

Constructions and Loci - Higher

Solutions

For AQA GCSE Mathematics (8300) • Higher tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (2 marks)

The diagram shows two trees, A and B , in a park.

A straight path is to be laid across the park.

Every point on the path is the same distance from tree A as from tree B .

Use ruler and compasses to construct the line of the path.

You must show your construction arcs.

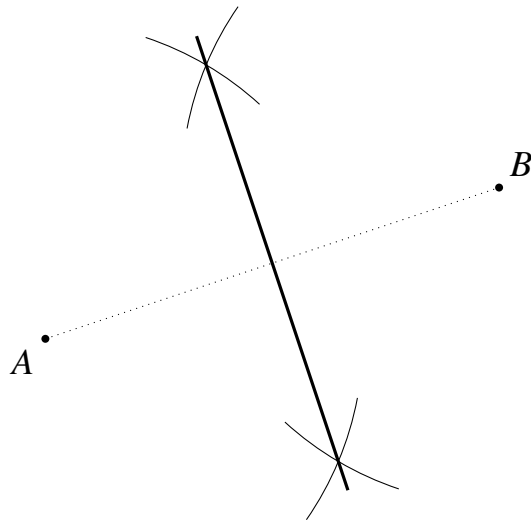
Points the same distance from A and B lie on the perpendicular bisector of AB .

Open your compasses to more than half the distance AB .

Draw arcs on both sides of AB , centred at A .

Keep the same radius. Draw arcs centred at B that cross the first arcs.

Join the two crossing points with a straight line. This is the path.



Answer: The perpendicular bisector of AB , with construction arcs

Tip: Leave all your construction arcs on the diagram. A line with no arcs does not get full marks.

Marks: 1 mark for two pairs of arcs that cross. 1 mark for the line through the crossing points.

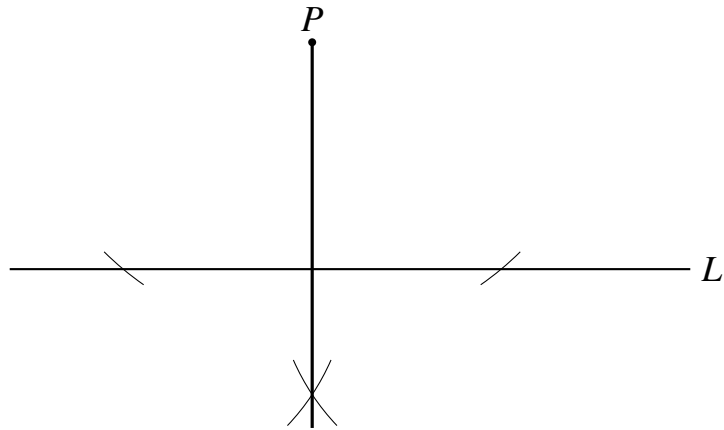
2 (2 marks)

Use ruler and compasses to construct the perpendicular from P to the line L .
You must show your construction arcs.

Put the compass point on P . Draw an arc that cuts L at two points.

From each of these two points, draw arcs of the same radius below L so they cross.

Join P to the crossing point with a straight line.



Answer: The perpendicular from P to L , with construction arcs

Marks: 1 mark for correct construction arcs. 1 mark for the perpendicular line.

3 (2 marks)

The diagram shows a triangular piece of card, PQR .

Oskar cuts the card along a straight line that starts at R .

Every point on the cut is the same distance from RP and RQ .

Using ruler and compasses, construct the line of the cut.

