Chapter 13

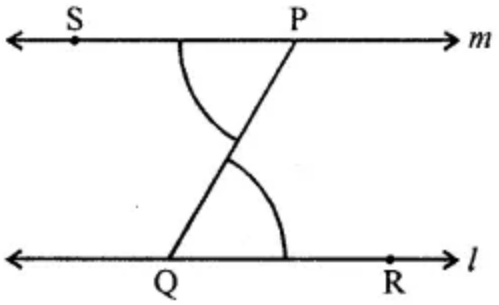
Practical Geometry

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 ∠PQR.

   This is the required line which is parallel to l.



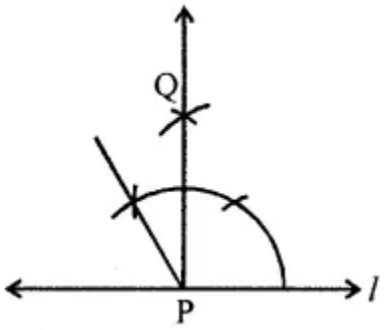
Question 2.
Draw a line l. Draw a perpendicular to l at any point on l. On this perpendicular choose a point A, 3.5 cm away from line l. Through A, draw a line m parallel to l.

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°.

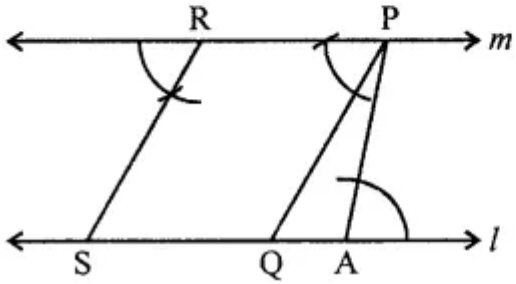
   PQ is the required perpendicular on the line l at point P.



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 :

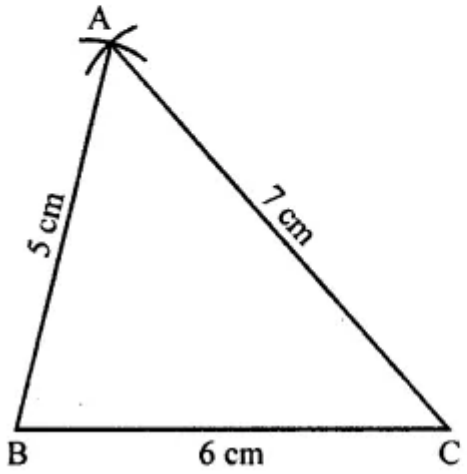
1. P is a line and P is a point not on the line l.
2. Take point A on it and join PA.
3. On P, draw an angle equal to ∠PAl and draw a line m which is parallel to l.
4. Take a point Q and join PQ. From a point R on m,
   draw a line parallel to PQ which meets l at S.
   We see that PQSR is a ||gm.



Question 4.
Construct a triangle ABC, given that
(i) AB = 5 cm, BC = 6 cm and AC = 7 cm
(ii) AB = 4.5 cm, BC = 5 cm and AC = 6 cm.
Solution:

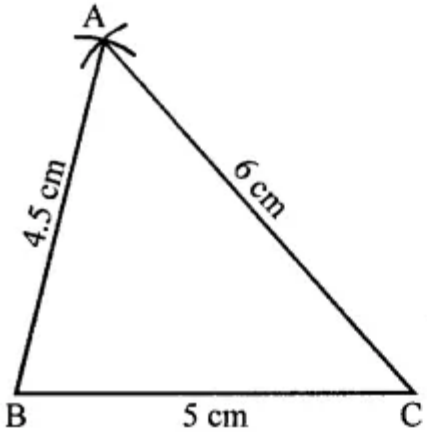
(i) Steps of construction :

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.
   ΔABC is the required triangle.



(ii) Steps of Construction:

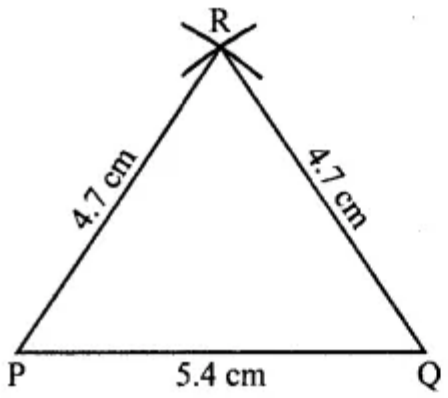
1. Draw a line segment BC 5 cm.
2. With centre B and radius 4.5 cm and with centre C and radius 6 cm, draw arcs which intersect each other at A.
3. Join AB and AC.
   ΔABC is the required triangle.



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.

