

Chapter 11

Understanding Symmetrical Shapes

Exercise 11.1

Question 1.

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

Solution:

There may be errors due to the thickness of the ruler and angular viewing by using a ruler. These errors are eradicated by using a divider. So, it is better to use a divider with ruler, than a ruler only, while measuring the length of a line segment.

Question 2.

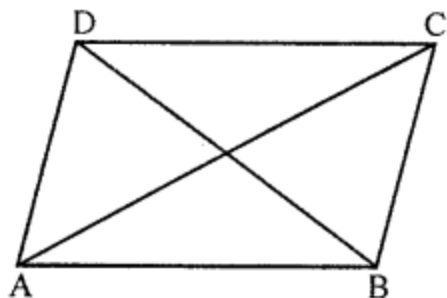
In the given figure, compare the line segments with the help of a divider and fill in the blanks by using the symbol $>$, $=$ or $<$;

(i) AB CD

(ii) BC.....AB

(iii) AC.....BD

(iv) CD BD



Solution:

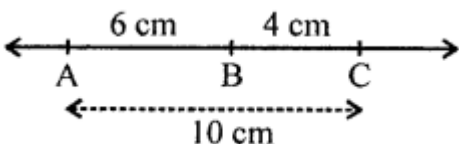
- (i) $AB = CD$
- (ii) $BC < AB$
- (iii) $AC > BD$
- (iv) $CD < BD$

Question 3.

If A, B and C are collinear points such that $AB = 6\text{cm}$, $BC = 4\text{cm}$ and $AC = 10\text{ cm}$, which one of them lies between the other two ?

Solution:

Given : A, B and C are collinear points



Points B lies between A and C.

Question 4.

In the given figure, verify the following by measurement :

- (i) $AB + BC = AC$

(ii) $AC - BC = AB$



Solution:

Measure with help of divider and ruler.

$AB = 3 \text{ cm}$, $BC = 1.5 \text{ cm}$ and $AC = 4.5 \text{ cm}$

(i) $AB + BC = AC$

$$\Rightarrow 3 \text{ cm} + 1.5 \text{ cm} = 4.5 \text{ cm}$$

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

(ii) $AC - BC = AB$

$$\Rightarrow 4.5 \text{ cm} - 1.5 \text{ cm} = 3 \text{ cm}$$

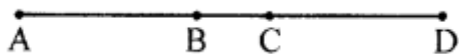
$$\Rightarrow 3 \text{ cm} = 3 \text{ cm}$$

Question 5.

In the given figure, verify by measurement that :

(i) $AC + BD = AD + BC$

(ii) $AB + CD = AD - BC$

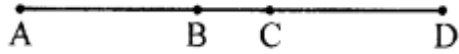


Solution:

measure with the help of

(i) $AC + BD = AD + BC$

(ii) $AB + CD = AD - BC$



Solution:

Measure with help of divide and ruler =

$AB = 1.8 \text{ cm}$, $BC = 0.8 \text{ cm}$, $BD = 2.7 \text{ cm}$, $CD = 1.9 \text{ cm}$, $AC = 4.5 \text{ cm}$

(i) $AC + BD = AD + BC$

$$\Rightarrow 2.6 \text{ cm} + 2.7 \text{ cm} = 4.5 \text{ cm} + 0.8 \text{ cm}$$

$$\Rightarrow 5.3 \text{ cm} = 5.3 \text{ cm}$$

(ii) $AB + CD = AD - BC$

$$\Rightarrow 1.8 \text{ cm} + 1.9 \text{ cm} = 4.5 \text{ cm} - 0.8 \text{ cm}$$

$$\Rightarrow 3.7 \text{ cm} = 3.7 \text{ cm}$$

Question 6.

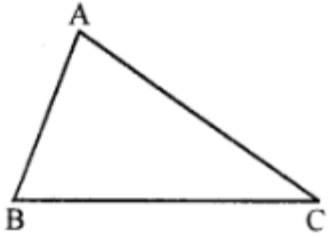
In the given figure, measure the lengths of the sides of the triangle

ABC and verify :

(i) $AB + BC > AC$

(ii) $BC + AC > AB$

(iii) $AC + AB > BC$



= Measure with help of a divide and ruler.

