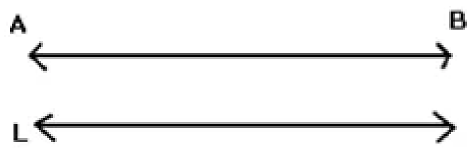
Chapter 16. Loci

Ex 16.1

Answer 2.

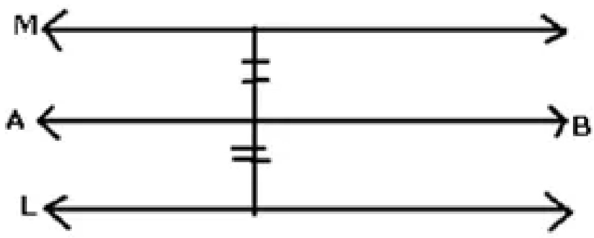
The locus of path traced by point P equidistant from A and B is the perpendicular bisector of the line segment joining the two points.

Answer 3.



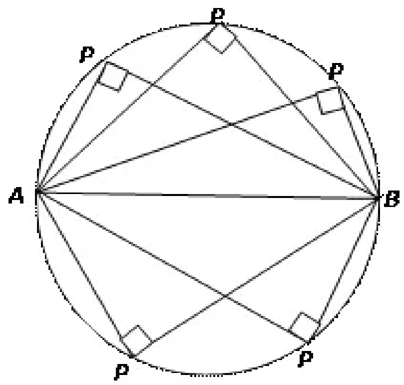
The locus of a point which moves so that its distance from a fixed straight line is same is a pair of straight lines parallel to the given line, one on each side of it and at the given distance from it.

Answer 4.



The locus of a point so that its perpendicular distance from two given lines is always equal is a line AB parallel to given lines L and M.

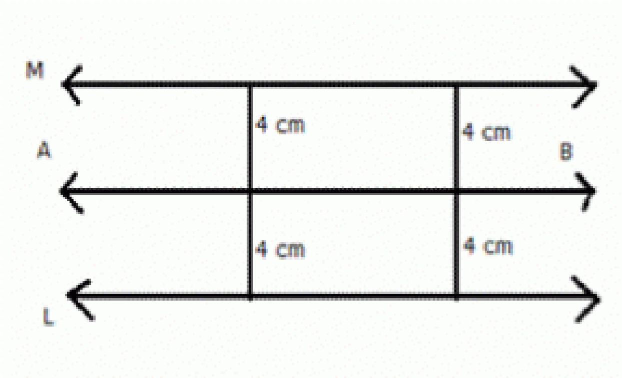
Answer 5.



The locus of point P is a circle with AB as diameter.

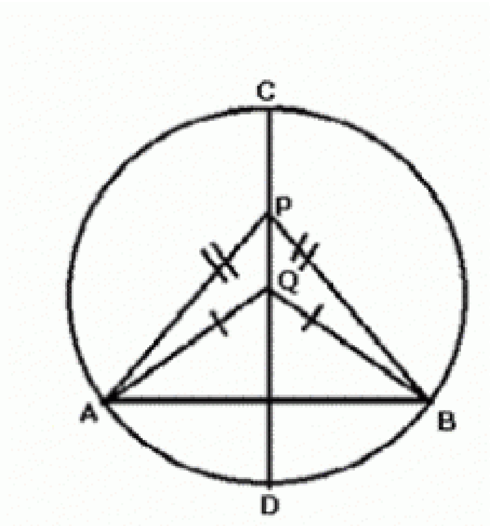
Answer 6.

(a) The locus of points at a distance of 4 cm from a fixed line.



The locus of points at a distance of 4 cm from fixed line AB are lines L and M which are parallel to AB.

(b) The locus of points inside a circle and equidistant from two fixed points on the circle.

