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# GCSE Mathematics

## Constructions & Loci

Mark Scheme - GCSE Maths Practice

M = method mark, A = accuracy mark (dependent on the preceding M mark), B = independent mark.

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## Edexcel-style questions

### Q1 Grade 4 Edexcel style

**Total: 1**

| Part | Mark scheme                           | Marks |
|------|---------------------------------------|-------|
| (a)  | a circle of radius 5 cm, centred on A | A1    |

### Q2 Grade 4 Edexcel style

**Total: 3**

| Part | Mark scheme                                                                                                   | Marks |
|------|---------------------------------------------------------------------------------------------------------------|-------|
| (a)  | open the compasses to more than half the length of AB, and draw an arc centred at A                           | B1    |
| (a)  | keeping the same radius, draw an arc centred at B, so the two arcs cross above and below AB                   | B1    |
| (a)  | join the two points where the arcs cross with a straight line - this line is the perpendicular bisector of AB | A1    |

### Q3 Grade 5 Edexcel style

**Total: 2**

| Part | Mark scheme                           | Marks |
|------|---------------------------------------|-------|
| (a)  | area = $\pi \times 6^2$               | M1    |
| (a)  | $3.14 \times 36 = 113.04 \text{ m}^2$ | A1    |

### Q4 Grade 5 Edexcel style

**Total: 2**

| Part | Mark scheme                                                                                                | Marks |
|------|------------------------------------------------------------------------------------------------------------|-------|
| (a)  | P must lie on the A-side of the perpendicular bisector of AB                                               | B1    |
| (a)  | P must also lie inside a circle of radius 4 cm centred on C, so P lies in the overlap of these two regions | A1    |

### Q5 Grade 6 Edexcel style

**Total: 4**

| Part | Mark scheme                                                                                                                             | Marks |
|------|-----------------------------------------------------------------------------------------------------------------------------------------|-------|
| (a)  | the locus consists of two straight lines, each parallel to XY and 4 cm from it, joined by a semicircular arc of radius 4 cm at each end | B1    |
| (a)  | the two straight parts together have length $2 \times 10 = 20 \text{ cm}$                                                               | M1    |
| (a)  | the two semicircular arcs together form a full circle of radius 4 cm: circumference = $3.14 \times (2 \times 4) = 25.12 \text{ cm}$     | M1    |
| (a)  | total perimeter = $20 + 25.12 = 45.12 \text{ cm}$                                                                                       | A1    |

## AQA-style questions

**Q6** Grade 4 AQA style

**Total: 1**

| Part | Mark scheme                                       | Marks |
|------|---------------------------------------------------|-------|
| (a)  | the perpendicular bisector of the line segment AB | A1    |

**Q7** Grade 4 AQA style

**Total: 3**

| Part | Mark scheme                                                                                            | Marks |
|------|--------------------------------------------------------------------------------------------------------|-------|
| (a)  | draw an arc centred at B that crosses both arms of the angle                                           | B1    |
| (a)  | keeping the same radius, draw an arc from each of these two crossing points, so the new arcs intersect | B1    |
| (a)  | join B to the point where the new arcs intersect - this line is the angle bisector of angle ABC        | A1    |

**Q8** Grade 5 AQA style

**Total: 3**

| Part | Mark scheme                                                            | Marks |
|------|------------------------------------------------------------------------|-------|
| (a)  | the barn wall blocks a $90^\circ$ corner, leaving a $270^\circ$ region | M1    |
| (a)  | area = $(270 \div 360) \times \pi \times 8^2$                          | M1    |
| (a)  | $0.75 \times 3.14 \times 64 = 150.72 \text{ m}^2$                      | A1    |

**Q9** Grade 6 AQA style

**Total: 3**

| Part | Mark scheme                                                                                             | Marks |
|------|---------------------------------------------------------------------------------------------------------|-------|
| (a)  | the marker lies on a circle of radius 6 m centred on A, and also on a circle of radius 8 m centred on B | M1    |
| (a)  | since $6 + 8 = 14 > 10$ and $8 - 6 = 2 < 10$ , the two circles cross at two distinct points             | M1    |
| (a)  | 2 possible positions                                                                                    | A1    |

**Q10** Grade 6 AQA style

**Total: 3**

| Part | Mark scheme                                                                                         | Marks |
|------|-----------------------------------------------------------------------------------------------------|-------|
| (a)  | garden area = $12 \times 8 = 96 \text{ m}^2$                                                        | M1    |
| (a)  | watered area = $\frac{1}{4} \times \pi \times 6^2 = 0.25 \times 3.14 \times 36 = 28.26 \text{ m}^2$ | M1    |
| (a)  | area not reached = $96 - 28.26 = 67.74 \text{ m}^2$                                                 | A1    |