$AB = 2.5\text{cm}$, $BC = 3.8\text{cm}$, $AC = 4\text{ cm}$

(i) $AB + BC > AC$

$$\Rightarrow 2.5 + 3.8\text{cm} > 4\text{ cm}$$

$$\Rightarrow 5.3\text{ cm} > 4\text{ cm}$$

(ii) $BC + AC > AB$

$$\Rightarrow 3.8 + 4\text{cm} > 2.5\text{cm}$$

$$\Rightarrow 7.8\text{ cm} > 2.5\text{ cm}$$

(iii) $AC + AB > BC$

$$\Rightarrow 4\text{cm} + 2.5\text{ cm} > 3.8\text{ cm}$$

$$\Rightarrow 6.5\text{ cm} > 3.8\text{cm}$$

Exercise 11.2

Question 1.

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

(i) 4 to 10

(ii) 2 to 5

(iii) 7 to 10

(iv) 8 to 5

(v) 11 to 5

(vi) 6 to 3

Also find the number of right angles turned in each case.

Solution:

(i) $\frac{1}{2}$; 2

(ii) $\frac{1}{4}$; 1

(iii) $\frac{1}{4}$; 1

(iv) $\frac{3}{4}$; 3

(v) $\frac{1}{2}$; 2

(vi) $\frac{3}{4}$; 3

Question 2.

Where will the hand of a clock stop if it

- (i) Starts at 10 and makes 12 of a revolution, clockwise ?
- (ii) Starts at 4 and makes 14 of a revolution, clockwise ?
- (iii) Starts at 4 and makes 34 of a revolution, clockwise ?

Solution:

- (i) at 4
- (ii) at 7
- (iii) at 1

Question 3.

Where will the hand of a clock stop if it starts from

- (i) 6 and turns through 1 right angle ?
- (ii) 8 and turns through 2 right angles ?
- (iii) 10 and turns through 3 right angles ?
- (iv) 7 and turns through 2 straight angles ?

Solution :

- (i) 9
- (ii) 2
- (iii) 1
- (iv) 7

Question 4:

What fraction of a revolution have you turned through if you stand facing

- (i) north and turn clockwise to face west ?
- (ii) South and turn anti-clockwise to face east ?
- (iii) east and turn clockwise (or anti-clockwise) to face west ?

Also find the number of right angles turned in each case.

Solution:

- (i) $\frac{3}{4}$; 3
- (ii) $\frac{1}{4}$; 1
- (iii) $\frac{1}{2}$; 2

Question 5.

Match the following:

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

(vi) Reflex angle

(f) One- Complete revolution

Solution:

(i) Straight angle

(c) Half of a revolution

(ii) Right angle

(d) One-fourth of a revolution

(iii) Complete angle

(e) One complete revolution

(iv) Acute angle

(b) Less than one- fourth of a revolution

(v) Obtuse angle

(e) Between $\frac{1}{4}$ and $\frac{1}{2}$ of a revolution

(vi) Reflex angle

(e) More than half a revolution

Question 6.

Classify the angles whose magnitudes are given below :

(i) 56°

(ii) 125°

(iii) 90°

(iv) 180°

(v) 215°

(vi) 178°

Solution:

(i) Acute angle

(ii) Obtuse angle

(iii) Right angle

- (iv) Straight angle
- (v) Reflex angle
- (vi) Reflex angle
- (vii) Acute angle
- (viii) Obtuse angle

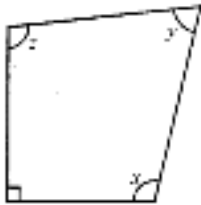
Question 7.

