

Chapter 13

Practical Geometry

Exercise 13

Question 1.

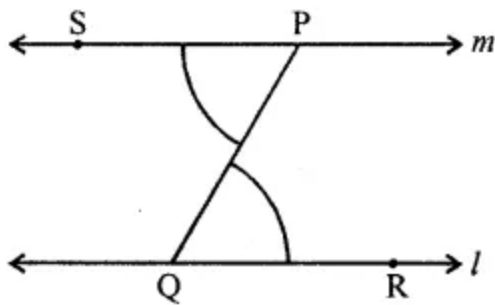
Draw a line, say l , take a point P outside it. Through P , draw a line parallel to l using ruler and compasses only.

Solution:

Steps of Construction:

1. Draw a line l and take a point P outside it.
2. Take another point Q on the line l and join PQ .
3. Construct at P equal to $\angle PQR$.

This is the required line which is parallel to l .



Question 2.

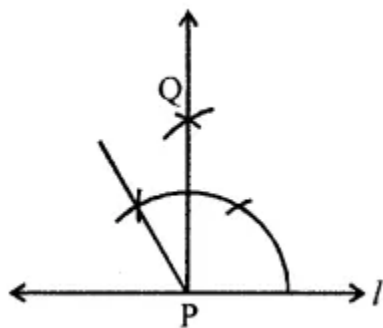
Draw a line l . Draw a perpendicular to l at any point on l . On this perpendicular choose a point A , 3.5 cm away from line l . Through A , draw a line m parallel to l .

Solution:

Steps of construction:

1. Draw a line l and take a point P on it.
2. At P draw a ray PQ making an angle of 90° .

PQ is the required perpendicular on the line l at point P .



Question 3.

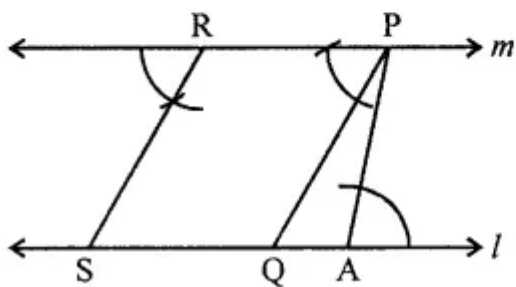
Let l be a line and P be a point not on l . Through P , draw a line m parallel to l . Now join P to any point Q on l . Choose any other point R on m . Through R , draw a line parallel to PQ . If this line meets l at S , then what shape do the two sets of parallel lines inclose?

Solution:

Steps of construction :

1. l is a line and P is a point not on the line l .
2. Take point A on l and join PA .
3. On P , draw an angle equal to $\angle PA l$ and draw a line m which is parallel to l .
4. Take a point Q and join PQ . From a point R on m , draw a line parallel to PQ which meets l at S .

We see that $PQSR$ is a $\parallel\text{gm}$.



Question 4.

Construct a triangle ABC , given that

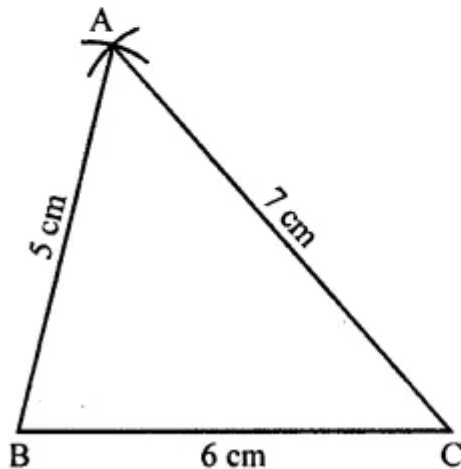
(i) $AB = 5 \text{ cm}$, $BC = 6 \text{ cm}$ and $AC = 7 \text{ cm}$

(ii) $AB = 4.5 \text{ cm}$, $BC = 5 \text{ cm}$ and $AC = 6 \text{ cm}$.