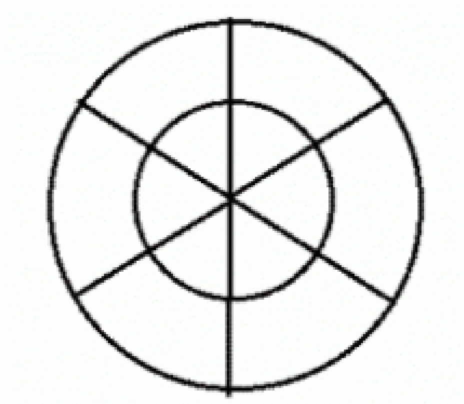


The locus of the points inside the circle which are equidistant from the fixed points on the circle will be the diameter which is perpendicular bisector of the line joining the two fixed points on the circle.

(c) The locus of the mid-points of all parallel chords of a circle.

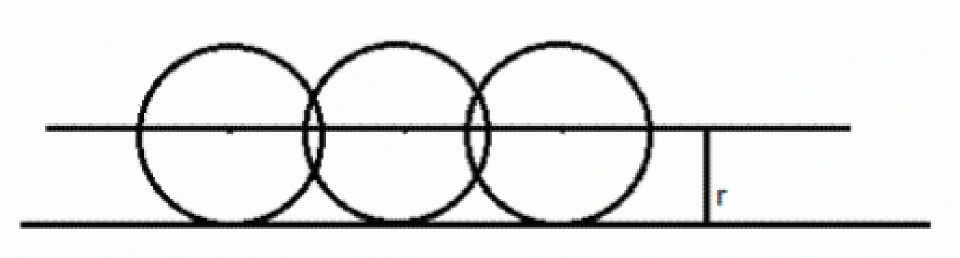
Answer 7.

(a) Midpoint of radii of a circle.



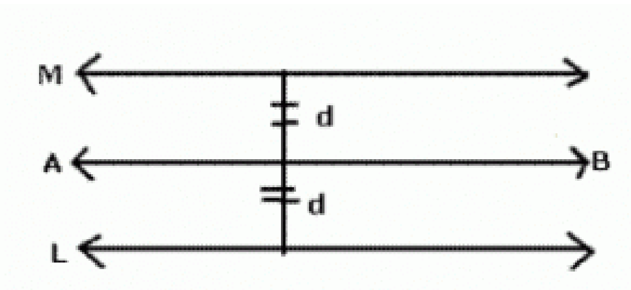
The locus of mid-point of radii of a circle is a concentric circle of radius equal to half the radius of given circle.

(b) Centre of a ball, rolling along a straight line on a level floor.



The locus of the centre of a ball, rolling along a straight line on a level floor will be a straight line parallel to the floor at a distance equal to the radius of the ball.

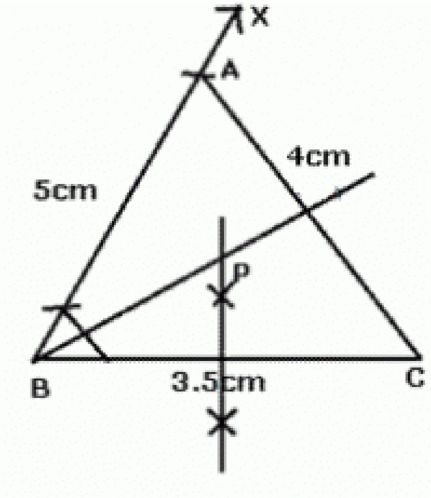
(c) Point in a plane equidistant from a given line.



The locus of all points in a plane equidistant from a fixed line is represented by two parallel lines either side of it at a distance d away.

(d) Centre of a circle of varying radius and touching the two arms of ∠ABC.

Answer 8.



Steps of construction:

(i) Draw a line segment BC = 3.5 cm.

(ii) With B as centre and radius 5 cm draw an arc.

(iii) With C as centre and radius 4 cm draw another arc which intersects the first arc at A.

