PRACTICE PAPER

ICSE CLASS 10 – MATHEMATICS

Chapter 16 : Loci

STEP-BY-STEP SOLUTIONS & MARKING SCHEME · Maximum Marks: 40

Results used

Equidistant from two fixed points → the perpendicular bisector of the line joining them. Equidistant from two intersecting lines → the pair of angle bisectors (perpendicular to each other).

Equidistant from two parallel lines → the parallel line midway between them. At a fixed distance d from a point → circle (centre the point, radius d); from a line → a pair of parallel lines, d from it on each side.

Mid-points of parallel chords lie on the diameter perpendicular to them. Equal chords of a circle are equidistant from its centre, so their mid-points lie on a concentric circle. Angle in a semicircle = 90°.

SECTION A (20 Marks)

Question 1 [8 × 1 = 8]

Part	Ans.	Working
(i)	**(a)**	Locus of points equidistant from two fixed points = perpendicular bisector of the segment joining them.
(ii)	**(c)**	Points 4 cm from a line lie on either side of it: a pair of parallel lines, each 4 cm from l.
(iii)	**(c)**	The two angle bisectors of the pair of intersecting lines; they are perpendicular to each other.
(iv)	**(b)**	A parallel line midway between them, 10 ÷ 2 = 5 cm from each.
(v)	**(c)**	Angle in a semicircle is 90°, so P lies on the circle with AB as diameter.
(vi)	**(d)**	The incentre, where the angle bisectors meet.
(vii)	**(c)**	The perpendicular bisector of AB passes through the mid-point of AB, so (A) is true; (R) is the reason.
(viii)	**(b)**	(A) is false: the locus is a pair of parallel lines, one on each side. (R) is true.

Question 2 [4 + 4 + 4 = 12]

(i)

(a) A **circle** with centre at the centre of the clock face and radius equal to the length of the minute hand [1]

(b) A **pair of straight lines parallel to AB**, one on each side of AB, each 2 cm from it [1]

(c) The **diameter of the circle perpendicular to the given chord** [1]

(d) The **perpendicular bisector of PQ** [1]

(ii)

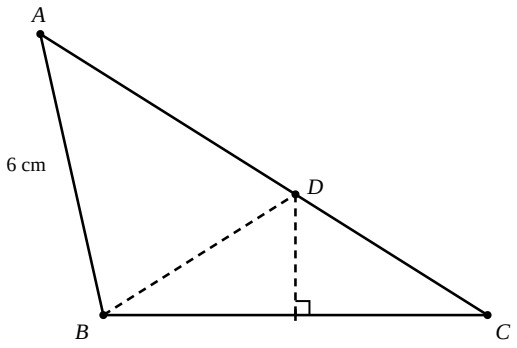
(a) The **perpendicular bisector of AB** (a line perpendicular to AB through its mid-point M, where AM = 4 cm) [1]

(b) A **circle with centre A and radius 4 cm** [1]

(c) The perpendicular bisector is 4 cm from A, which equals the radius, so it only touches the circle at M [1]

Exactly one point — the mid-point M of AB [1]

(iii)



D lies on the perpendicular bisector of BC, so it is equidistant from B and C: **DB = DC** [2]

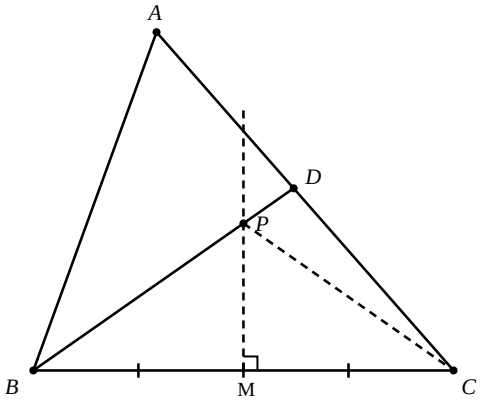
BD + AD = CD + AD = AC = 11 cm [1]

Perimeter of ΔABD = AB + BD + AD = 6 + 11 = **17 cm** [1]

SECTION B (20 Marks) — any two questions

Question 3 [3 + 3 + 4 = 10]

(i)



Let M be the mid-point of BC, so PM ⊥ BC. In ΔPMB and ΔPMC: BM = CM [1]

∠PMB = ∠PMC = 90°, and PM is common [1]

ΔPMB ≅ ΔPMC (SAS) ⇒ **PB = PC** [1]

(ii)

Draw PX ⊥ AB and PY ⊥ BC. In ΔPXB and ΔPYB: ∠PBX = ∠PBY (BD bisects ∠ABC) [1]

∠PXB = ∠PYB = 90°, and PB is common [1]

ΔPXB ≅ ΔPYB (AAS) ⇒ **PX = PY**, i.e. P is equidistant from AB and BC [1]

(iii)

