

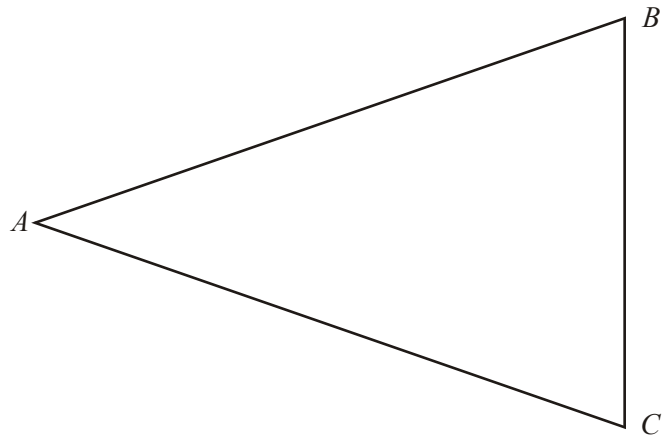
1. The diagram represents a triangular garden  $ABC$ .

The scale of the diagram is 1 cm represents 1 m.

A tree is to be planted in the garden so that it is

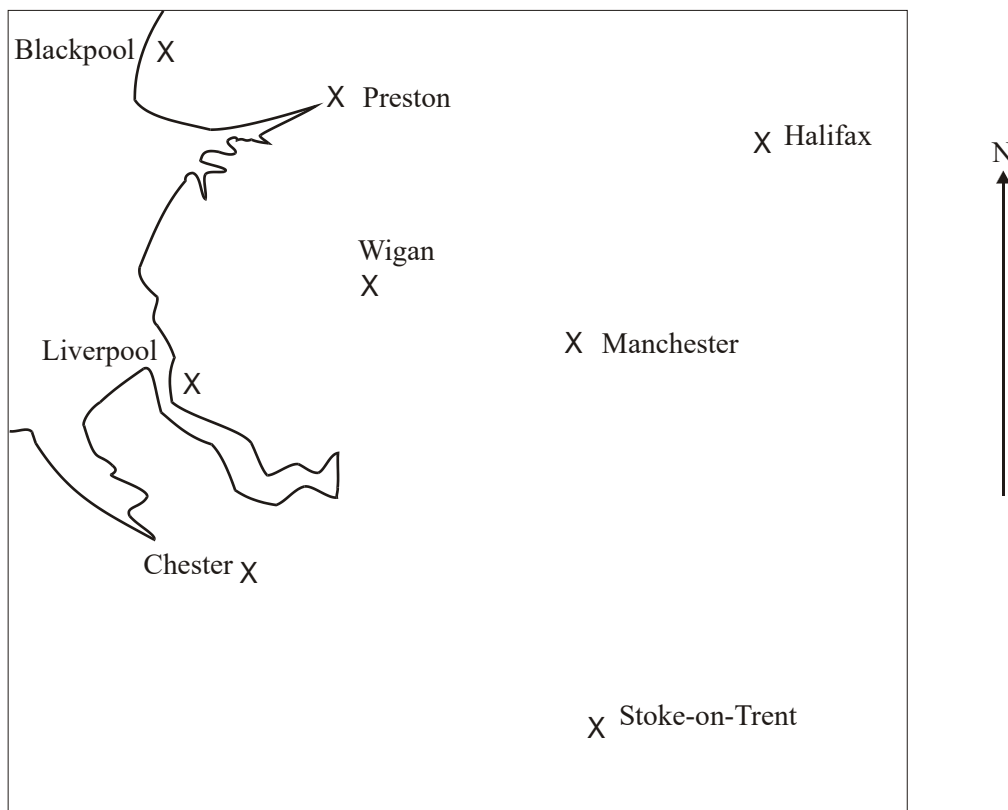
nearer to  $AB$  than to  $AC$ ,  
within 5 m of point  $A$ .

On the diagram, shade the region where the tree may be planted.



(Total 3 marks)

2. This is a map of part of Northern England.



Scale: 1 cm represents 10 km

A radio station in Manchester transmits programmes.  
 Its programmes can be received anywhere within a distance of 30 km.

On the diagram, shade the region in which the programmes can be received.

**(Total 2 marks)**

3.

A  
×B  
××  
C

Jill rolls a ball from point C.

At any point on its path, the ball is the same distance from point A and point B.

- (a) On the diagram above, draw accurately the path that the ball will take.

