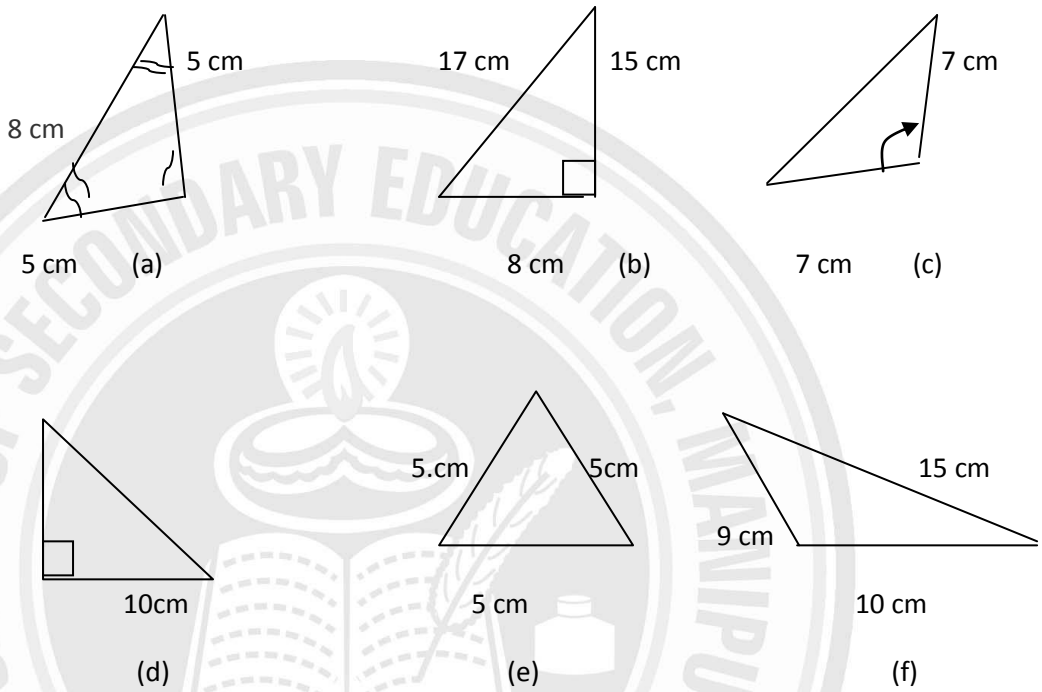
Ans: Acute angled triangle.

2. Match the following:

Measures of Triangle	**Type 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**

Answer. i – e, ii – g, iii – a, iv – f, v – d, vi – c, vii – b.

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



Solutions:

a) Acute angled triangle and Isosceles triangle.
b) Right angle triangle and Scalene triangle.
c) Obtuse angled and Isosceles triangle.
d) Right angled triangle and Isosceles triangle.
e) Equilateral triangle and Acute angled triangle.
f) Scalene triangle and Obtuse angled triangle.

4. Try to construct triangles using match sticks. Some are shown here. Can you make a triangle with

(a) 3 matchsticks?

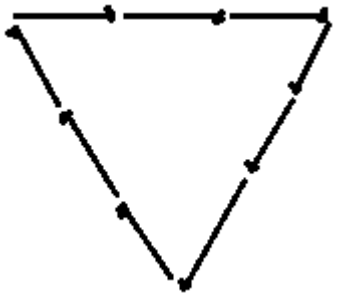
(b) 4 matchsticks?

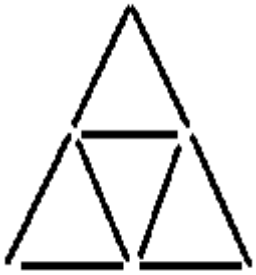
(c) 5 matchsticks?

(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.





Solutions:

(a) Using 3 matchsticks we can construct the above triangle. It is an equilateral triangle.

(b) We cannot construct triangle using 4 matchsticks.

(c) Using 5 matchsticks we can make the above triangle. It is an Isosceles triangle.

(d)

Using 6 matchsticks we can make the above triangle. It is an equilateral triangle.

Exercise 5.7

1. Say True or False:

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

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

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

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

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

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

2. Give reasons for the following:

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

Ans: A square can be thought of as a special rectangle because all the angles in square are 90° like rectangle.

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

Ans: In a parallelogram opposite sides are equal and in rectangle also opposite sides are equal. Thus a rectangle can be thought of as a special parallelogram.