(iv) Join AB and AC.

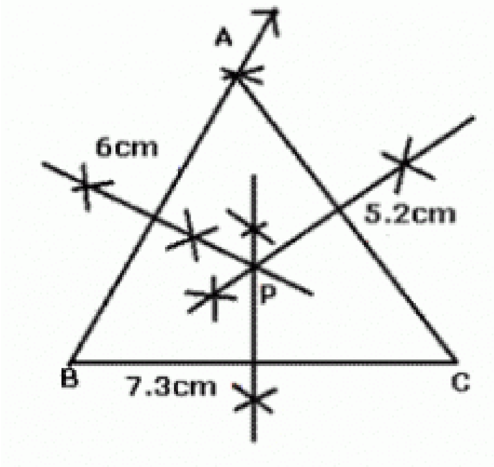
(v) Draw perpendicular bisector of BC.

(vi) Draw the angle bisector of angle ABC which intersects the perpendicular bisector of BC at P.

P is the required point which is equidistant from AB, BC, B and C.

The length of PB = 2.5 cm

Answer 9.



Steps of construction:

(i) Draw a line segment BC = 7.3 cm.

(ii) With B as centre and radius 6 cm draw an arc.

(iii) With C as centre and radius 5.2 cm draw another arc which intersects the first arc at A.

(iv) Join AB and AC.

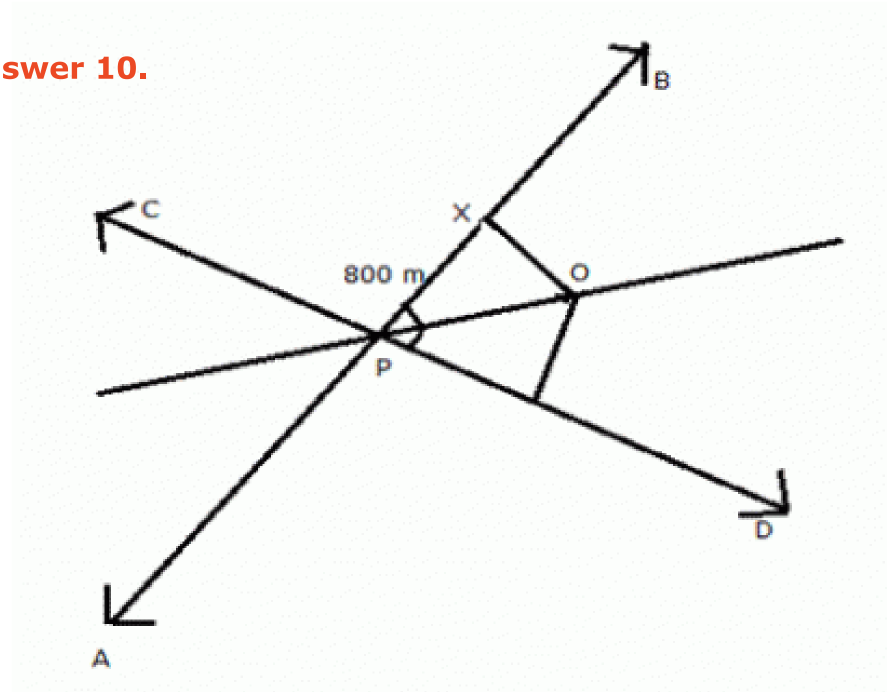
(v) Draw perpendicular bisector of BC, AB and AC.

In triangle ABC, P is the point of intersection of AB, AC and BC.

Therefore, PA = PB, PB = PC, PC = PA.

Thus, circum-centre of a triangle is the point which is equidistant from all its vertices.

Answer 10.



Steps of construction:

(i) Draw two lines AB and CD crossing at an angle of 75°

(ii) Draw an angle bisector for ∠BPD

(iii) Draw perpendicular from X on angle bisector meeting at O.