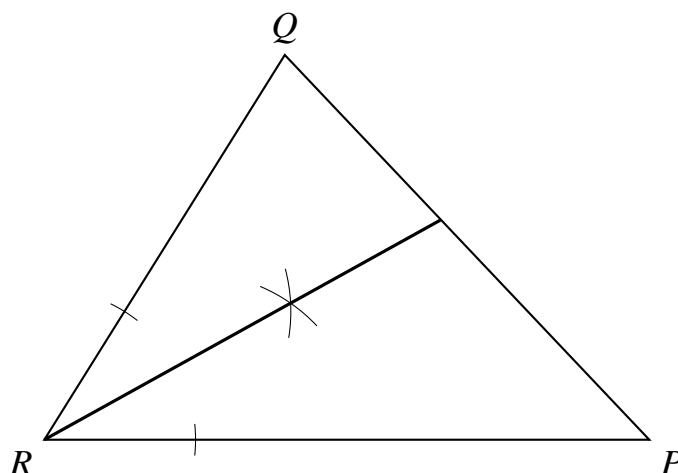
Points the same distance from two lines lie on the bisector of the angle between them.

So the cut is the bisector of angle PRQ .

Put the compass point on R . Draw an arc that cuts RP and RQ .

From these two points, draw equal arcs that cross inside the angle.

Join R to the crossing point and carry the line on to PQ .



Answer: The bisector of angle PRQ , from R to PQ

Tip: “The same distance from two lines” means an **angle bisector**. “The same distance from two points” means a perpendicular bisector.

Marks: 1 mark for correct construction arcs. 1 mark for the angle bisector.

4 (3 marks)

Use ruler and compasses to construct an angle of 30° at A , above the line AB .
You must show all your construction arcs.

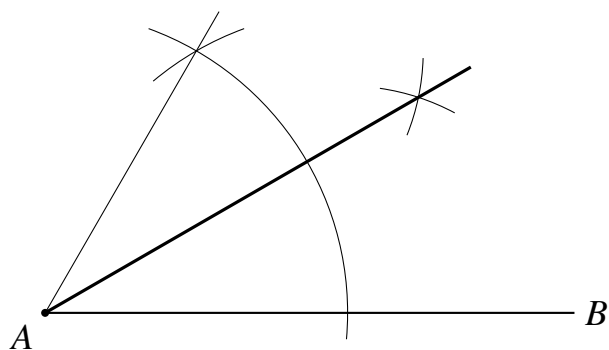
First construct 60° using an equilateral triangle:

Draw an arc centred at A that cuts AB .

Keep the same radius. Put the compass point where the arc cuts AB and draw an arc that crosses the first arc.

The line from A through this crossing point makes 60° with AB .

Then bisect the 60° angle to get 30° .



Answer: A 30° angle at A , with construction arcs

Tip: 30° is half of 60° . Remember: construct an equilateral triangle, then bisect.

Marks: 1 mark for constructing 60° . 1 mark for the bisector arcs. 1 mark for the 30° line.

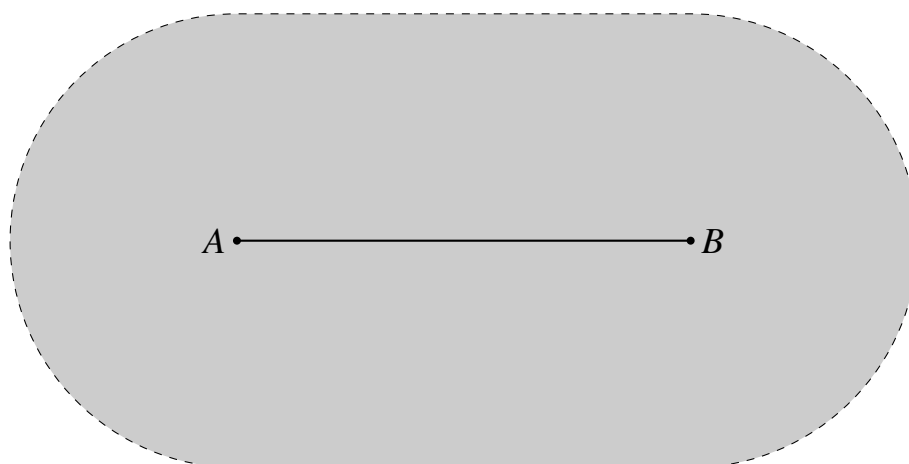
5 (3 marks)

Construct the region that lies within 3 cm of the line segment AB .