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

Ans: A square can be thought of as a special rhombus because its four sides are equal and diagonals are perpendicular to each other.

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

Ans: Because all of them have four sides.

(e) Square is also a parallelogram.

Ans: Square is also a parallelogram because it's opposite sides are equal and parallel.

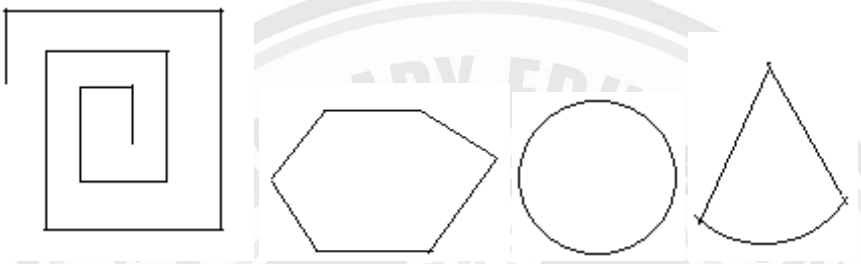
3. A figure is said to be regular if its sides are equal in length and angles are equal in measure. Can you identify the regular quadrilateral?

Solutions:

Square is a regular quadrilateral because all the interior angles are of 90^0 and all sides are of same length.

Exercise 5.8

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



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

Solutions:

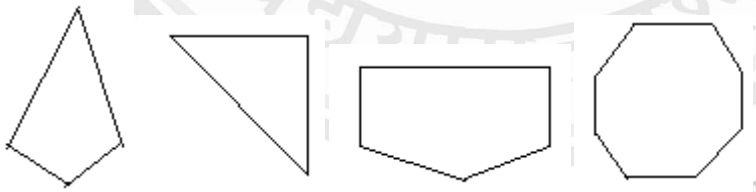
a) This figure is not a polygon because it is not a close figure.

b) This is a polygon. It has 5 line segments.

c) This is not a polygon because there is no line segment in this figure.

d) This is not a polygon because it is enclosed by an arc.

2. Name each polygon.



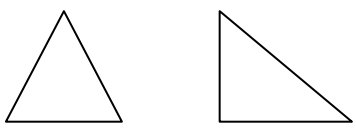
(a) (b) (c) (d)

Make two more examples of each of these.

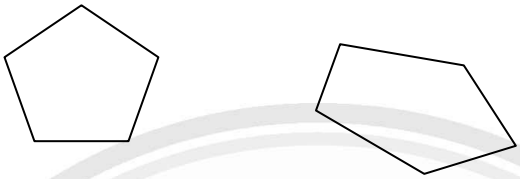
Solutions:

(a) The given figure is quadrilateral. Two more examples are as follows

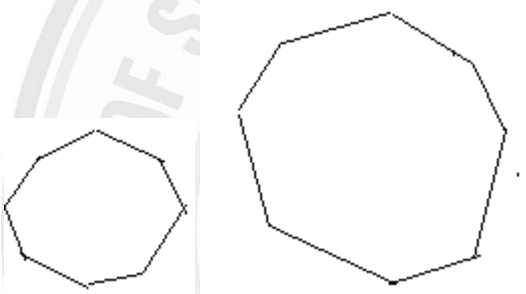
(b) The given figure is triangle. Two more examples are as follows:



(c)The given figure is pentagon. Two more examples are follows:



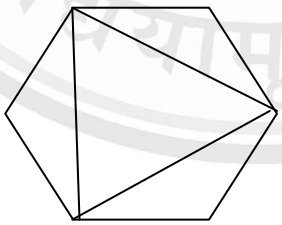
(d) The given figure is octagon. Two more examples are:



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.

Solution:

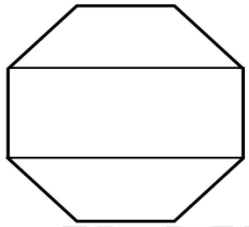
We can draw an equilateral triangle by joining three of vertices of a hexagon as shown in below figure.



4. 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.

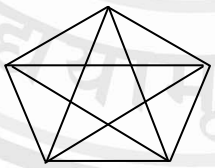
Solution:

The below figure is a regular octagon in which a rectangle is drawn by joining four of the vertices of the octagon.



5. 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.