(iv) From point Y, PX=PY, draw a perpendicular on angle bisector meeting at O.

(v) O is the point which is equidistant from P, X and both the roads.

$$\cos\theta = \frac{\text{hypotenuse}}{\text{base}}$$

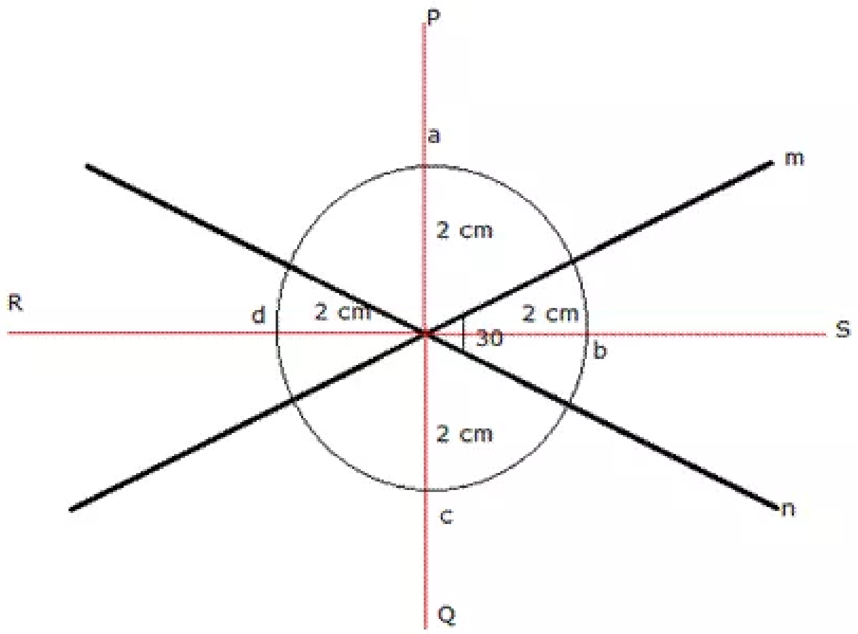
$$\cos\frac{75}{2} = \frac{PO}{PX}$$

$$\cos(37.5) = \frac{PO}{800}$$

$$0.980243 = \frac{PO}{800}$$

$$PO = 784.19m$$

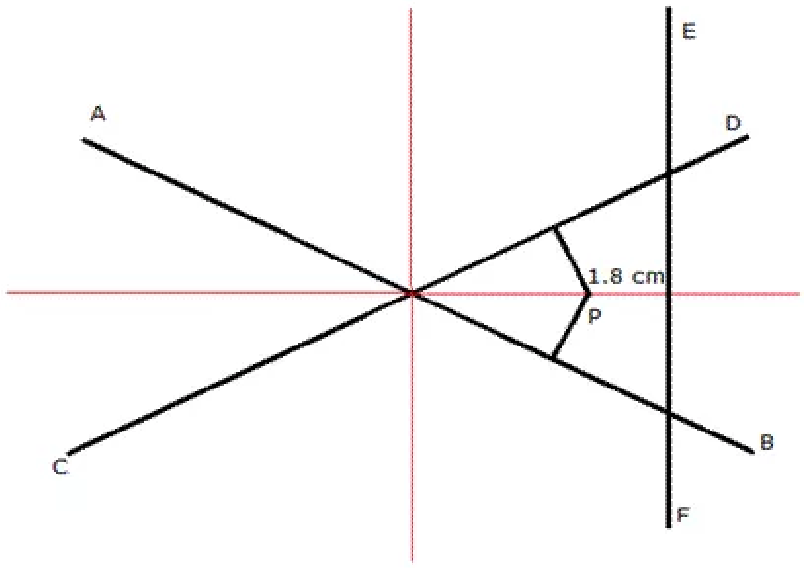
Answer 11.



Draw an angle bisector PQ and RS of angles formed by the lines m and n. From centre draw a circle with radius 2 cm, which intersect the angle bisectors at a, b, c and d respectively.