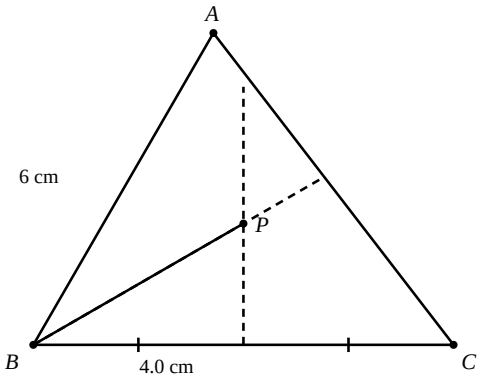
∠PBC = ½ × 70° = **35°** [1]

PB = PC (part (i)) ⇒ ∠PCB = ∠PBC = **35°** [1]

∠BPC = 180° − 35° − 35° = **110°** [2]

Question 4 [3 + 3 + 4 = 10]

(i)



Draw BC = 7 cm. At B construct ∠CBA = 60° and cut off BA = 6 cm. Join AC [1]

With centre B draw an arc cutting BA and BC; with these two points as centres and an equal radius draw arcs crossing inside the angle; join B to the crossing point. This is the **bisector of ∠ABC** — the locus of points equidistant from AB and BC [2]

(ii)

With centres B and C and the same radius (more than 3.5 cm) draw arcs meeting above and below BC; join the two crossing points [2]

This is the **perpendicular bisector of BC**, the locus of points equidistant from B and C [1]

(iii)

The two loci meet at the required point **P** [1]

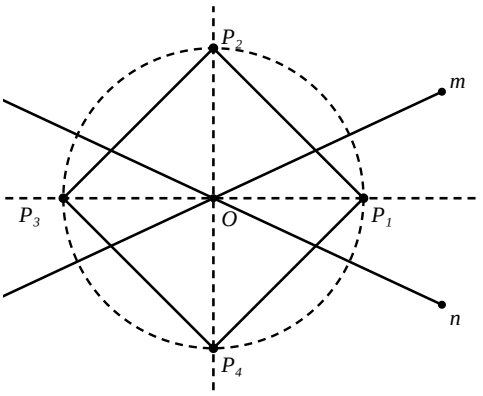
Measurement: **PB ≈ 4.0 cm** (accept 3.9 – 4.1 cm; calculation: PB = 3.5 ÷ cos 30° = 4.04 cm) [1]

P is on the perpendicular bisector of BC, so PC = PB ≈ 4.0 cm (P is equidistant from B and C) [1]

P is on the bisector of ∠ABC, so it is also equidistant from AB and BC [1]

Question 5 [3 + 3 + 4 = 10]

(i)



The points equidistant from m and n lie on the bisectors of the angles between them [2]

Locus: a pair of straight lines through O, perpendicular to each other (the two angle bisectors) [1]

(ii)

Locus: a circle with centre O and radius 2.5 cm (drawn dashed in the figure) [3]

(iii)

Each bisector cuts the circle in 2 points: **4 points** P_1, P_2, P_3, P_4 in all [1]

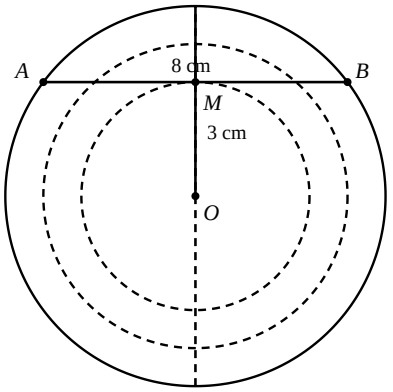
The bisectors are perpendicular diameters of the circle, so the diagonals are equal, perpendicular and bisect each other: **the figure is a square** [1]

Diagonal = $2 \times 2.5 = 5$ cm [1]

Area = $\frac{1}{2} \times 5 \times 5 =$ **12.5 cm²** (side = $2.5\sqrt{2} \approx 3.5$ cm) [1]

Question 6 [3 + 3 + 4 = 10]

(i)



Points equidistant from A and B lie on the perpendicular bisector of AB [1]

The perpendicular bisector of a chord passes through the centre of the circle [1]

Locus: the diameter of the circle perpendicular to AB [1]

(ii)

The line joining the centre to the mid-point of a chord is perpendicular to the chord [1]

So the mid-points of chords parallel to AB all lie on the line through O perpendicular to AB [1]

Locus: the diameter perpendicular to the given chord (the same diameter as in (i)) [1]

(iii)

Half chord = 4 cm: $OM^2 = 5^2 - 4^2 = 9 \Rightarrow OM = 3$ cm (M = mid-point of the chord) [1]

Locus: a circle concentric with the given circle, radius 3 cm (dashed) [1]

Chords of 6 cm: half chord = 3 cm, $OM^2 = 5^2 - 3^2 = 16 \Rightarrow OM = 4$ cm [1]

Locus: a concentric circle of radius 4 cm [1]

— End of Solutions —