State which of the following angles with a small letter in the following diagrams are acute, which obtuse and which are reflex:

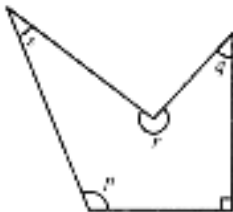
(i)



(ii)



(iii)

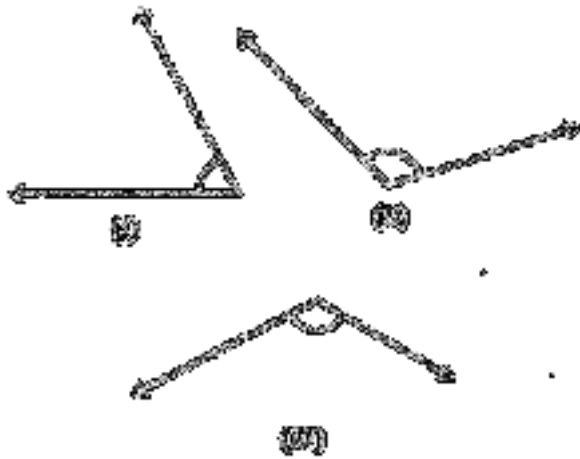


Solution:

- (i) $\angle a$ and $\angle c$ are acute, $\angle b$ is obtuse
- (ii) $\angle x$ and $\angle z$ are obtuse, $\angle y$ is acute.
- (iii) $\angle p$ is obtuse, $\angle q$ and $\angle s$ are acute, $\angle r$ is reflex.

Question 8.

Use your protector to measure each of the angles marked in the following figures :



Solution:

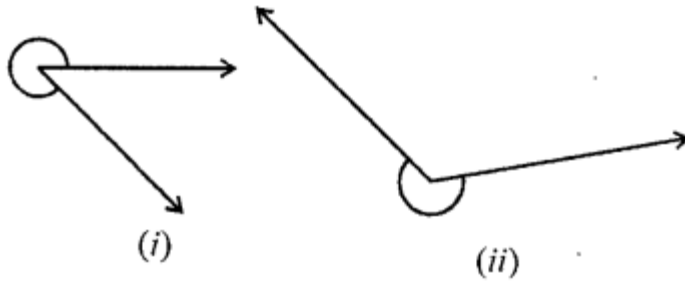
(i) 62°

(ii) 116°

(iii) 121°

Question 9.

Use your protector to measure the reflex angles marked in the following figures:



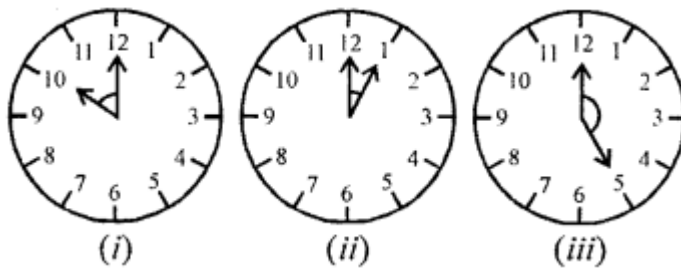
Solution:

(i) 315°

(ii) 235°

Question 10.

Find the measure of the angles between the hands of the clock in each figure :



Solution:

(i) 60°

(ii) 30°

(iii) 150°

Question 11.

Write the measure of the smaller angle formed by the hour and the minute hands of a clock at 7 O' clock. Also write the measure of the Other angle and also state what types of angles these are.

Solution:

Smaller angle is 150° (Obtuse).

The Other angle is 210° (reflex).

Question 12.

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

Solution:

One is a $30^\circ - 60^\circ - 90^\circ$ set square; the Other is $45^\circ - 45^\circ - 90^\circ$ set square. The angle of measure 90° (i.e., a right angle) is common between them.

Exercise 11.3

Question 1.

Which of the following are models for perpendicular lines ?

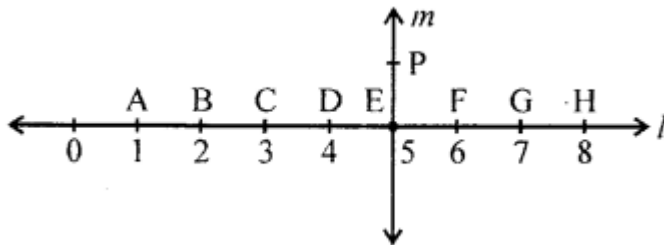
- (i) The adjacent edges of a postcard.
- (ii) The lines of a railway track.
- (iii) The line segment forming the letter 'L'.
- (iv) The adjacent edges of your Math book.
- (v) The line segments forming the letter 'V'.

Solution:

(i), (iii) and (iv) are models for perpendicular lines.

Question 2.

In the figure given below, line l is perpendicular to line m .



Solution:

(a) Is $CE = EG$?

