

Constructions

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation 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)

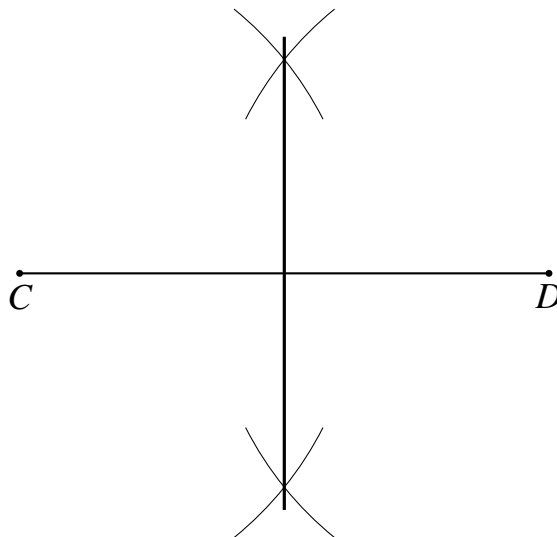
Use ruler and compasses to construct the perpendicular bisector of the line CD .
You must show all your construction lines.

Open the compasses to more than half of CD .

Draw arcs from C , above and below the line.

Keep the same radius and draw arcs from D , above and below the line.

Join the two points where the arcs cross.



Answer: Perpendicular bisector with arcs

Marks: 1 mark for correct construction arcs. 1 mark for the line through both crossing points.

2 (2 marks)

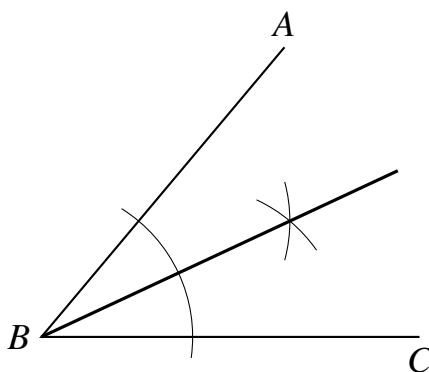
Use ruler and compasses to construct the bisector of angle ABC .
You must show all your construction lines.

Put the compasses on B and draw an arc that crosses both arms.

Put the compasses on one crossing point and draw an arc inside the angle.

Keep the same radius and do the same from the other crossing point.

Draw a line from B through the point where these two arcs cross.



Answer: Bisector (25° each side)

Tip: Measuring the angle and halving it with a protractor is not a construction. You must show the compass arcs.

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

3 (2 marks)

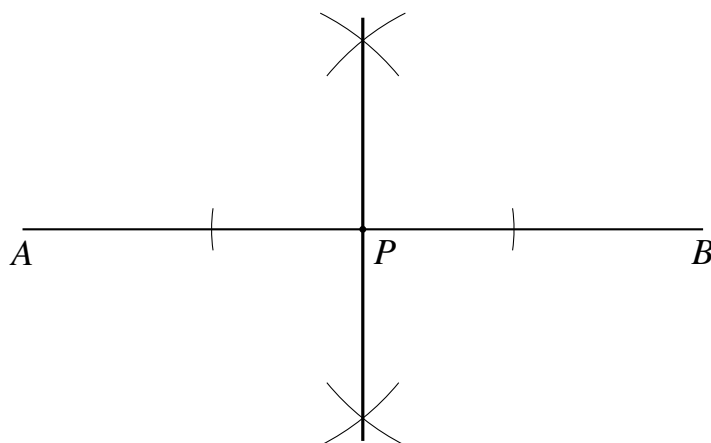
Use ruler and compasses to construct a line perpendicular to AB at the point P .
You must show all your construction lines.

Put the compasses on P and mark two points on AB , the same distance either side of P .

Open the compasses wider.

Draw arcs from each of these two points, so that the arcs cross above P .

Join P to the point where the arcs cross.



Answer: Perpendicular at P with arcs

Tip: The first arcs must be centred on P , not on the ends A and B . Do not draw the right angle first and add arcs afterwards.

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

4 (2 marks)

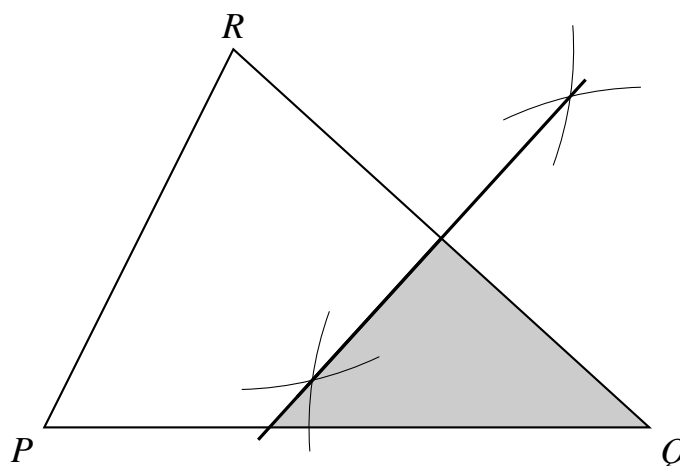
Shade the region of points inside triangle PQR that are closer to Q than to R .
Use ruler and compasses. You must show all your construction lines.