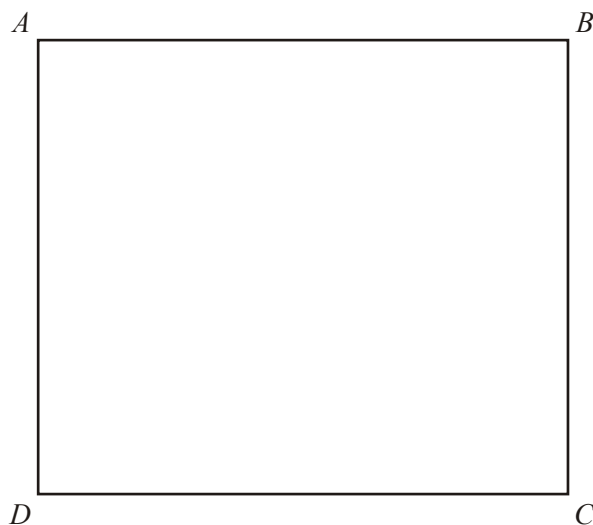
(2)

- (b) On the diagram, shade the region that contains all the points that are no more than 3 cm from point B.

(2)

**(Total 4 marks)**

4.



$ABCD$  is a rectangle.

Shade the set of points inside the rectangle which are **both**

**and** more than 4 centimetres from the point  $A$   
more than 1 centimetre from the line  $DC$ .

(Total 4 marks)

5. Draw the locus of all points which are equidistant from the points  $A$  and  $B$ .

$A \times$

$\times B$

(Total 2 marks)

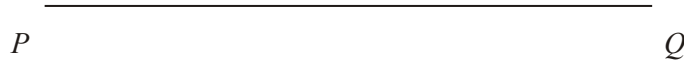
6. (a) Draw the locus of all points which are equidistant from the points  $A$  and  $B$ .

$A \times$

$\times B$

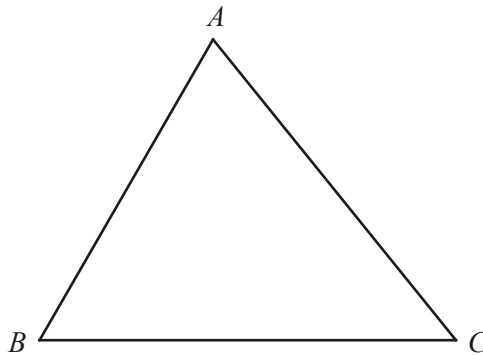
(2)

- (b) Draw the locus of all points that are exactly 3 cm from the line  $PQ$ .



(2)  
(Total 4 marks)

7.



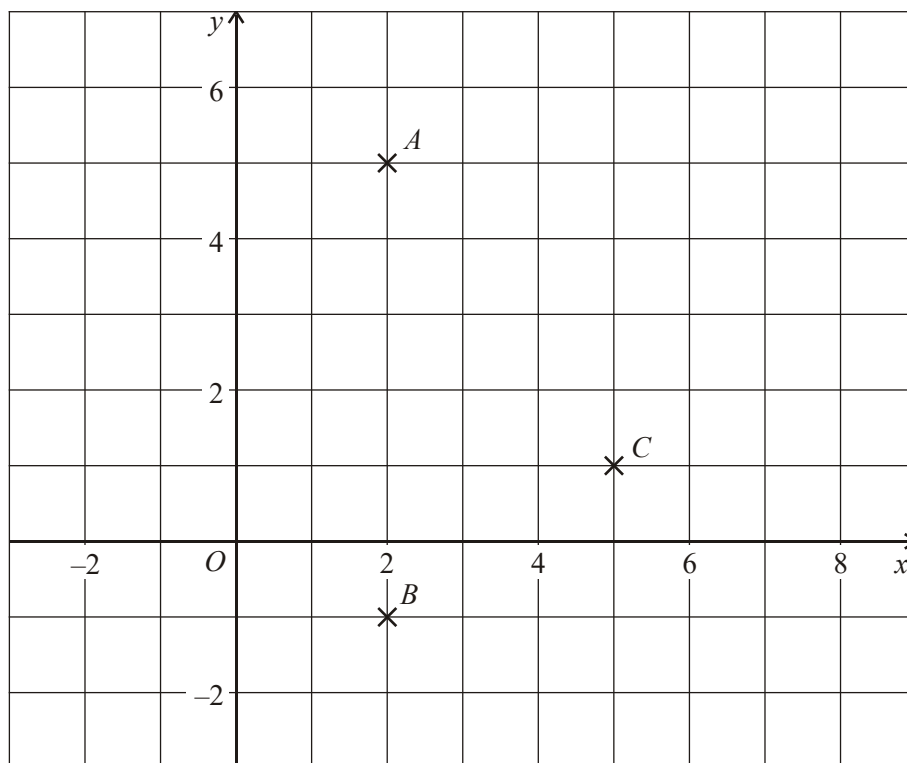
$ABC$  is a triangle.