Solution:

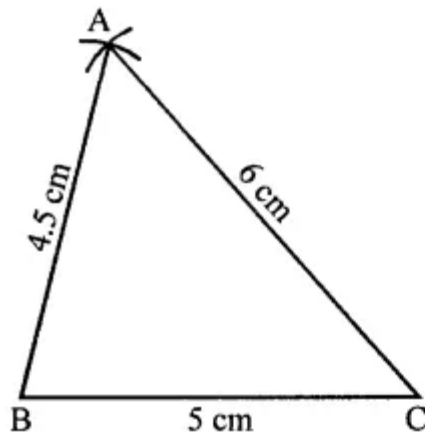
(i) Steps of construction :

1. Draw a line segment $BC = 6$ cm.
 2. With centre B and radius 5 cm and with centre C and radius 7 cm, draw arcs which intersect each other at A.
 3. Join AB and AC.
- $\triangle ABC$ is the required triangle.



(ii) Steps of Construction:

1. Draw a line segment $BC = 5$ cm.
 2. With centre B and radius 4.5 cm and with centre C and radius 6 cm, draw arcs which intersect each other at A.
 3. Join AB and AC.
- $\triangle ABC$ is the required triangle.



Question 5.

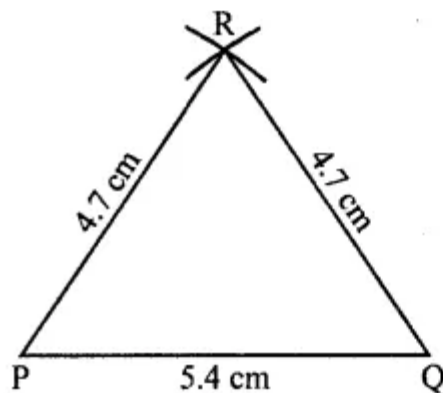
Construct a triangle PQR given that $PQ = 5.4$ cm, $QR = PR = 4.7$ cm. Name the triangle.

Solution:

Steps of construction :

1. Draw a line segment $PQ = 5.4$ cm.
2. With centre P and radius 4.7 cm and with centre Q and radius 4.7 cm, draw two arcs intersecting each other at R.
3. Join RP and RQ.

PQR is the required triangle which is an isosceles triangle.



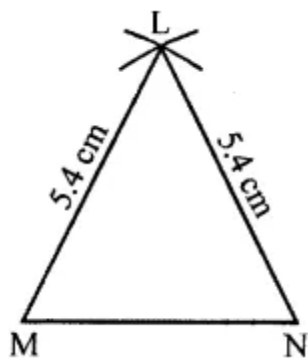
Question 6.

Construct a triangle LMN such that the length of each side is 5.3 cm. Name the triangle.

Solution:

Steps of construction :

1. Draw a line segment $MN = 5.4$ cm.
 2. With centre M and N and radius 5.4 cm, draw two arcs intersecting each other at L.
- $\triangle LMN$ is the required triangle which is an equilateral triangle.



Question 7.

Construct a triangle ABC such that $AB = 2.5$ cm, $BC = 6$ cm and $AC = 6.5$ cm. Measure $\angle ABC$ and name the triangle.

Solution:

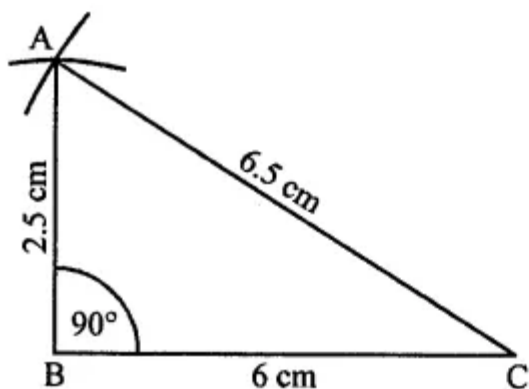
Steps of construction :

1. Draw a line segment $BC = 6$ cm.
2. With centre B and radius 2.5 cm and with centre C and radius 6.5 cm, draw two arcs intersecting each other at A.
3. Join AB and AC.

$\triangle ABG$ is the required triangle.

On measuring $\angle ABC$ it is equal to 90° .

Therefore, $\triangle ABC$ is a right angled triangle.



Question 8.