## OCR-style questions

Q11 Grade 4 OCR style

Total: 1

| Part | Mark scheme                                     | Marks |
|------|-------------------------------------------------|-------|
| (a)  | the bisector of the angle between the two lines | A1    |

Q12 Grade 5 OCR style

Total: 3

| Part | Mark scheme                                                                                                         | Marks |
|------|---------------------------------------------------------------------------------------------------------------------|-------|
| (a)  | draw an arc centred at P that crosses the line on both sides, marking two points equidistant from P                 | B1    |
| (a)  | increase the radius, and draw an arc above (or below) the line from each of these two points, so the arcs intersect | B1    |
| (a)  | join P to the point where the arcs intersect - this line is perpendicular to the given line at P                    | A1    |

Q13 Grade 5 OCR style

Total: 3

| Part | Mark scheme                                     | Marks |
|------|-------------------------------------------------|-------|
| (a)  | the wall blocks half of the full circle         | M1    |
| (a)  | area = $\frac{1}{2} \times \pi \times 5^2$      | M1    |
| (a)  | $0.5 \times 3.14 \times 25 = 39.25 \text{ m}^2$ | A1    |

Q14 Grade 6 OCR style

Total: 3

| Part | Mark scheme                                                                                           | Marks |
|------|-------------------------------------------------------------------------------------------------------|-------|
| (a)  | P lies on the perpendicular bisector of AB, which is a straight line                                  | M1    |
| (a)  | P also lies on a circle of radius 5 cm centred on C; a straight line can cross a circle at most twice | M1    |
| (a)  | 2 positions                                                                                           | A1    |

Q15 Grade 6 OCR style

Total: 3

| Part | Mark scheme                                                                                                                                                                           | Marks |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| (a)  | construct the bisector of the angle at O (equidistant from both arms), using arcs from O and then from the two points where that arc crosses the arms                                 | B1    |
| (a)  | construct a circle of radius 5 cm centred at O                                                                                                                                        | B1    |
| (a)  | the required point(s) are where the angle bisector crosses this circle; since a ray from O crosses a circle centred at O exactly once, there is exactly 1 such point inside the angle | A1    |

## Teachably-style questions

### Q16 Grade 4 Teachably style

**Total: 1**

| Part | Mark scheme                                                                                     | Marks |
|------|-------------------------------------------------------------------------------------------------|-------|
| (a)  | a pair of straight lines, one on each side of the given line, each parallel to it and 3 cm away | A1    |

### Q17 Grade 5 Teachably style

**Total: 4**

| Part | Mark scheme                                                                                                                            | Marks |
|------|----------------------------------------------------------------------------------------------------------------------------------------|-------|
| (a)  | draw a straight line and mark a point A on it                                                                                          | B1    |
| (a)  | open the compasses to any fixed radius, and draw an arc centred at A that crosses the line at a point B                                | B1    |
| (a)  | keeping the same radius, draw an arc centred at B that crosses the first arc                                                           | B1    |
| (a)  | join A to the point where the two arcs cross - the angle between this line and AB is exactly 60°, since triangle formed is equilateral | A1    |

### Q18 Grade 5 Teachably style

**Total: 4**

| Part | Mark scheme                                                                                                               | Marks |
|------|---------------------------------------------------------------------------------------------------------------------------|-------|
| (a)  | main region: the fences block a 90° corner, leaving 270°, so area = $0.75 \times \pi \times 10^2 = 235.5 \text{ m}^2$     | M1    |
| (a)  | the rope (10 m) is longer than the short fence (6 m), so $10 - 6 = 4 \text{ m}$ of rope wraps around that fence's far end | M1    |
| (a)  | this adds a further quarter circle of radius 4 m: area = $0.25 \times \pi \times 4^2 = 12.56 \text{ m}^2$                 | M1    |
| (a)  | total area = $235.5 + 12.56 = 248.06 \text{ m}^2$                                                                         | A1    |

### Q19 Grade 5 Teachably style

**Total: 2**

| Part | Mark scheme                 | Marks |
|------|-----------------------------|-------|
| (a)  | $r^2 = 78.5 \div 3.14 = 25$ | M1    |
| (a)  | $r = 5 \text{ m}$           | A1    |

### Q20 Grade 6 Teachably style

**Total: 3**

| Part | Mark scheme                                                                                                                                | Marks |
|------|--------------------------------------------------------------------------------------------------------------------------------------------|-------|
| (a)  | the route must stay more than 10 km from C at every point along it                                                                         | B1    |
| (a)  | the closest the route comes to C is 6 km, which is less than the required 10 km                                                            | B1    |
| (a)  | no - part of the route passes within 10 km of the rock, so the captain must divert around an exclusion circle of radius 10 km centred on C | A1    |

**END OF PAPER**

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