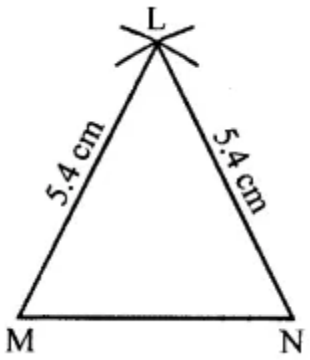


Question 6.
Construct a triangle LMN such that the length of each side is 5.3 cm. Name the triangle.

Solution:

Steps of construction :

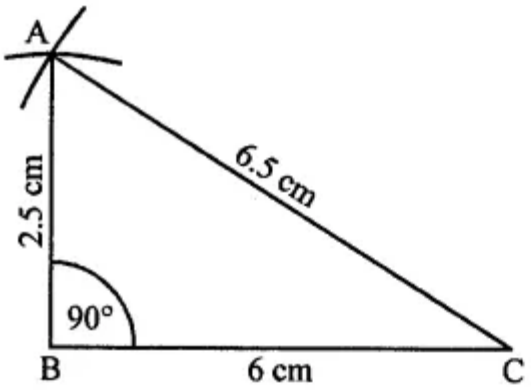
1. Draw a line segment MN = 5.4 cm.
2. With centre M and N and radius 5.4 cm, draw two arcs intersecting each other at L.
   ΔLMN is the required triangle which is an equilateral triangle.



Question 7.
Construct a triangle ABC such that AB = 2.5 cm, BC = 6 cm and AC = 6.5 cm. Measure ∠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.
   ΔABG is the required triangle.
   On measuring ∠ABC it is equal to 90°.
   Therefore, ΔABC is a right angled triangle.



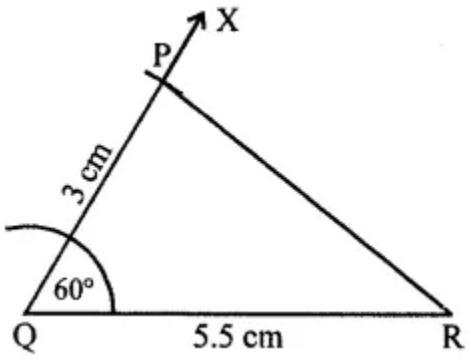
Question 8.
Construct a triangle PQR, given that PQ = 3 cm, QR = 5.5 cm and ∠PQR = 60°.

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.

   ΔPQR is the required triangle.



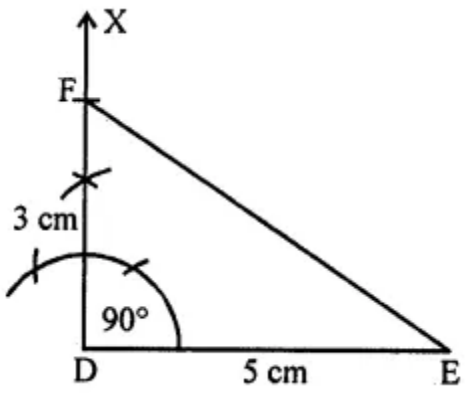
Question 9.
Construct ΔDEF such that DE = 5 cm, DF = 3 cm and m∠EDF = 90°.

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.

   ΔDEF 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.

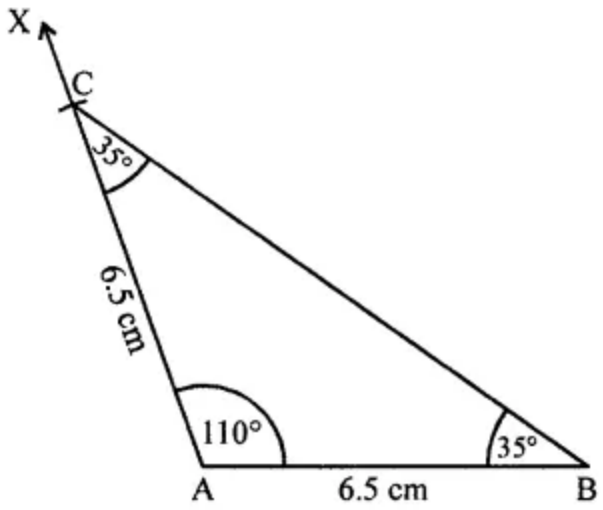
Solution:

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.

   ΔABC is the required triangle.

   On measuring its base angles ∠B and ∠C, these are 35° each.

