

Constructions and loci

Foundation and Higher tiers | Total marks: 38

Marks

- M** Method mark, for a correct method. It can be implied by a correct answer.
- A** Accuracy mark, for a correct answer. It needs the method mark before it.
- B** A mark for a correct value or statement, with or without working.
- ft** Follow through: the mark is given for using an earlier wrong answer correctly.
- oe** Or equivalent.
- [a, b]** Any value from a to b inclusive.

Questions

Q	Skill	Spec	Tier	Grade	Calculator	Marks
1	Recognising a construction	G2	Common	3	No	1
2	Perpendicular bisector	G2	Common	4	No	2
3	Angle bisector	G2	Common	4	No	2
4	Constructing a triangle from three sides	G2	Common	4	No	2
5	Constructions, spot the error	G2	Common	4	No	1
6	Perpendicular from a point, shortest distance	G2	Common	5	No	3
7	Constructing an angle of 45°	G2	Common	5	No	3
8	Describing and drawing loci	G2	Common	5	No	3
9	Loci in a region	G2 R2	Common	5	No	3
10	Constructing angles of 60° and 45°	G2	Common	6	No	4
11	Loci on a map	G2 R2	Common	6	Yes	3
12	Loci round a corner	G2 R2	Common	6	Yes	3
13	The shortest distance from a point to a line	G2 G20	Common	6	Yes	3
14	Loci: the area within a distance of a point	G2 G18 G20	Common	8	Yes	5
	Total					38

Question 1 G2 · Common · Grade 3 · 1 mark

Q	Answer	Mark	Comments
1	an angle bisector	B1	

Question 2 G2 · Common · Grade 4 · 2 marks

Q	Answer	Mark	Comments
2	two pairs of arcs of equal radius, centred on A and B, crossing on both sides of AB	M1	or crossing on one side and AB bisected
	correct perpendicular bisector drawn	A1	crosses AB within 2 mm of its midpoint (40.5 mm from A) at $90^\circ \pm 2^\circ$

Question 3 G2 · Common · Grade 4 · 2 marks

Q	Answer	Mark	Comments
3	an arc centred on Q crossing QP and QR, and two arcs of equal radius from these points that cross	M1	
	correct angle bisector drawn	A1	at $34^\circ \pm 2^\circ$ to QR

Question 4 G2 · Common · Grade 4 · 2 marks

Q	Answer	Mark	Comments
4	an arc of radius 4.5 cm centred on A or an arc of radius 4 cm centred on B	M1	± 2 mm
	both arcs and triangle ABC completed	A1	AC = 4.5 cm ± 2 mm and BC = 4 cm ± 2 mm. C may be below AB

Question 5 G2 · Common · Grade 4 · 1 mark

Q	Answer	Mark	Comments
5	the arcs from A and the arcs from B have different radii	B1	oe, his compasses changed, so the line does not go through the midpoint of AB

Question 6 G2 · Common · Grade 5 · 3 marks

Q	Answer	Mark	Comments
6(a)	an arc centred on P cutting the line twice, and two arcs of equal radius from these points that cross	M1	
	correct perpendicular drawn from P to the line	A1	$\pm 2^\circ$
6(b)	3.8	B1	accept [3.6, 4.0]

Question 7 G2 · Common · Grade 5 · 3 marks

Q	Answer	Mark	Comments
7	a perpendicular to the line at P, with arcs	M1	oe, any other valid construction of 45°
	arcs to bisect one of the right angles at P	M1dep	dep on the first M1
	an angle of 45° at P drawn	A1	$\pm 2^\circ$

Question 8 G2 · Common · Grade 5 · 3 marks

Q	Answer	Mark	Comments
8(a)	the perpendicular bisector of AB	B1	
8(b)	two lines parallel to PQ, 2 cm from it on either side, the same length as PQ	B1	± 2 mm
	two semicircles of radius 2 cm, centred on P and Q, joining the ends of the lines	B1	± 2 mm

Question 9 G2 R2 · Common · Grade 5 · 3 marks

Q	Answer	Mark	Comments
9	an arc of radius 3 cm centred on A	B1	± 2 mm
	the bisector of angle DAB, constructed with arcs	B1	$\pm 2^\circ$
	the correct region shaded	B1	inside the garden, outside the arc and on the AB side of the bisector

Question 10 G2 · Common · Grade 6 · 4 marks

Q	Answer	Mark	Comments
10	an angle of 60° at A, constructed with arcs	M1	an equilateral triangle construction, $\pm 2^\circ$
	a perpendicular to AB at B, constructed with arcs	M1	
	the right angle at B bisected with arcs	M1	dep on the second M1
	triangle ABC completed	A1	angles 60° and $45^\circ \pm 2^\circ$, AC = 5.1 cm ± 2 mm

Question 11 G2 R2 · Common · Grade 6 · 3 marks

Q	Answer	Mark	Comments
11	the perpendicular bisector of AB, constructed with arcs	B1	± 2 mm and $\pm 2^\circ$
	a circle (or arc) of radius 3.5 cm centred on C	B1	± 2 mm
	the correct region shaded	B1	inside the circle and on the A side of the bisector

Question 12 G2 R2 · Common · Grade 6 · 3 marks

Q	Answer	Mark	Comments
12	an arc of radius 5 cm centred on P, outside the greenhouse	B1	± 2 mm, three quarters of a circle
	a quarter circle of radius 2 cm centred on the corner Q below P	B1	± 2 mm, the 1 m of hose left after bending round the corner
	the correct region shaded	B1	

Question 13 G2 G20 · Common · Grade 6 · 3 marks

Q	Answer	Mark	Comments
13	AB = 50	B1	oe, from $AB^2 = 30^2 + 40^2$
	$\frac{1}{2} \times 30 \times 40 = \frac{1}{2} \times 50 \times d$	M1	oe, or $40 \times \sin B$ with $\sin B = \frac{3}{5}$, or $30 \times \frac{4}{5}$
	24	A1	

Question 14 G2 G18 G20 · Common · Grade 8 · 5 marks

Q	Answer	Mark	Comments
14	$\sqrt{9^2 - 7^2}$ or $\sqrt{32}$ or 5.657...	M1	oe, the distance from D to where the edge of the light meets DC
	$\tan^{-1}(\frac{7}{\sqrt{32}})$ or 51.06...	M1	oe, the angle of the sector, or $\cos^{-1}(\frac{7}{9}) = 38.94...$ for the angle of the triangle at A
	$\frac{1}{2} \times 7 \times \sqrt{32}$ or 19.80...	M1	oe, the area of the triangle
	$\frac{\text{their } 51.1}{360} \times \pi \times 9^2$ or 36.09...	M1	oe, the area of the sector
	66.5	A1	accept [66.4, 66.6]