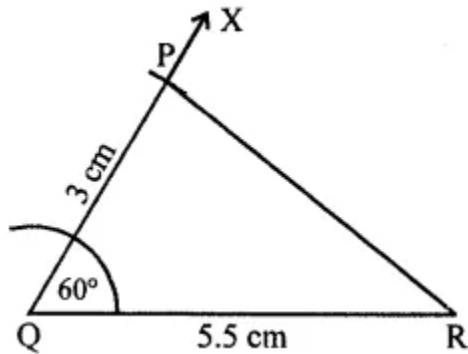
Construct a triangle PQR, given that $PQ = 3$ cm, $QR = 5.5$ cm and $\angle PQR = 60^\circ$.

Solution:

Steps of construction :

1. Draw a line segment $QR = 5.5$ cm.
2. At B, draw a ray BX making an angle of 60° and cut off $PQ = 3$ cm.
3. Join PR .

$\triangle PQR$ is the required triangle.



Question 9.

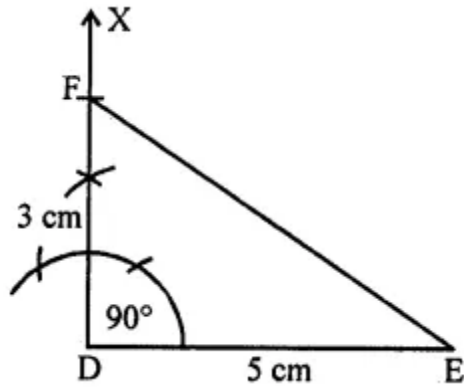
Construct $\triangle DEF$ such that $DE = 5$ cm, $DF = 3$ cm and $m\angle EDF = 90^\circ$.

Solution:

Steps of construction :

1. Draw a line segment $DE = 5$ cm.
2. At D, draw a ray DX making an angle of 90° and cut off $DF = 3$ cm.
3. Join FE .

$\triangle DEF$ is the required triangle.



Question 10.

Construct an isosceles triangle in which the length of each of its equal sides is 6.5 cm and the angle between them is 110° . Measure base angles.

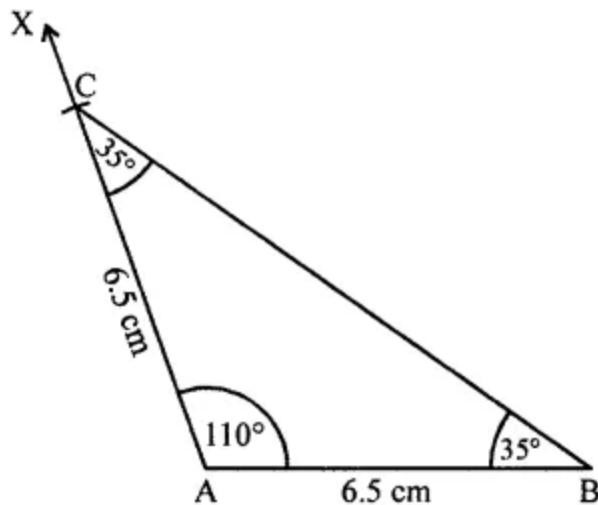
Solution:

Steps of construction:

1. Draw a line segment $AB = 6.5$ cm.
2. At A, draw a ray AX making an angle of 110° and cut off $AC = 6.5$ cm.
3. Join BC.

$\triangle ABC$ is the required triangle.

On measuring its base angles $\angle B$ and $\angle C$, these are 35° each.



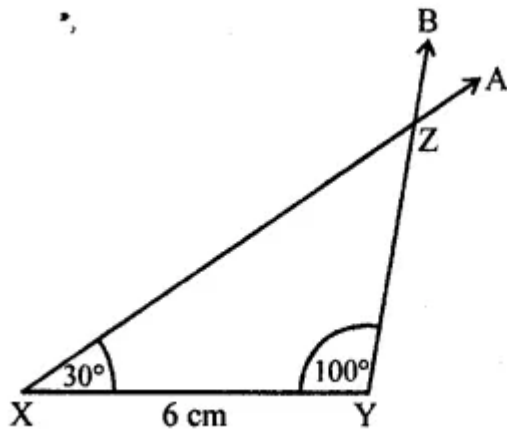
Question 11.