Draw two lines parallel to AB , one 3 cm above it and one 3 cm below it.

At each end, draw a semicircle of radius 3 cm, centred at A and at B .

The region is the “running track” shape inside. Shade it.



Answer: The shaded “stadium” shape shown

Tip: Near the ends of the segment, the points 3 cm away form semicircles, not straight lines. Don’t draw a rectangle.

Marks: 1 mark for the parallel lines. 1 mark for the semicircles. 1 mark for the fully correct region.

6 (3 marks)

$PQRS$ is a plan of a campsite. The scale is 1 cm represents 5 m.
 T is a water tap and W is a waste bin.

A tent is to be put up on the campsite. It must be
 closer to T than to W
 and

at least 10 m from the hedge PQ .

Shade the region where the tent can be put up.
 Show all your construction lines.

“Closer to T than to W ”: construct the perpendicular bisector of TW .

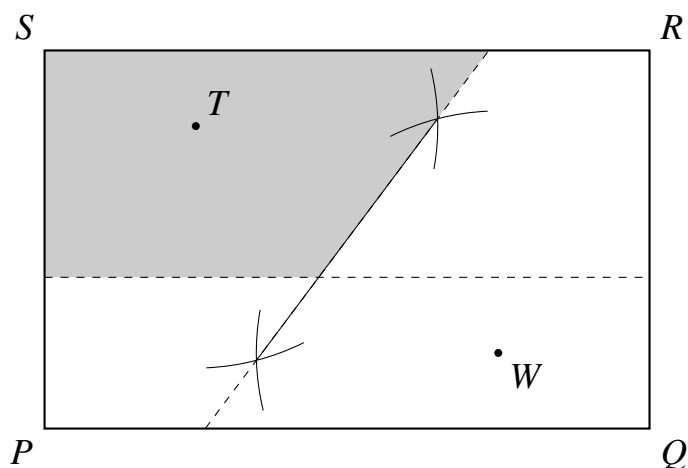
The tent must be on T ’s side of this line.

10 m on the plan is $10 \div 5 = 2$ cm.

Draw a line parallel to PQ , 2 cm above it.

The tent must be on or above this line.

Shade the region that is on T ’s side of the bisector and above the parallel line.



Answer: The shaded region shown

Tip: Use the scale first: 10 m is 2 cm, not 10 cm. “Closer to T than to W ” is a perpendicular bisector, not a circle.

Marks: 1 mark for the perpendicular bisector of TW with arcs. 1 mark for the line 2 cm from PQ . 1 mark for the correct region shaded.

7 (3 marks)

Use ruler and compasses to answer this question.

$ABCD$ is a plan of a field.

A water trough, X , is to be placed in the field.

X is

the same distance from A as from D

the same distance from BA and BC .

Show the position of X on the diagram.