(b) Does $\overleftrightarrow{PE}$ bisect segment $\overleftrightarrow{BH}$?

(c) Identify any two line segments for which $\overleftrightarrow{PE}$ is the perpendicular bisector.

(d) Are these true ?

Solution:

(a) $CE = CD + DE$

$$= 1 + 1 = 2 \text{ units}$$

$$EG = EF + FG$$

$$= 1 + 1 = 2 \text{ units}$$

$\therefore CE = EG$ (Yes)

(b) $\because CE = EG$

$\therefore E$ is the mid point of BH

Line $\overleftrightarrow{PE}$ bisect segment $\overleftrightarrow{BH}$ (Yes)

(c) $\overline{DF}$, $\overline{BH}$

(i) True

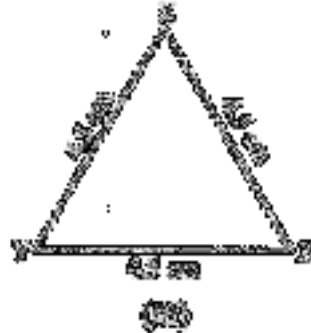
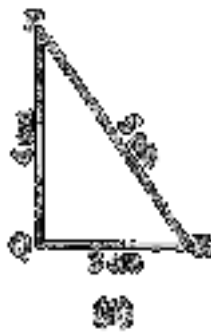
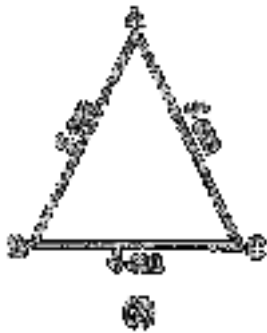
(ii) True

(iii) True

Exercise 11.4

Question 1.

Name the following triangles with regards to sides :

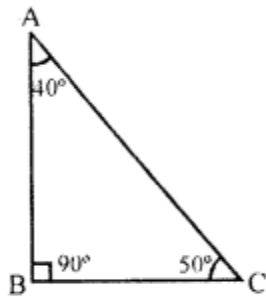


Solution:

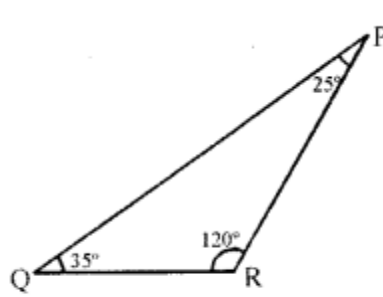
- (i) Isosceles triangle
 - (ii) Scalene triangle
 - (iii) Equilateral triangle
-
- (i) Isosceles triangle
 - (ii) Scalene triangle.
 - (iii) Equilateral triangle.

Question 2.

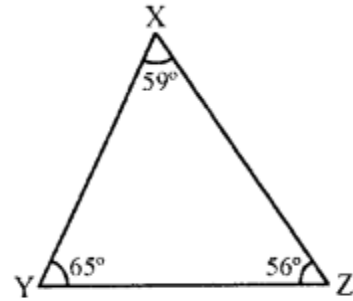
Name the following triangles with regards to angles:



(i)



(ii)



(iii)

Solution:

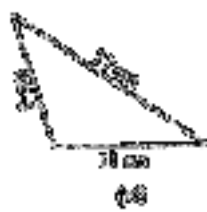
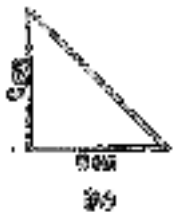
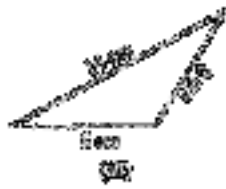
(i) Right angles triangle as $\angle B = 90^\circ$

(ii) Obtuse angles triangle as $\angle R$ is Obtuse and greater than 90° .

(iii) Acute angled triangle as all the angle are less than 90° .

Question 3.

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



Solution:

- (i) Acute angled and isosceles triangle
- (ii) right angles and scalene triangle
- (iii) Obtuse angled and isosceles triangle
- (iv) Right angles and isosceles triangle
- (v) Equilateral and acute angled triangle
- (vi) Obtuse angled and scalene triangle

Question 4.

Match the following.