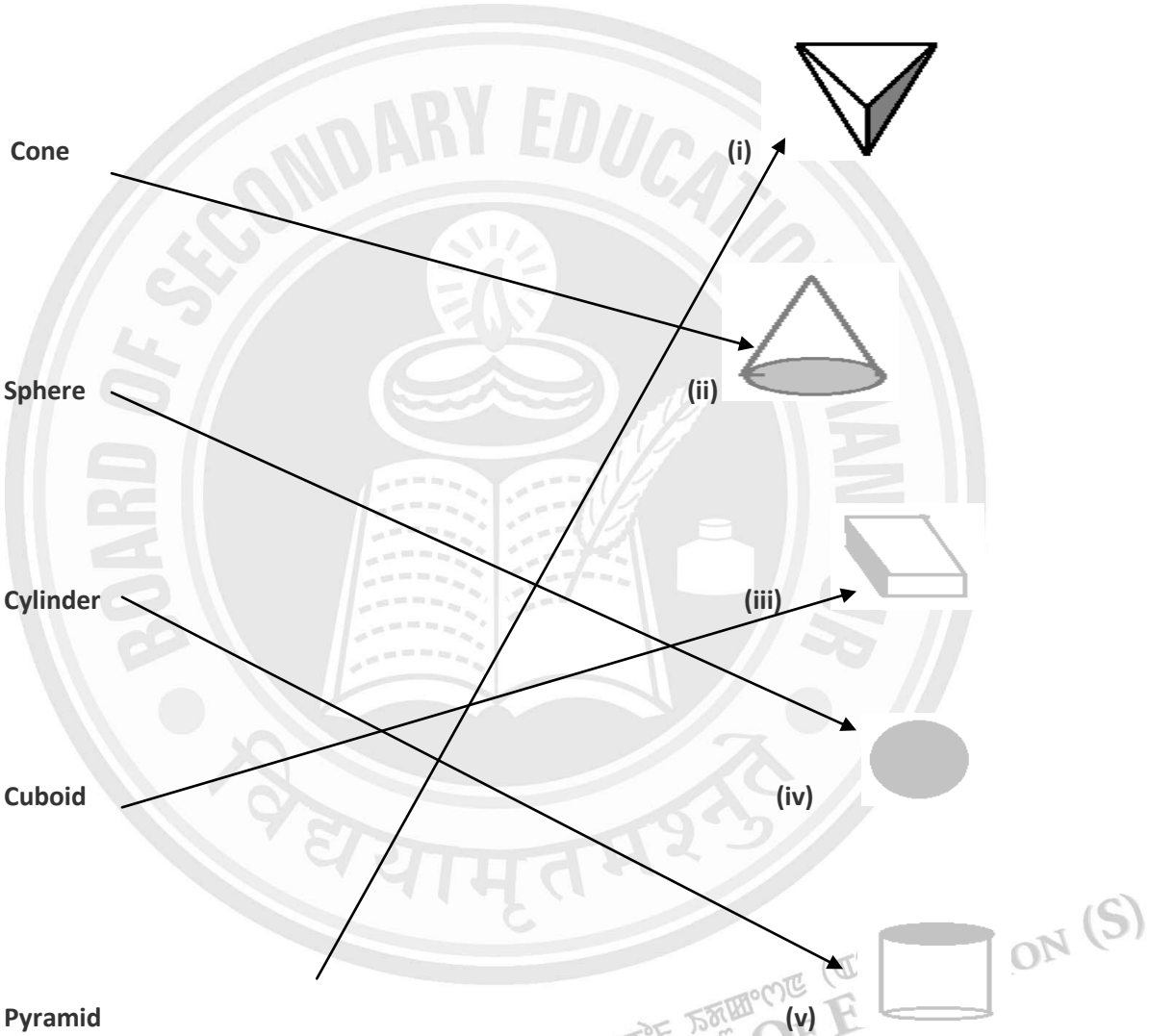
Solution:



Exercise 5.9

Match the following:

Give two new examples of each shape.



Two new examples of each shape are

a) **Birthday cap and ice-cream cone. (cone)**
b) **Football and Tennis ball. (sphere)**
c) **Candle and road roller. (cylinder)**
d) **Brick and book. (cuboid)**
e) **Egypt pyramid and diamond. (pyramid)**

2. What shape is

(a) Your instrument box?

Ans: The shape of an instrument box is cuboid.

(b) A brick?

Ans: The shape of a brick is cuboid.

(c) A match box?

Ans: The shape of a matchbox is cuboid.

(d) A road-roller?

Ans: The shape of a road-roller is cylinder.

(e) A sweet laddu?

Ans: The shape of a sweet laddu is sphere.

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