Shade the region inside the triangle which is **both**

**and** less than 4 centimetres from the point  $B$   
and closer to the line  $AC$  than the line  $AB$ .

(Total 4 marks)

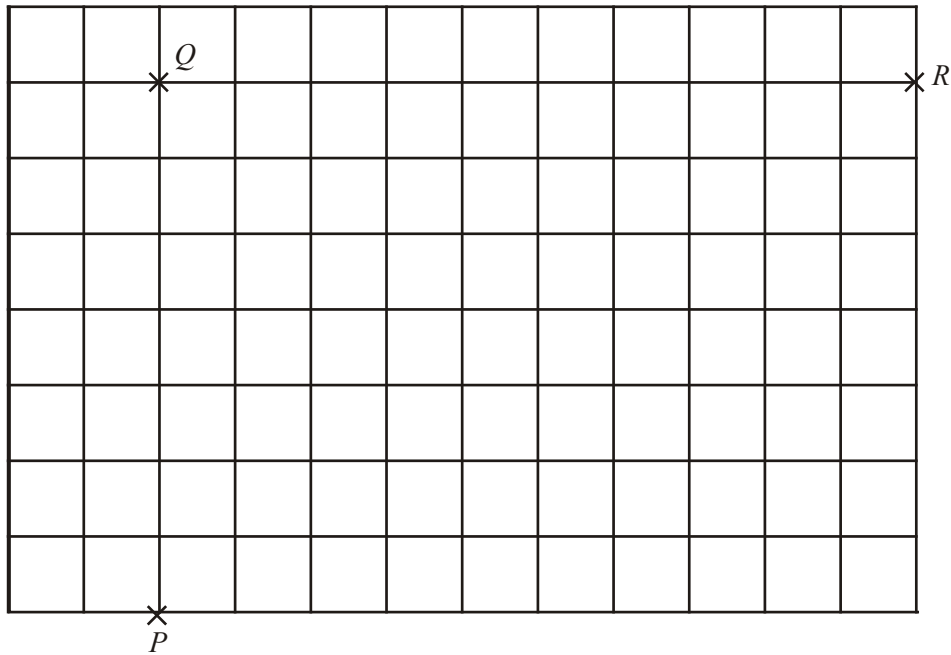
8. The diagram shows three points  $A$ ,  $B$  and  $C$  on a centimetre grid.



- (a) On the grid, draw the locus of points which are equidistant from  $A$  and  $B$ . (1)
- (b) On the grid, draw the locus of points which are 3 cm from  $C$ . (1)
- (c) On the grid, shade the region in which points are nearer to  $A$  than  $B$  and also less than 3 cm from  $C$ . (1)

(Total 3 marks)

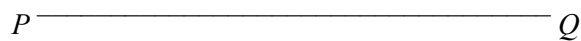
9. The diagram shows three points  $P$ ,  $Q$  and  $R$ .



On the grid, draw the locus of points which are equidistant from  $PQ$  and  $QR$ .

(Total 2 marks)

10. Draw the locus of all points that are exactly 3 cm from the line  $PQ$ .



(Total 2 marks)