Measure of triangles	Types of triangles
(i) 3 sides of equal length	(a) Scalene
(ii) 2 sides of equal length	(b) Isosceles right angled
(iii) all sides 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

Solution:

Measure of triangles	Types of triangles
(i) 3 sides of equal length	(e) Equilateral
(ii) 2 sides of equal length	(g) Isosceles
(iii) all sides of different length	(a) Scalene
(iv) 3 acute angles	(f) Acute angled
(v) 1 right angle	(d) Right angled
(vi) 1 Obtuse angle	(c) Obtuse angled
(vii) 1 right angle with two sides of equal length	(b) Isosceles right angled

Question 5.

State which of the following statement are true and which are false :

- (i) A triangle can have two right angles.
- (ii) A triangle cannot have more than one Obtuse angle.
- (iii) A triangle has atleast two acute angles.
- (iv) If all the three sides of a triangle are equal, it is called a scalene triangle.
- (v) A triangle has four sides.
- (vi) An isosceles triangle is an equilateral triangle also.
- (vii) An equilateral triangle is an isosceles triangle also.
- (viii) An scalene triangle has all its angles equal.

Solution:

(i) False

(ii) True

(iii) True

(iv) False

(v) False

(vi) False

(vii) True

(viii) False

Exercise 11.5

Question 1.

State whether the following statements are true (T) or False (F):

- (i) Each angle of a rectangle is a right angle.
- (ii) The Opposite sides of a rectangle are equal in length.
- (iii) The diagonals of a square are perpendicular to one another.
- (iv) All sides of a rhombus are equal in length.
- (v) All sides of a parallelogram are equal in length.
- (vi) The Opposite sides of a trapezium are parallel.
- (vii) The diagonal of a parallelogram are equal.

Solution:

- (i) True
- (ii) True
- (iii) True
- (iv) False
- (v) False
- (vi) False
- (vii) False

Question 2.

Examine whether the following figures are polygons. Give reasons.

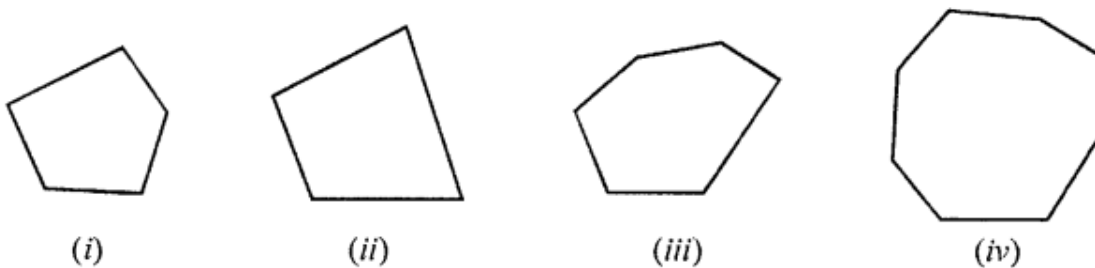


Solution:

- (i) Not a polygon, because it is not a closed curve.
- (ii) Polygon, because it is a simple closed curve made up entirely of line segments.
- (iii) Not a polygon, because it is not a simple curve.
- (iv) Not a polygon, because it is not made up of entirely line segments.

Question 3.

Name each of the following polygons :



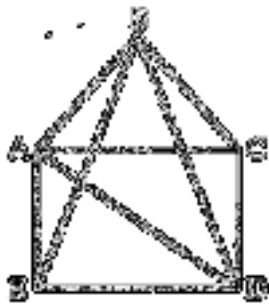
Solution:

- (i) Pentagon
- (ii) Quadrilateral
- (iii) Hexagon
- (iv) Octagon

Question 4.

Draw a rough sketch of a pentagon and draw its diagonals.

Solution:



ABCDE is required pentagon.

Its diagonals are : AC, AD, BE, BD.

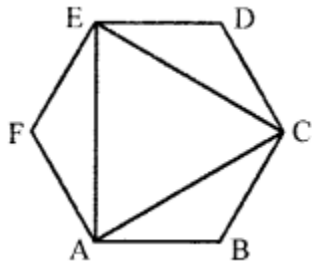
Question 5.

Draw a rough sketch of a regular hexagon. Connecting three of its vertices draw.

