eClassroom

GCSE Mathematics

Loci & Construction

Worked Solutions

Pearson Edexcel GCSE & iGCSE Mathematics

Section A — Foundation — Worked Solutions

[Fluency] Question 1

A circle of radius 3 cm centred on A.

∴ **Circle, radius 3 cm, centre A**

[Fluency] Question 2

Perpendicular bisector of PQ.

∴ **Perpendicular bisector of PQ**

[Fluency] Question 3

A line parallel to both l_1 and l_2, halfway between them.

∴ **Line equidistant from both, parallel to each**

[Fluency] Question 4

1. Set compass to more than half AB. Draw arc from A above and below AB.
2. Repeat from B with same radius. Connect the two intersection points.

∴ **Perpendicular bisector constructed ✓**

[Fluency] Question 5

1. Place compass at B, draw arc crossing BA and BC.
2. From each intersection, draw equal arcs. Connect B to intersection.

∴ **Angle bisector constructed ✓**

[Reasoning] Question 6

1. Draw a line. Mark point A.
2. With compass at A, draw an arc crossing the line at B and C.
3. With same radius, draw arcs from B and C. They intersect at D.
4. Angle BAD = 60°.

∴ **60° angle constructed ✓**

[Reasoning] Question 7

Draw a circle of radius 5 cm (on scale, 5 cm) centred on P.

Shade the entire interior of the circle.

∴ **Shaded circle r=5cm centred on P ✓**

[Reasoning] Question 8

Actual distance = 4.5 × 20 000 = 90 000 cm = 900 m

∴ **900 m**

[Problem Solving] Question 9

Construct perpendicular bisectors of two sides of the triangle.

They meet at the circumcentre C.

Draw circle centred at C passing through all three vertices.

∴ **Circumscribed circle constructed ✓**

[Problem Solving] Question 10

Construct the angle bisectors of two angles of the triangle.

They meet at the incentre I.

Draw circle centred at I, touching all three sides (perpendicular distance from I to each side is the radius).

∴ **Inscribed circle via angle bisectors ✓**

Section B — Higher — Worked Solutions

[Fluency] Question 1

(a) Two circles r=6cm centred at P and Q. Shade the lens-shaped intersection.

(b) Construct perpendicular bisector of PQ. Region closer to P is on P's side.

∴ **(a) Intersection region ✓ (b) Half-plane on P side ✓**

[Fluency] Question 2

1. Construct 60° angle (equilateral triangle).

2. Bisect the 60° to give 30°.

∴ **30° constructed ✓**

[Reasoning] Question 3

Scale: 1cm=20km. Draw A and B 5cm apart.

Circle centred A: r=3.5cm (70km). Circle centred B: r=2.5cm (50km).

Shade intersection of two circles.

∴ **Region satisfying both conditions shown ✓**

[Reasoning] Question 4

1. Perpendicular bisector of T_1T_2 (equidistant from two trees).

2. Angle bisector of the two paths at P (equidistant from two paths).

Treasure is at intersection of these two loci.

∴ **Two constructions: perp bisector + angle bisector ✓**

[Reasoning] Question 5

(a) Arc of radius 6m centred A, within field. Where arc hits side AB at 6m from A, goat can wrap around. Parts inside field only.

(b) Sector of circle: the goat can reach a quarter circle (corner A) within field of radius 6m. Area = ¼π(36) + extra wrapped sections.

Inside field: 90° sector r=6 plus 2 more sectors where rope wraps round corners.

∴ **See full construction diagram ✓**

[Problem Solving] Question 6

1. Place compass at P, draw arc crossing l at two points A and B.
2. With larger radius from A and B, draw arcs intersecting at Q.
3. Line PQ is perpendicular to l.

∴ **Perpendicular from P to l constructed ✓**

[Problem Solving] Question 7

The curve is a **parabola**.

F is the focus. l is the directrix.

Every point on the parabola is equidistant from focus and directrix.

∴ **A parabola with focus F and directrix l**

[Problem Solving] Question 8

Scale 1cm=1km. Draw A and B 8cm apart.

Circle centred A radius 3cm (excluded: outside this). Circle centred B radius 5cm.

Perp bisector of AB (closer to A = on A's side).

Shade: outside 3cm from A, inside 5cm from B, on A's side of perp bisector.

∴ **Region satisfying all three conditions constructed ✓**

[Problem Solving] Question 9

Let P be equidistant from A and B, so PA = PB.

Let M be midpoint of AB. In triangles PMA and PMB:

PA = PB (given), MA = MB (M is midpoint), PM is common.

By SSS congruence: ∠PMA = ∠PMB = 90°.

So PM ⊥ AB. Therefore P lies on the perpendicular bisector of AB ✓

∴ **Locus is the perpendicular bisector of AB ✓**

[Problem Solving] Question 10

1. Draw circle, mark point A on circumference.
2. With same radius, step off 6 arcs around the circle.
3. Connect alternate points → hexagon.

Works because interior angle of equilateral triangle = 60°, so 6 fit around centre (6×60°=360°).

∴ **Regular hexagon constructed and explained ✓**