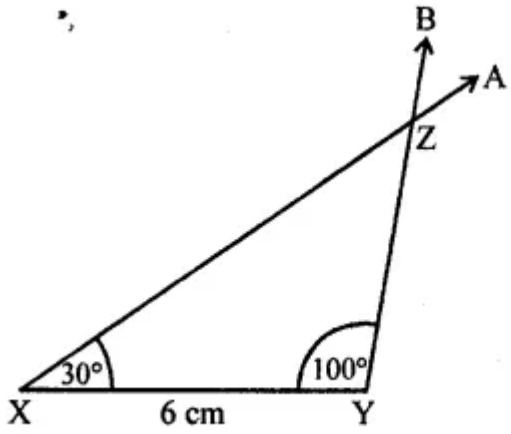


Question 11.
Construct triangle XYZ if it is given that XY = 6 cm, ∠X = 30° and ∠Y = 100°.

Solution:

Steps of construction :

1. Draw a line segment XY = 6 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 X.
   ∠XYZ is the required triangle.

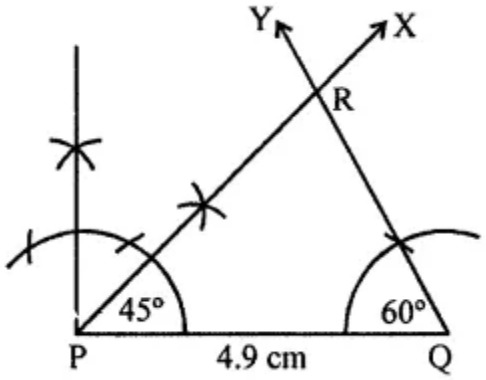


Question 12.
Construct a triangle PQR given that PQ = 4.9 cm, ∠P = 45° and ∠Q = 60°. Measure ∠R.

Solution:

Steps of construction :

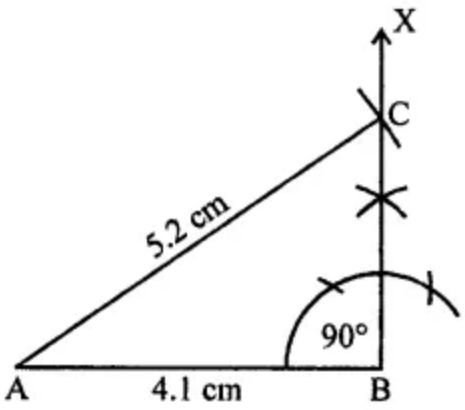
1. Draw a line segment PQ = 4.9 cm.
2. AP, draw a ray PX making are the angle of 45° and at Q,
   draw a ray QY making an angle of 60°
   which intersect it each other at R.
   ΔPQR is the required triangle.



Question 13.
Construct a triangle ABC such that AB = 4.1 cm, ∠B = 90° and hypotenuse AC = 5.2 cm.
Solution:

Steps of construction:

1. Draw a line segment AB = 4.1 cm.
2. AB, 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.
   ΔABC is the required triangle.

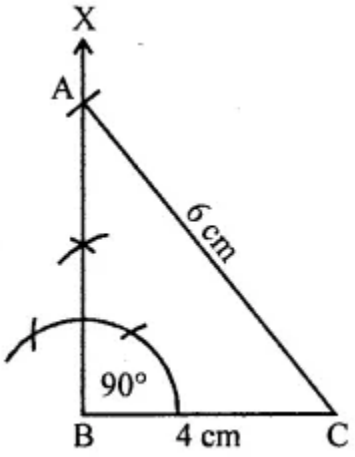


Question 14.
Construct a right-angled triangle whose hypotenuse is 6 cm long and one of the legs is 4 cm long.

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.
   ΔABC is the required triangle.



Objective Type Questions

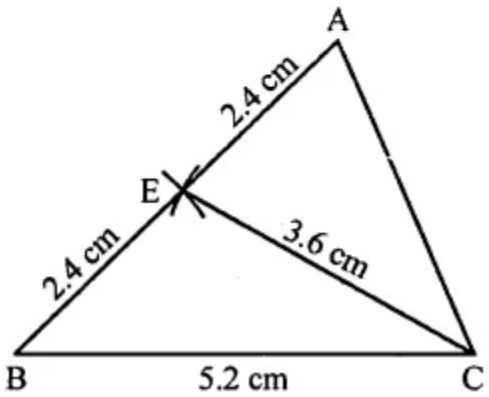
Higher Order Thinking Skills (HOTS)

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.

   ΔABC is the required triangle.



Question 2.
Construct an isosceles right-angled triangle ABC such that its hypotenuse BC = 6 cm.