Construct triangle XYZ if it is given that $XY = 6$ cm, $\angle X = 30^\circ$ and $\angle Y = 100^\circ$.

Solution:

Steps of construction :

1. Draw a line segment $XY = 6 \text{ cm}$.
2. At X , draw a ray XA making an angle of 30° and at Y draw a ray YB making an angle of 100° which intersect each other at Z .
 $\triangle XYZ$ is the required triangle.



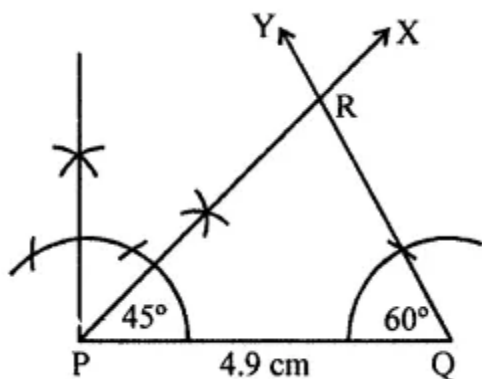
Question 12.

Construct a triangle PQR given that $PQ = 4.9 \text{ cm}$, $\angle P = 45^\circ$ and $\angle Q = 60^\circ$. Measure $\angle R$.

Solution:

Steps of construction :

1. Draw a line segment $PQ = 4.9 \text{ cm}$.
2. At P , draw a ray PR making an angle of 45° and at Q , draw a ray QR making an angle of 60° which intersect each other at R .
 $\triangle PQR$ is the required triangle.



Question 13.

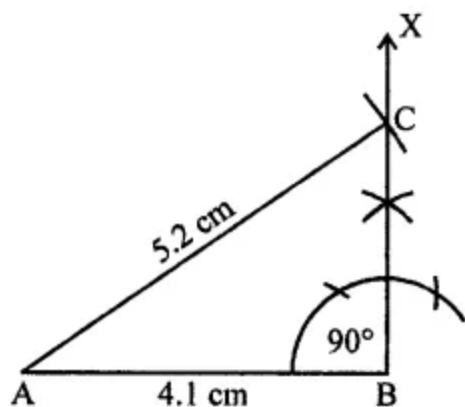
Construct a triangle ABC such that $AB = 4.1$ cm, $\angle B = 90^\circ$ and hypotenuse $AC = 5.2$ cm.

Solution:

Steps of construction:

1. Draw a line segment $AB = 4.1$ cm.
2. At B, draw a ray BX making an angle of 90° .
3. With centre A and radius 5.2 cm, draw an arc which intersects BX at C.
4. Join AC.

$\triangle ABC$ is the required triangle.



Question 14.

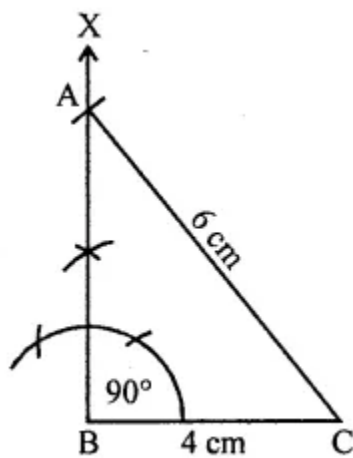
Construct a right-angled triangle whose hypotenuse is 6 cm long and one of the legs is 4 cm long.

Solution:

Steps of construction :

1. Draw a line segment $BC = 4$ cm.
2. At B, draw a ray BX making an angle of 90° .
3. With centre C and radius 6 cm
draw an arc which intersects BX at A.
4. Join AC.

$\triangle ABC$ is the required triangle.



Objective Type Questions

Higher Order Thinking Skills (HOTS)

Question 1.