- |    |  |     |
|----|--|-----|
| 1. | See overlay<br>Bisector of $\angle BAC$<br>Arc around $A$<br>Region  | 3   |
|    | <i>B3 cao<br/>(B2 for <u>either</u> two correct boundaries, no shading/ wrong shading <u>or</u> one correct boundary, one incorrect boundary with valid shading)<br/>(B1 for <u>either</u> two incorrect boundaries but one drawn from <math>A</math> and one intersection, with valid shading <u>or</u> one correct boundary)<br/>Ignore shading outside the triangle</i> | [3] |
| 2. | Locus (circle) drawn & shaded  | 2   |
|    | <i>B1 circle centre Manchester <math>\pm 2\text{mm}</math><br/>B1 shading with accurate or approximate circle within tolerance</i>   | [2] |
| 3. | (a) $B2$ line through $C$ , at least $50\text{mm}$ long, fully within the overlay.<br>( $B1$ at least $25\text{mm}$ of line in the overlay lines, or fully in the overlay and less than $50\text{mm}$ long)  | 2   |
|    | (b) $B2$ solid shaded circle $28 - 32 \text{ mm}$ from $B$<br>( $B1$ attempt to draw a shaded circle around $B$ , any radius,<br>OR unshaded circle within tolerance, or shaded sector correct tolerance)  | 2   |
|    |  | [4] |
| 4. | overlay  | 4   |
|    | <i>M1 quarter "circle" drawn centre <math>A</math> inside rectangle (ignore lines outside the rectangle)<br/>A1 radius <math>4 \text{ cm} \pm 2\text{mm}</math><br/>B1 line drawn <math>1 \text{ cm} \pm 2\text{mm}</math> from <math>DC</math>.<br/>B1 ft (dep on two loci attempts drawn) region shaded</i>  | [4] |



5. Within guide 2
- B2 for line at least 2cm long within inner guideline*  
*B1 for line at least 2cm long completely or partially outside inner guidelines but within outer guidelines*  
*or line within inner guidelines of length less than 2cm*  
*or at least 3 relevant points within inner guidelines*  
*or 2 pairs of relevant intersecting arcs within inner guidelines.*  
*NB: Ignore any additional lines or drawings*
- [2]
6. (a) Within guide 2
- B2 for line at least 2cm long within inner guideline*  
*B1 for line at least 2cm long completely or partially outside inner guidelines but within outer guidelines or line within inner guidelines of length less than 2cm or at least 3 relevant points within inner guidelines or 2 pairs of relevant intersecting arcs within inner guidelines.*  
*NB: Ignore any additional lines or drawings*
- (b) Within guide 2
- B2 for fully correct shape within or touching guidelines*  
*(B1 two correct parallel lines within or touching guidelines allow or two correct semicircles at ends within or touching guidelines allow or correct shape outside guidelines)*  
*NB: Accept dotted lines. Ignore any additional lines or drawings eg. Full circles drawn at ends*
- [4]
7. Diagram 4
- M1 arc radius 4 cm centre B within the guidelines*  
*M1 angle bisector from A to BC within the guidelines*  
*A1 for clear indication that inside of arc is being identified as correct region for the first condition, or that side of straight line nearer to C is identified as correct region for the second condition.*  
*(Note that only 1 of the Ms need be awarded for this A mark to be awarded)*  
*A1 fully correct region*  
*Ignore any drawing outside the given triangle*
- [4]

8. (a) Line  $y = 2$  1  
*B1 for line within guidelines, lengths  $\geq 9$*
- (b) Circle, centre C, radius 3cm 1  
*B1 for complete circle, centre C within guidelines*
- (c) Correct region shaded 1  
*B1 (indep) for correct region shaded within guidelines OR shaded minor, segment ft horizontal chord in(a) and ft circle, centre C from(b)*
- [3]**
9. correct angle bisector 2  
*B2 for correct line within guidelines  
 (B1 for 2 or more points plotted within guidelines)*
- [2]**
10. Within guidelines 2  
*B2 for fully correct shape within or touching guidelines  
 (B1 for two correct parallel lines within or touching guidelines  
 or two correct semicircles at ends within or touching guidelines  
 or correct shape outside guidelines)*
- NB: Accept dotted lines. Ignore any additional lines or drawings, e.g. full circles drawn at ends
- [2]**

## 1. Mathematics A

### Paper 3

There was evidence that far more candidates are using compasses for this type of question, and as a result there was more success at achieving marks. Arcs from  $A$  were usually within tolerance, but many candidates lost this mark when they chose to draw a line instead of an arc. The angle bisector at  $A$  was also usually accurate, but candidates rarely constructed this line, choosing instead to draw it in by eye. Most candidates shaded in the correct region having drawn two boundary lines.

### Paper 5

Most candidates gained some credit in this question although a straight line segment instead of an arc was sometimes drawn from the relevant line from  $A$  to the side  $AB$ . Those who correctly drew the two boundaries almost always went on to shade the correct region.