Points the same distance from Q and from R lie on the **perpendicular bisector** of QR .

Open the compasses to more than half of QR . Draw arcs from Q and from R , on both sides of QR .

Join the two points where the arcs cross. This is the perpendicular bisector of QR .

Points closer to Q are on Q 's side of this line. Shade the part of the triangle on that side.



Answer: The part of the triangle on Q 's side of the perpendicular bisector of QR

Tip: "Closer to Q than to R " needs the perpendicular bisector of QR . Drawing circles round Q and R is a common mistake.

Marks: 1 mark for the perpendicular bisector of QR with construction arcs. 1 mark for the correct region shaded.

5 (2 marks)

Use ruler and compasses to construct an angle of 60° at A .

Use AB as one arm of the angle.

You must show all your construction lines.

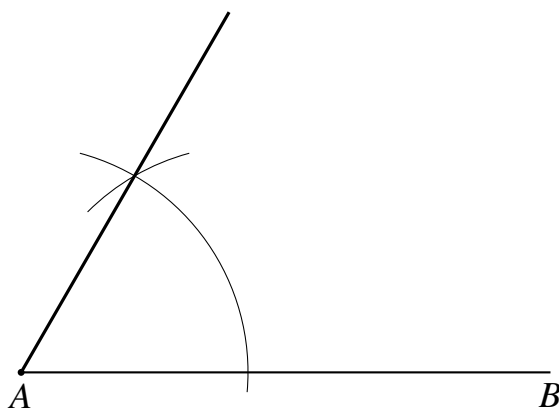
Put the compasses on A and draw a large arc that crosses AB .

Keep the same radius. Put the compasses where the arc crosses AB .

Draw an arc that crosses the first arc.

Join A to the point where the arcs cross.

This makes an equilateral triangle, so the angle is 60° .



Answer: 60° angle with arcs

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

6 (2 marks)

Use ruler and compasses to construct an angle of 30° at A .

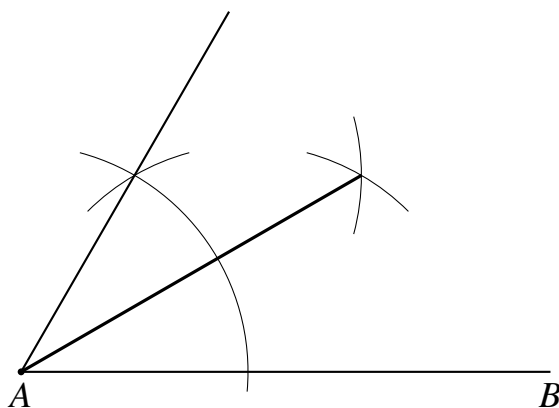
Use AB as one arm of the angle.

You must show all your construction lines.

30° is half of 60° .

First construct an angle of 60° at A (make an equilateral triangle with arcs).

Then bisect the 60° angle.



Answer: 30° angle with arcs

Marks: 1 mark for constructing a 60° angle. 1 mark for the correct bisector (30°).

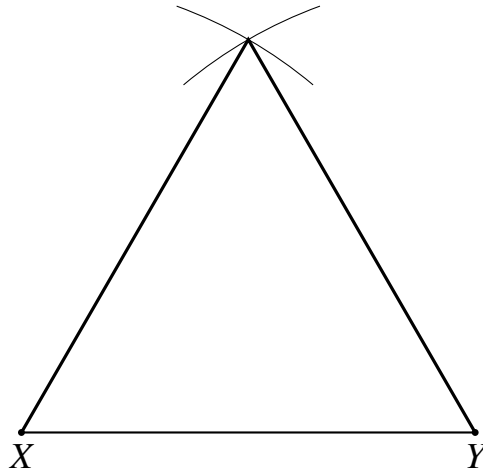
7 (2 marks)

Use ruler and compasses to construct an equilateral triangle with sides of length 6 cm.
The side XY has been drawn for you.
You must show all your construction lines.

Open the compasses to 6 cm.

Draw an arc from X and an arc from Y .

Join X and Y to the point where the arcs cross.



Answer: Equilateral triangle with arcs

Marks: 1 mark for correct construction arcs. 1 mark for the correct triangle.