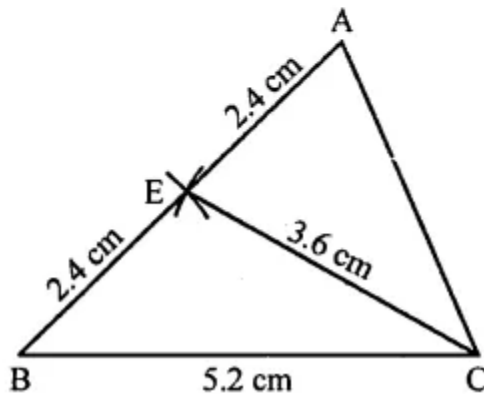
Construct a triangle ABC such that $BC = 5.2$ cm, $AB = 4.8$ cm and median $CM = 3.6$ cm.

Solution:

Steps of construction:

1. Draw a line segment $BC = 5.2$ cm.
2. With centre B and radius $\frac{4.8}{2} = 2.4$ cm and with centre C and radius 3.6 cm, draw arcs intersecting each other at E.
3. Join CE and BE.
4. Produce BE to A such that $EA = BE = 2.4$ cm.
5. Join AC.

$\triangle ABC$ is the required triangle.



Question 2.

Construct an isosceles right-angled triangle ABC such that its hypotenuse $BC = 6$ cm.

Solution:

Steps of construction:

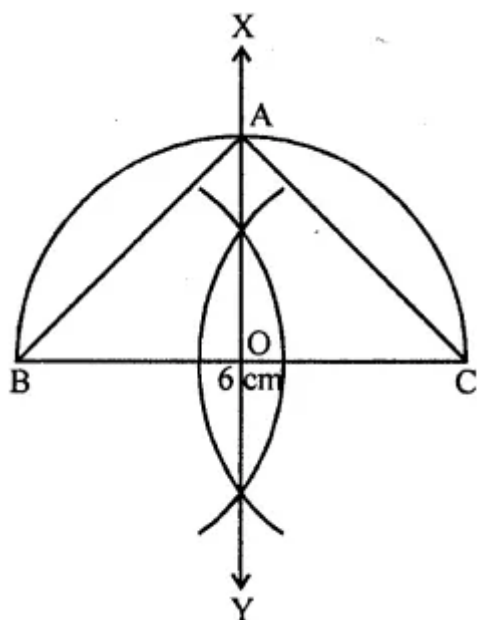
1. Draw a line segment $BC = 6$ cm.
2. Bisect BC at O.
3. With centre O and BC as diameter draw the same circle.
4. At O, draw a perpendicular which meets the semicircle at A.

5. Join AB and AC.

$\triangle ABC$ is the required triangle.

Note: Angle in a semicircle is 90° .

So, $\angle A = 90^\circ$ and $AB = AC$.



Check Your Progress

Question 1.

State whether the following statements are true or false. Justify your answer.

- (i) A triangle with lengths of sides 2.5 cm, 3 cm, and 6 cm can be constructed.
- (ii) A triangle DEF with $EF = 7.2$ cm, $m\angle E = 110^\circ$ and $m\angle F = 80^\circ$ can be constructed.
- (iii) If the measure of an acute angle and the length of the hypotenuse of a right-angled triangle are given, then the triangle can be constructed.

Solution:

(i) We know that in a triangle,

the sum of its any two sides is greater than its third side.

Therefore, a triangle with sides 2.5 cm, 3 cm and 6 cm.

$$2.5 + 3 = 5.5 < 6 \text{ cm}$$

This triangle is not possible.

(ii) In triangle DEF with side $EF = 7.2$ cm

and $m\angle E = 110^\circ$ and $m\angle F = 80^\circ$.

The sum of these two angles is $110^\circ + 80^\circ = 190^\circ$

which is not possible as a triangle has a sum of 180° .

(iii) If the measure of an acute angle and length of the hypotenuse in a right-angled triangle is given.

Yes this triangle can be constructed,

Measure of third acute angle = $180^\circ - 90^\circ$ one acute angle

We are given one side i.e., hypotenuse and its ends angles which is known as ASA criterion.

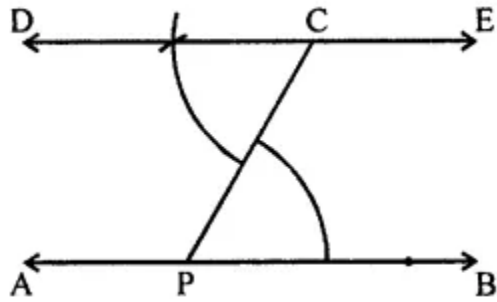
Question 2.