Solution:

Steps of construction:

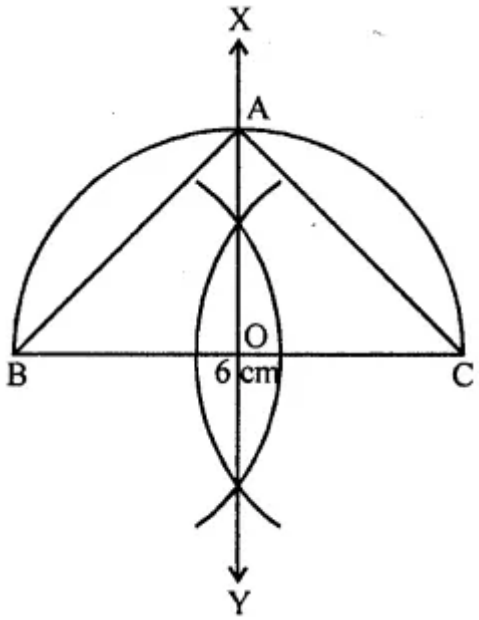
1. Draw a line segment BC = 6 cm.
2. Bisect BC at O.
3. With centre O and BC as diameter draw the same circle.
4. At O, draw a perpendicular which meets the semicircle at A.

5. Join AB and AC.

   ΔABC is the required triangle.

Note: Angle in a semicircle is 90°.

So, ∠A = 90° and AB = AC.



Check Your Progress

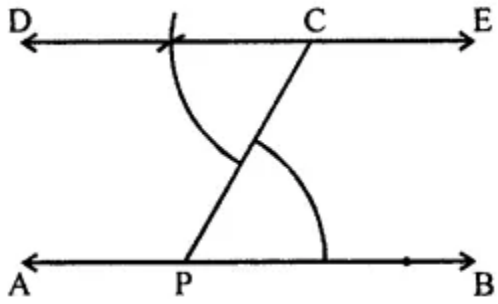
Question 1.
State whether the following statements are true or false. Justify your answer.
(i) A triangle with lengths of sides 2.5 cm, 3 cm, and 6 cm can be constructed.
(ii) A triangle DEF with EF = 7.2 cm, m∠E = 110° and m∠F = 80° can be constructed.
(iii) If the measure of an acute angle and the 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 cm
This triangle is not possible.
(ii) In triangle DEF with side EF = 7.2 cm
and m∠E =110° and m∠E = 80°.
The sum of these two angles is 110° + 80° = 190°
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° – 90° 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:

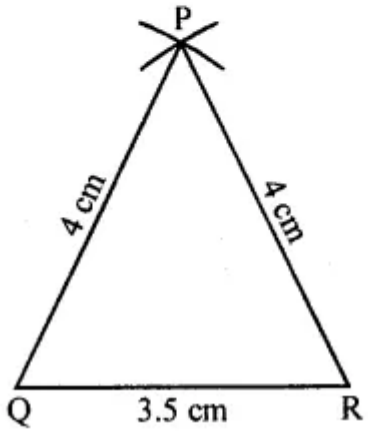
1. Draw a line AB and take a point C outside it.
2. Take a point P on AB and join PC.
3. Construct ∠PCD = ∠CPB and produce C to D and C to E.
   Then, DE is parallel to AB.



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.
   ΔPQR is the required triangle.



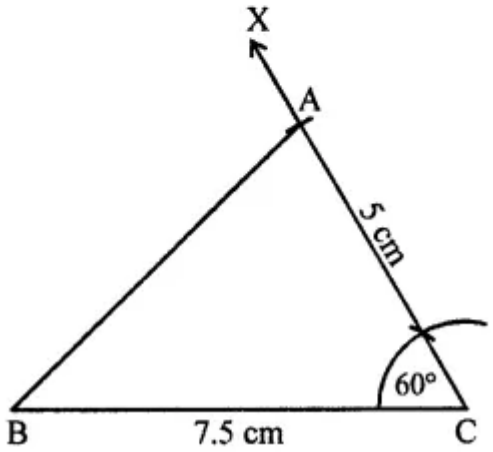
Question 4.
Construct a triangle ABC with BC = 7.5 cm, AC = 5 cm and m∠C = 60° by using ruler and compasses only.

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.

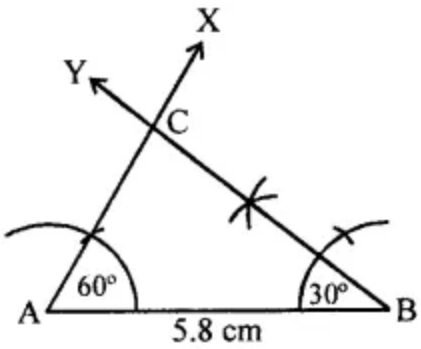
   ΔABC is the required triangle.



Question 5.
Construct a triangle ABC, given m∠A = 60°, m∠B = 30° 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.

   ΔABC is the required triangle.



Question 6.
Construct an isosceles right angled triangle ABC, with m∠ABC = 90° 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 bisects intersect the semicircle at B.
5. Join BA and BC.

ΔABC is the required triangle.