8 (2 marks)

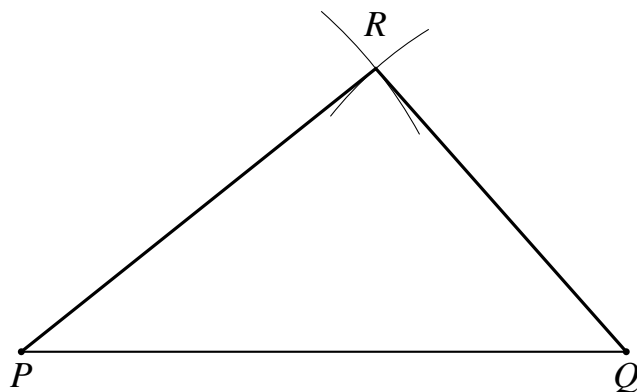
Use ruler and compasses to construct triangle PQR with $PR = 6$ cm and $QR = 5$ cm. PQ has been drawn for you.

Open the compasses to 6 cm. Draw an arc from P .

Open the compasses to 5 cm. Draw an arc from Q .

R is where the arcs cross.

Join R to P and to Q .



Answer: Accurate triangle with arcs

Tip: Use compasses for both sides. Triangles drawn by measuring and guessing are usually not accurate enough.

Marks: 1 mark for one correct arc. 1 mark for a fully correct triangle.

9 (2 marks)

Use ruler and compasses to construct triangle ABC with

$AB = 7$ cm, $AC = 5$ cm and $BC = 6$ cm.

You must show all your construction lines.

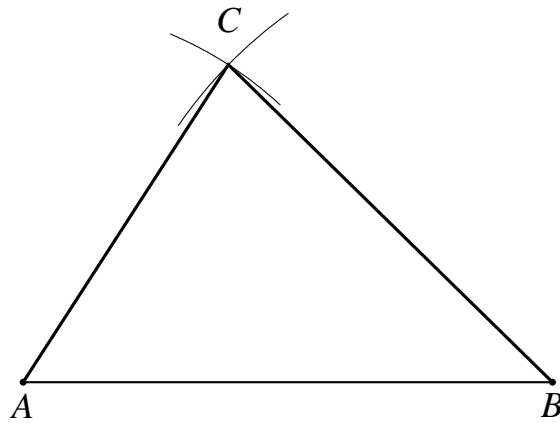
Draw the line AB , 7 cm long, with a ruler.

Open the compasses to 5 cm. Draw an arc from A .

Open the compasses to 6 cm. Draw an arc from B .

C is where the arcs cross.

Join C to A and to B .



Answer: Accurate triangle with arcs

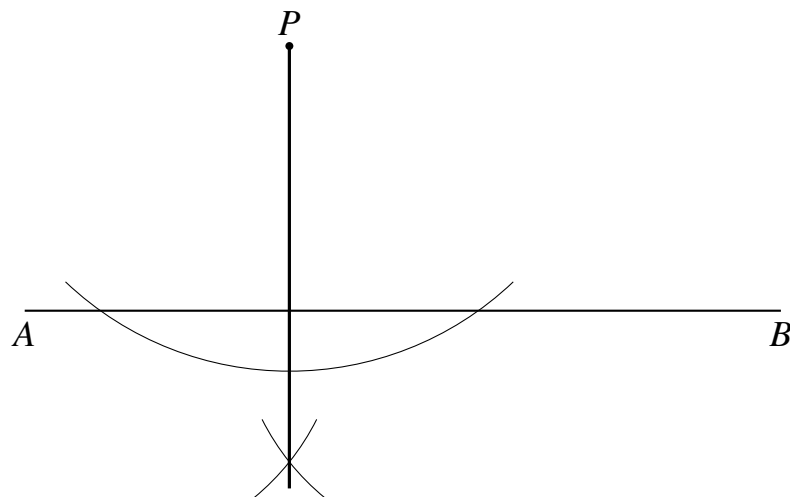
Marks: 1 mark for a 7 cm line with one correct arc. 1 mark for a fully correct triangle with arcs.

10 (3 marks)

A new straight road is to be built from town P to the road AB . The new road must be as short as possible. Use ruler and compasses to construct the new road. The scale of the map is 1 cm represents 2 km. Work out the real length of the new road.

The shortest distance from a point to a line is along the perpendicular.

So construct the perpendicular from P to AB :



Measure the new road: it is 3.5 cm long on the map.

Use the scale: $3.5 \times 2 = 7$ km

Answer: 7 km (accept 6.8 to 7.2)

Marks: 1 mark for correct construction arcs. 1 mark for the perpendicular from P to AB . 1 mark for 7 km.