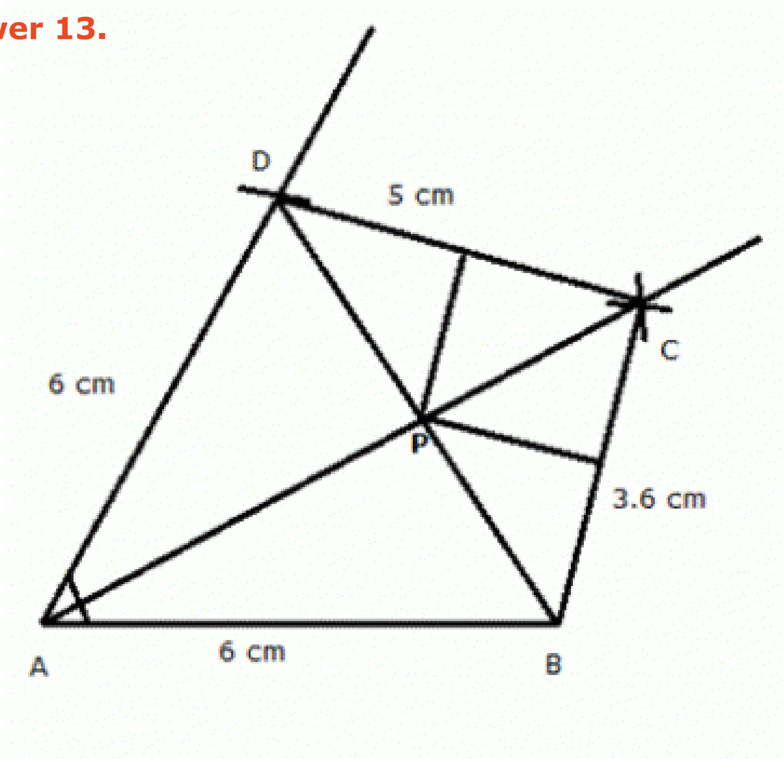
Hence, a, b, c and d are the required four points.

Answer 12.



Draw angle bisector of AB and CD. Draw perpendiculars from AB and CD on angle bisector, say P. P is the required point which is equidistant from AB and CD and at a distance of 1.8 cm from EF.

Answer 13.



Steps of construction:

i) Draw a line AB = 6 cm.

ii) Draw a ray making an angle of 45° with AB.

iii) With a as centre, draw AD = 6 cm on the ray.

iv) Draw an angle bisector of angle BAD.

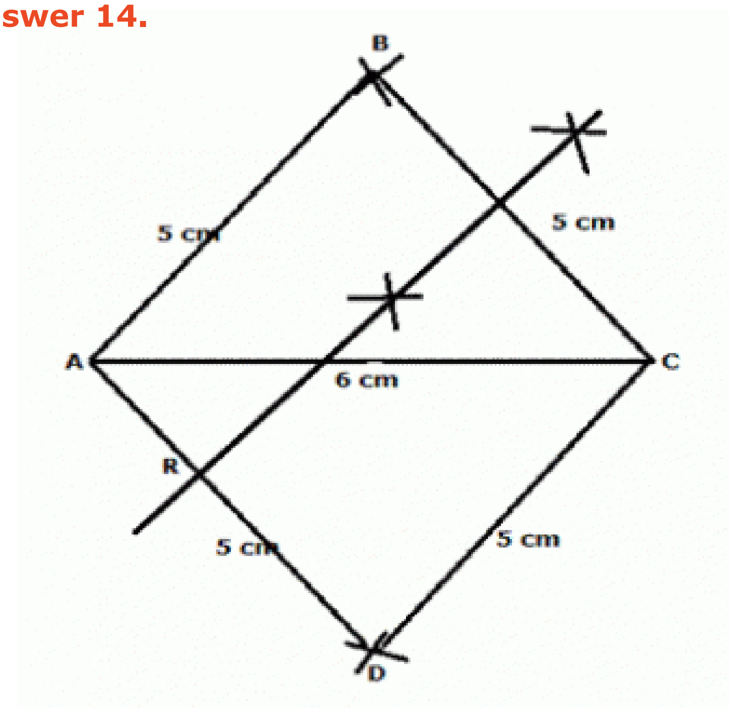
v) With B as centre cut an arc BC = 3.6 cm on the angle bisector.