- (i) an isosceles triangle
- (ii) a right angles triangle

Solution:

The triangle ACE Obtained on joining its three vertices A, C and E is an equilateral triangle.

**Question 6.**

Can you identify the regular quadrilateral ?

Solution:

Square is regular quadrilateral.

Exercise 11.6

Question 1.

What is the shape of

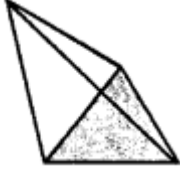
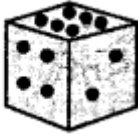
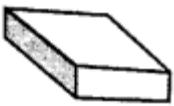
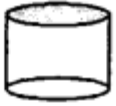
- (i) Your geometry box ?
- (ii) a brick ?
- (iii) a matchbox?
- (iv) a dum ?
- (v) a playing die ?
- (vi) a sweet laddu ?

Solution:

- (i) Cuboid
- (ii) Cuboid
- (iii) Cuboid
- (iv) Cylinder
- (v) Cube
- (vi) Sphere

Question 2.

Match the following :

(i) Cone	(a) 	(i) Pyramid	(d) 
(ii) Sphere	(b) 	(ii) Cylinder	(e) 
(iii) Cube	(c) 	(iii) Cuboid	(f) 

Solution:

(i) - (b),

(ii) –(d),

(iii) – (e),

(iv) – (a),

(v) - (f)

(vi) – (c)

Question 3.

Fill in the blanks:

(i) A cube has square faces,..... edges and vertices.

(ii) A triangular prism has..... triangular faces,.....rectangular faces,.....edges and vertices.

(iii) A triangular pyramid has..... faces,edges and vertices.

Solution:

- (i) A cube has **6** square faces, **12** edges and **8** vertices.
- (ii) A triangular prism has **2** triangular faces **3** rectangular faces **9** edges and **6** vertices.
- (iii) A triangular pyramid has **4** faces, **6** edges and **4** vertices.

Objective Type Questions

Mental Maths

Question 1.

Fill in the blanks:

- (i) An angle whose measure is less than that of a right angle is.....
- (ii) An angle whose measure is the sum of the measure of two right angles is
- (iii) When the sum of measures of two angles is that of a right angle, then each one of them is.....
- (iv) When the sum of measure of two angles is that of a straight angle and if one of them is acute then the other is.....
- (v) A triangle having one of its angles as right angle and with lengths of two sides equal is calledtriangle.
- (vi) A cuboid has..... faces,edges and vertices.
- (vii) A rectangular pyramid has..... faces,.....edges andvertices.

Solution:

- (i) An angle whose measure is less than that of a right angle is **acute**.
- (ii) An angle whose measure is the sum of the measure of two right angles is **Straight**.
- (iii) When the sum of measures of two angles is that of a right angle, then each one of them is **acute**.
- (iv) When the sum of measure of two angles is that of a straight angle and if one of them is acute then the other is **Obtuse**.

- (v) A triangle having one of its angles as right angle and with lengths of two sides equal is called **an isosceles right angled** triangle.
- (vi) A cuboid has **6** faces, **12** edges and **8** vertices.
- (vii) A rectangular pyramid has **5** faces, **8** edges and **5** vertices.

Question 2.

State whether the following statements are true (T) or False (F) :

- (i) Each angle of an equilateral triangle is a right angle.
- (ii) The adjacent sides of a rectangle are equal in length.
- (iii) The diagonals of a rectangle are equal in length.
- (iv) The diagonals of a rectangle are perpendicular to one another.
- (v) The diagonals of a rhombus are equal in length.
- (vi) Any three line segments make up a triangle.
- (vii) All the faces of a triangular prism are triangles.
- (viii) All the faces of a triangular pyramid are triangles.

Solution:

- (i) False
- (ii) False
- (iii) True
- (iv) False
- (v) False
- (vi) False
- (vii) False
- (viii) True

Question 3.

State whether the following statement is true or false. Justify your answer.

‘ An angle whose measure is greater than that of a right angle is obtuse’.

Solution:

False, because the angle can be obtuse, straight, reflex or complete.

Multiple Choice Questions

Choose the correct answer from the given four options (4 to 15):

Question 4.