Draw a line AB and take a point C outside it. Through C, draw a line parallel to AB by using the concept of equal corresponding angles.

Solution:

Steps of construction:

1. Draw a line AB and take a point C outside it.
2. Take a point P on AB and join PC.
3. Construct $\angle PCD = \angle CPB$ and produce C to D and C to E.
Then, DE is parallel to AB.



Question 3.

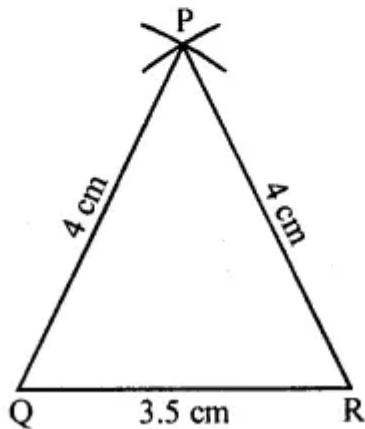
Draw a triangle PQR with $PQ = 4$ cm, $QR = 3.5$ cm and $PR = 4$ cm. What type of triangle is this?

Solution:

Steps of construction:

1. Draw a line segment $QR = 3.5$ cm.
2. At Q and R as centers and radius 4 cm, draw arcs intersecting each other at P.
3. Join PQ and PR.

$\triangle PQR$ is the required triangle.



Question 4.

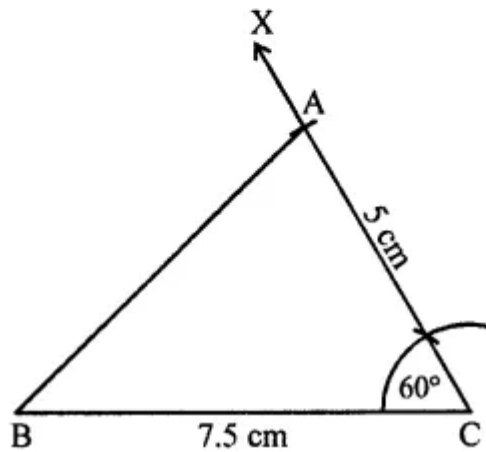
Construct a triangle ABC with $BC = 7.5$ cm, $AC = 5$ cm and $m\angle C = 60^\circ$ by using ruler and compasses only.

Solution:

Steps of construction :

1. Draw a line segment $BC = 7.5$ cm.
2. At C, draw a ray CX making an angle of 60° and cut off $CA = 5$ cm.
3. Join AB.

$\triangle ABC$ is the required triangle.



Question 5.

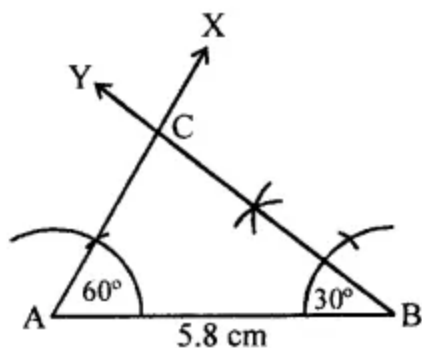
Construct a triangle ABC, given $m\angle A = 60^\circ$, $m\angle B = 30^\circ$ and $AB = 5.8$ cm by using ruler and compasses only.

Solution:

Steps of Construction:

1. Draw a line segment $AB = 5.8$ cm.
2. At A draw a ray AX making an angle of 60° and at B, a ray BY making an angle of 30° which intersect each other at C.

$\triangle ABC$ is the required triangle.



Question 6.

Construct an isosceles right angled triangle ABC, with $m\angle ABC = 90^\circ$ and $AC = 6$ cm.

Solution:

Steps of construction:

1. Draw a line segment $AC = 6$ cm.
2. Draw its perpendicular bisector which intersects AC at O .
3. With centre O and AC as diameter, draw a semicircle.
4. The perpendicular bisector intersects the semicircle at B .
5. Join BA and BC .

$\triangle ABC$ is the required triangle.