vi) With D as centre cut an arc CD = 5 cm on the angle bisector. ABCD is the required quadrilateral.

vii) Join BD.

viii) Draw perpendicular bisectors of CD and BC which meet BD on P. P is the required point.

Answer 14.



Steps of Construction:

(i) Draw AC = 6 cm.

(ii) With A as centre, draw two arcs of 5 cm on both sides of line AC .

(iii) With C as centre, draw two arcs of 5 cm on both sides of line AC .

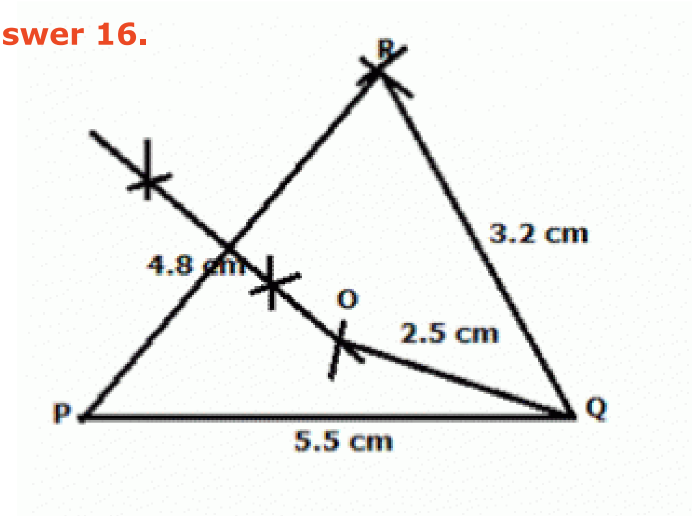
(iv) All the arcs meet at B and D. Join AB, AD, BC and BD. ABCD is the required rhombus.

(v) On measuring, $\angle ABC = 78°$.

(vi) Draw perpendicular bisector of BC meeting AD at R. R is the point equidistant from B and C, hence RB = RC.

(vii) On measuring, R = 1.2 cm

Answer 16.



Steps of construction:

(i) Draw PQ = 5.5 cm

(ii) With P as centre and radius 4.8 cm draw an arc.

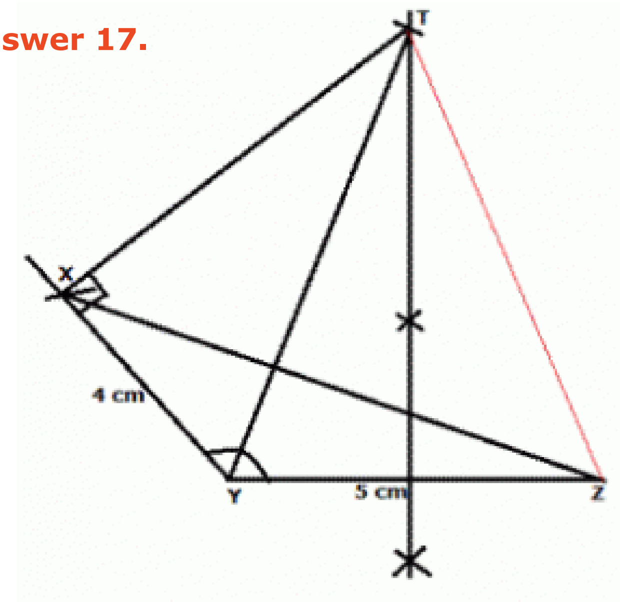
(iii) With Q as centre and radius 3.2 cm cut another arc which meets the first arc at R. Join PR and QR. PQR is the required triangle.