Comparison of lengths is possible in case of

- (a) two lines
- (b) two line segments
- (c) two rays
- (d) a ray and a line segment

Solution:

two line segments (b)

Question 5.

A reflex angle measures

- (a) more than 90° but less than 180°
- (b) more than 90° but less than 270°

- (c) more than 180° but less than 360°
- (d) none of these

Solution:

- (c) more than 180° but less than 360°

Question 6.

A scalene triangle cannot be

- (a) an acute angles triangle
- (b) an obtuse angles triangle
- (c) a right angles triangle
- (d) an equilateral triangle

Solution:

- (d) an equilateral triangle

Question 7.

An Obtuse angled triangle can be

- (a) right angled
- (b) isosceles
- (c) equilateral
- (d) none of these

Solution:

- (b) isosceles

Question 8.

If you are facing north and turn through 34° of a turn in anti-clockwise direction, which direction will you face ?

- (a) east
- (b) south
- (c) west
- (d) north

Solution:

- (a) east

Question 9.

Open any two adjacent fingers of your hand. What kind of angle you get ?

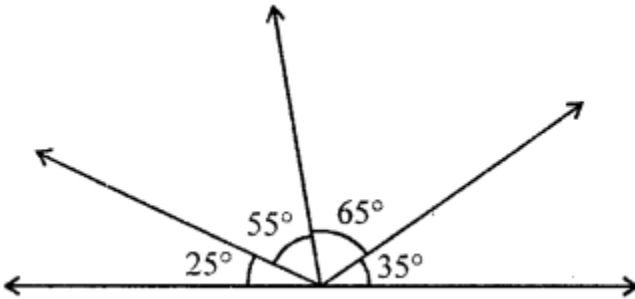
- (a) acute
- (b) right
- (c) Obtuse
- (d) Straight

Solution:

- (a) acute

Question 10.

In the given figure, the number of obtuse angles is



(a) 2

(b) 3

(c) 4

(d) 5

Solution:

(c) 4

Question 11.

If the sum of two angles is an obtuse angle, then which of the following is not possible ? one right angle and one acute angle one obtuse angle and one acute angle two acute angles two right angles

(a) two right angles

(b) One obtuse angle and one acute angle

(c) two acute angles

(d) two right angles

Solution:

(d) two right angles

Question 12.

If the sum of two angles is greater than 180° , then which of the following is not possible ?

- (a) two Obtuse angles
- (b) two right angles
- (c) One Obtuse and one acute angle
- (d) one reflex and one acute angle

Solution:

- (b) two right angles

Question 13.

Which of the following statements is false ?

- (a) Every quadrilateral triangle is an isosceles triangle.
- (b) Every isosceles triangle is an equilateral triangle.
- (c) Every parallelogram is a trapezium.
- (d) Every trapezium is a quadrilateral.

Solution:

Every isosceles triangle is an equilateral triangle. (b)

Question 14.

Which of the following statement is correct ?

- (a) Every rhombus is a square
- (b) Every parallelogram is a rectangle
- (c) Every square is a rhombus
- (d) Every rectangle is a square

Solution:

(c) Every square is a rhombus

Question 15

A quadrilateral whose each angle is a right angle is a

- (a) trapezium
- (b) parallelogram
- (c) rhombus
- (d) rectangle

Solution:

(d) rectangle

Higher Order Thinking Skills (HOTS)

Question 1.

If the lengths of two sides of an isosceles triangle are 3 cm and 7 cm, then what is the lengths of the third side ?

Solution:

2 sides of isosceles triangle are equal.

Also sum of two sides of triangle is always greater than 3rd side.

∴ The length of 3rd side = 7 cm

Question 2.

If the lengths of three consecutive sides of an isosceles trapezium are 5 cm, 6 cm and 8cm, then what is the length of the fourth side ?

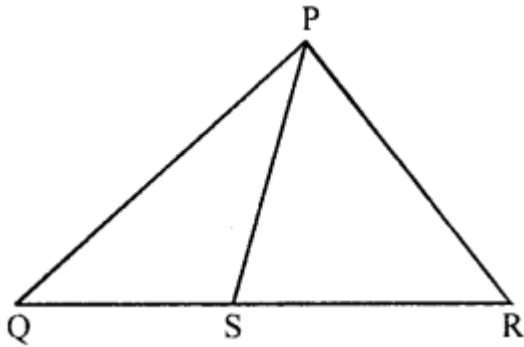
Solution:

6 cm

Check Your Progress

Question 1.