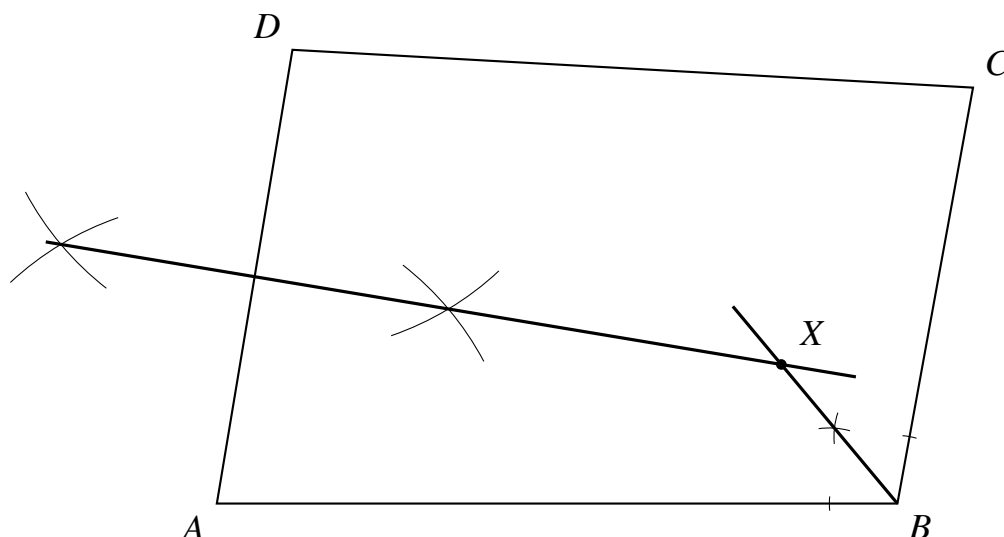
Points the same distance from A and D lie on the perpendicular bisector of AD .

Construct this perpendicular bisector with compasses.

Points the same distance from BA and BC lie on the bisector of angle ABC .

Construct this angle bisector with compasses.

X is where the two lines cross.



Answer: X marked where the perpendicular bisector of AD meets the bisector of angle ABC

Tip: Two points (A and D) need a perpendicular bisector. Two lines (BA and BC) need an angle bisector.

Marks: 1 mark for the perpendicular bisector of AD with arcs. 1 mark for the bisector of angle ABC with arcs. 1 mark for X marked.

8 (4 marks)

Use a ruler and compasses in this question.

The scale diagram shows two straight roads, JK and JL , and a hospital, H .

A phone mast is to be built. It must be

less than 5 km from H

and

closer to road JK than to road JL .

Label the region, R , where the mast could be built.

Show all your construction lines.

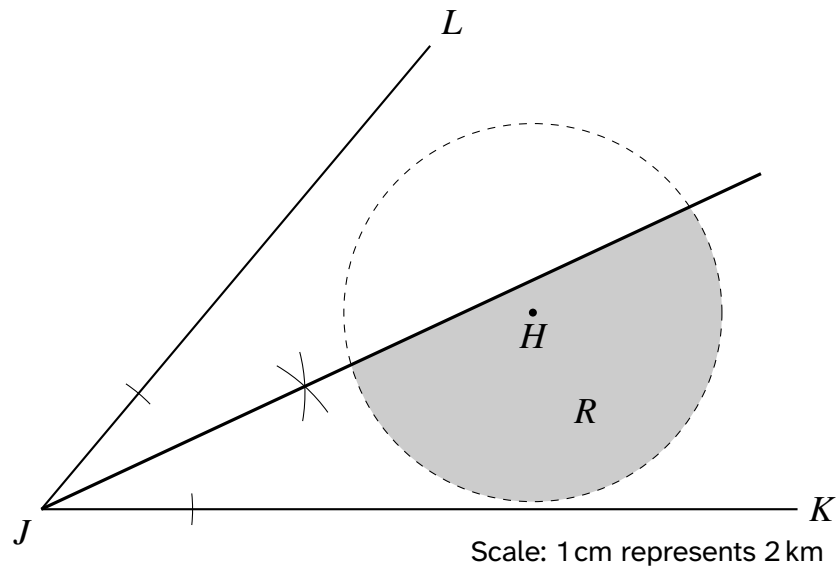
Scale: 5 km is $5 \div 2 = 2.5$ cm.

Draw a circle of radius 2.5 cm centred at H .

“Closer to road JK than to road JL ”: construct the bisector of angle KJL .

The mast must be on the JK side of the bisector.

R is inside the circle and below the bisector.



Answer: Region R as shown

Tip: “Closer to one line than another” needs an angle bisector. Use the scale before you draw the circle.

Marks: 1 mark for 2.5 cm. 1 mark for the circle centred at H . 1 mark for the angle bisector with arcs. 1 mark for region R .