(iv) Draw perpendicular bisector of PR.

(v) Q as centre and radius as 2.5 cm, draw an arc which intersects the perpendicular bisector of PR at O.

O is the required point which is at a distance of 2.5 cm from Q.

Answer 17.



Steps of Construction:

(i) Draw YZ = 5 cm

(ii) Draw an arc with angle Y= 120° and radius 4 cm.

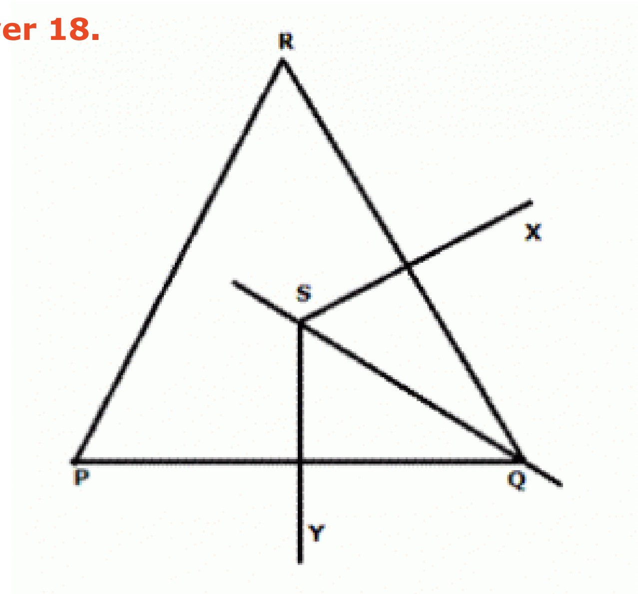
(iii) Join XZ.

(iv) Draw perpendicular bisector of YZ.

(v) With X as centre and angle X as 90° , join X to the perpendicular bisector at T. T is the required point.

(vi) Measure TY. TY = 6.8 cm = TZ as T lies on perpendicular bisector of YZ.

Answer 18.



Steps of Construction:

(i) Draw line segment PQ.

(ii) With P and Q as centre draw intersecting arcs at R.

(iii) Join PR and RQ.

(iv) Draw angle bisector of angle Q.

(v) Draw perpendicular bisectors of PQ and RQ which meet the angle bisector at S. S is the required point.

(vi) In ΔQSY and ΔQSX

SQ = SQ

$\angle SQY = \angle SQX$

$\angle SYQ = \angle SXQ = 90$ degrees.

Therefore, Δ QSY and Δ QSX are congruent.

Hence, SY = SX and therefore S is equidistant from PQ and RQ.

Answer 20.

A is equidistant from B and D. Therefore, A lies on perpendicular bisector of BD.

C is equidistant from B and D. Therefore, C lies on perpendicular bisector of BD.

A and C both lie on perpendicular bisector of BD.

Hence, AC is perpendicular bisector of BD.

Answer 21.

A is equidistant from B and D. Therefore, A lies on perpendicular bisector of BD.

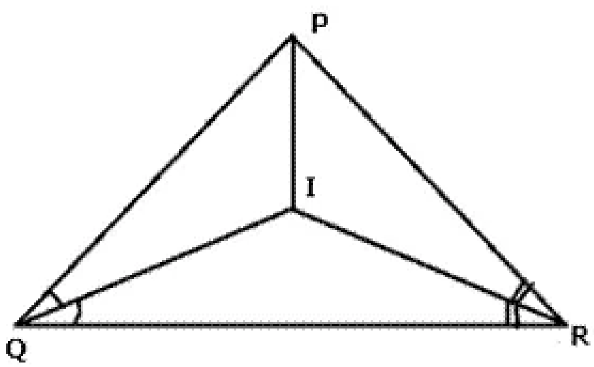
C is equidistant from B and D. Therefore, C lies on perpendicular bisector of BD.