In the given figure, identify the longest and shortest line segments by measuring their lengths.



Solution:

Longest segment is QR and shortest is QS.

Question 2.

Where will the hour hand of a clock stop if it starts from 10 and turns through 3 right angles ?

Solution:

7

Question 3.

Classify the angles whose measures are given below:

- (i) 56°
- (ii) 125°
- (iii) 90°
- (iv) 180°
- (v) 215°
- (vi) 328°

Solution:

- (i) Acute angle
- (ii) Obtuse angle
- (iii) Right angle
- (iv) Straight angle
- (v) Reflex angle
- (vi) Reflex angle

Question 4.

Name the types of the following triangles:

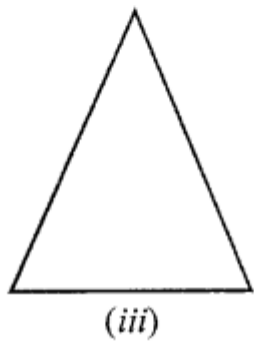
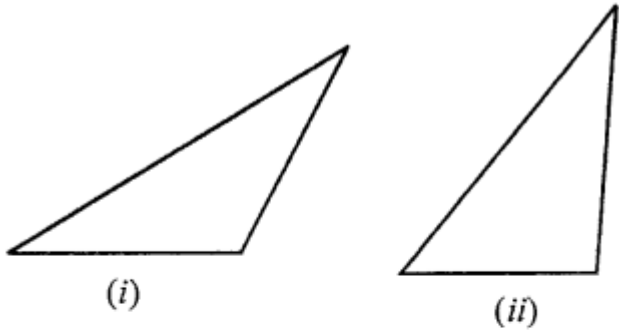
- (i) $\triangle ABC$ with $AB = 8$ cm, $AC = 7$ cm and $BC = 5.5$ cm.
- (ii) $\triangle PQR$ with $PQ = PR = 5$ cm and $QR = 7.3$ cm.
- (iii) $\triangle DEF$ with $D = 90^\circ$.
- (iv) $\triangle XYZ$ with $\angle Y = 90^\circ$ and $XY = YZ$.
- (v) $\triangle LMN$ with $\angle L = 30^\circ$, $\angle M = 70^\circ$ and $\angle N = 80^\circ$.

Solution:

- (i) Scalene triangle.
- (ii) Isosceles triangle.
- (iii) Right-angled triangle
- (iv) Isosceles right-angles triangle.
- (v) Acute angles triangle.

Question 5.

Name each of the following triangles in two different ways (you may use ruler and protector) :



Solution:

- (i) Obtuse angled and isosceles.
- (ii) Right- angled angle scalene.
- (iii) Acute angles and isosceles.

Question 6.

State whether the following statements are true or false:

- (i) A rectangle is a regular quadrilateral.
- (ii) A rhombus is a regular quadrilateral.
- (iii) Every parallelogram is a rhombus.
- (iv) The diagonals of a rhombus intersect at right angles.
- (v) A polygon having 6 sides is called an Octagon.
- (vi) A road roller has two plane circular faces and one curved face.
- (vii) A rectangular pyramid has 5 rectangular faces.

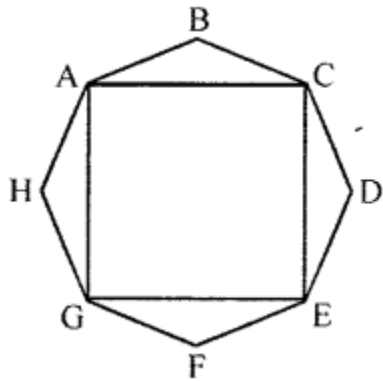
Solution :

- (i) False
- (ii) False
- (iii) False
- (iv) True
- (v) False
- (vi) True
- (vii) False

Question 7.

Draw a rough sketch of a regular octagon and draw a square by joining exactly four of its vertices.

Solution:



ABCDEFGH is a regular Octagon and ACEG is a required square.