**Mathematics B Paper 16**

Most candidates, other than the very weakest, managed to score at least 1 mark here. Often 2 marks were earned for a correct angle bisector and a shaded region in the required part of the diagram, with a straight line representing the locus of points 5cm from  $A$  failing to earn the third mark. When a correct arc was constructed the solution often went no further.

2. This was very well answered at this level with only a very few omitting to shade in the interior of the circle.

**3. Intermediate Tier**

Part (a) was well answered. In part (b) most candidates demonstrated an understanding of what they had to do, but it was clear which of those candidates did not have a compass, and those which could only use it inaccurately. A minority either failed to shade the circle, or gave only a sector rather than a full circle.

**Higher Tier**

Both parts were well answered at this level. There were some common errors on part (b). These were mainly omission of shading on a correct circle, or a shaded sector of the correct circle rather than the full circle.

**4. Specification A****Intermediate Tier**

There was evidence that a significant proportion of candidates had the full range of equipment available to them for this question. It was, however, surprising how many candidates were unable to visualise the first locus as a circle or arc. Candidates were more successful at drawing in the line.

**Higher Tier**

More than three-quarters of the candidates were able to score full marks on this question. Most could draw the required horizontal line and shade a suitable region, but the quarter circle proved troublesome to some. Common errors include those of accuracy, where a crude arc was drawn free-hand with indifferent radius; and those of understanding, where a square of side 4cm was drawn instead of a circular arc. Candidates should be encouraged to bring the appropriate equipment to the examination.

## Specification B

### Intermediate Tier

Most candidates earned at least one mark here, usually for correctly drawing the locus of points 1 cm from the line  $DC$ . Disappointingly only a minority were able to construct the locus of points 4 cm from  $A$ . This was often seen as a rectangle or square with maybe just one point satisfying the given condition. Many picked up a mark for correctly identifying a region between their two loci.

### Higher Tier

Many fully correct answers to this question were seen. Some candidates drew a square instead of the required quarter circle. A few candidates misinterpreted the second locus and drew two further quarter circles centred on  $C$  and  $D$ . Many candidates did not seem to have a pair of compasses and drew the curve freehand.

5. This was extremely poorly done with the vast majority of the candidates having little idea of what was required. Many drew arcs and circles all over the place whilst many others did not attempt the question at all or just drew in the line  $AB$ . A few did attempt two arcs from  $A$  and  $B$ , mostly with their radius the same size as  $AB$ . Where these arcs joined in two places they were awarded one mark. A few others did manage to score one mark by marking 3 points within the guidelines.
6. Candidates did not appear to be well prepared for this question. Over half of the candidates did not score any marks. In part (a) many candidates scored full marks without drawing arcs, by either measuring to the centre of  $AB$  or even estimating where the centre was and drawing a vertical line. Other attempts just showed two arcs intersecting or touching. At time the arcs were drawn such they would have intersected outside the page. The number of candidates who drew two pairs of intersecting arcs and then drew the line through the intersections was very small. In part (b) many candidates drew extraneous lines, circles and arcs. Some candidates drew just the lines or just the arcs.

## 7. Specification A

Candidates were very successful at using compasses to draw an arc with centre  $B$  and radius 4 cm and shading the correct side of the arc.

About a quarter of the candidates were able to draw the angle bisector from  $A$  to  $BC$  and those who did usually went on to get full marks. Many candidates drew the perpendicular bisector of  $BC$  and some drew a vertical line from  $A$  to  $BC$ . Some bisected the wrong angle (usually  $B$ ) and some drew more than one arc but no straight lines. One third of the candidates, though, gained no marks at all in this question.

**Specification B**

There was a large spread of marks on this question. Many candidates scored at least 2 marks by showing that the required region must lie inside the arc of radius 4 cm centre B. Responses to the second condition were more varied with many candidates putting in the altitude from A or the median from A.

8. Candidates were generally more successful with (b), the circle, rather than (a), the horizontal line. Candidates should be made aware that, when asked to draw the locus, complete lines/circles should be given rather than 'broken' lines.
9. Few candidates understood the concept of a locus. Only about one quarter of candidates were able to gain full marks. A few candidates just gave a series of points rather than the full locus.
10. This question was well attempted by many candidates using the correct equipment of ruler and compasses. Although some candidates made no attempt to draw the locus most had at least some idea of what was required. Many gained one mark for a partially correct answer – often this was for drawing a correct semicircle at each end of the line but omitting the two parallel lines.