A and C both lie on perpendicular bisector of BD.

Hence, AC is perpendicular bisector of BD.

Since AC is perpendicular bisector of BD so $\angle AMB = \angle AMD$ = right angle.

Answer 22.



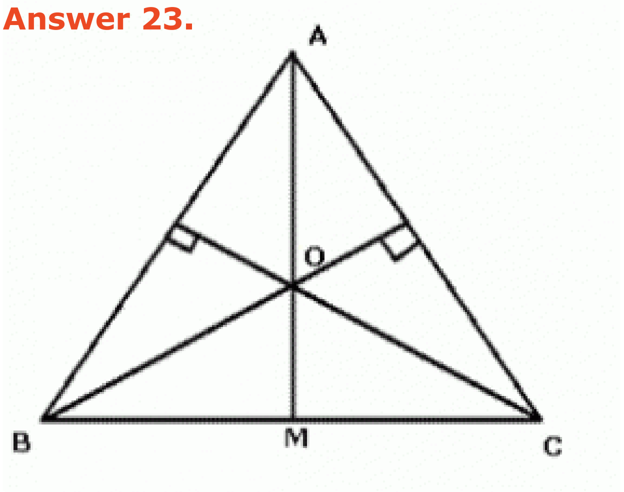
Since I lies on bisector of $\angle R$, I is equidistant from PR and QR.

Again I lies on the bisector of $\angle Q$, I is equidistant from PQ and QR.

Hence, I is equidistant from all sides of the triangle.

Therefore, I lies on the bisector of $\angle P$ i.e $\angle QPR$

Answer 23.



Since O lies on the perpendicular bisector of AB, O is equidistant from A and B.

OA = OB........(i)

Again, O lies on the perpendicular bisector of AC, O is equidistant from A and C.

OA = OC.........(ii)

From (i) and (ii)

OB = OC

Now in ΔOBM and ΔOCM ,

OB = OC (proved)

OM = OM

BM = CM (M is mid-point of BC)

Therefore, ΔOBM and ΔOCM are congruent.

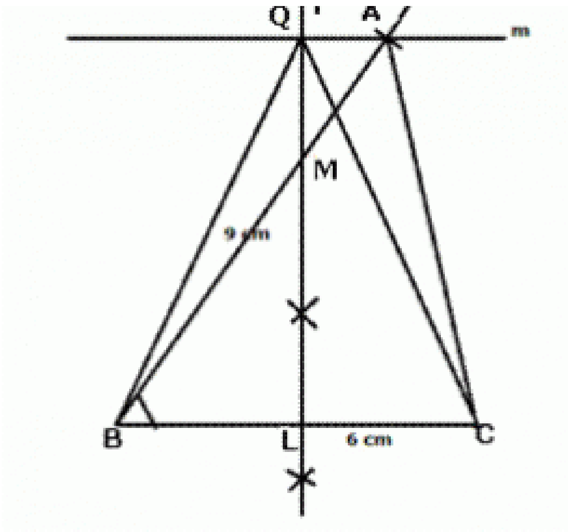
$\angle OMB = \angle OMC$

But BMC is a straight line, so

$\angle OMB = \angle OMC = 90°$

Thus, OM meets BC at right angles.

Answer 26.



Steps of Construction:

(i) ABC is the required triangle.

(ii) Draw perpendicular bisector of BC which intersects BA in M, then any point on LM is equidistant from B and C.

(iii) Through A, draw a line m || BC.

(iv) The perpendicular bisector of BC and the parallel line m intersect each other at Q.

(v) Then triangle QBC is equal in area to triangle ABC. m is the locus of all points through which any triangle with base BC will be equal in area of triangle ABC.