

Constructions

Solutions

For AQA GCSE Mathematics (8300) • 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 (1 mark)

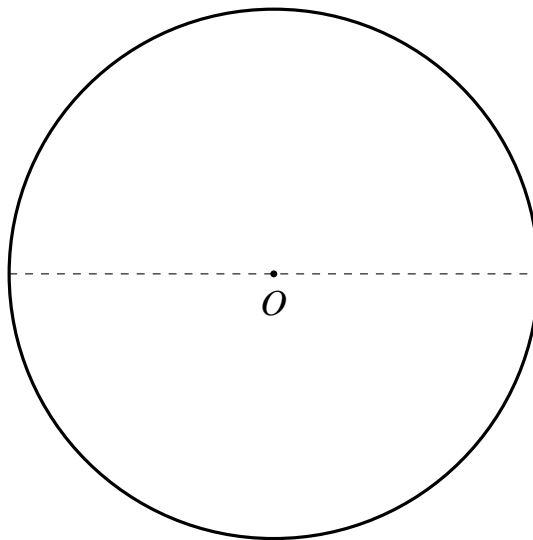
In this question use a pair of compasses.

Draw a circle with centre O and diameter 7 cm.

The diameter is 7 cm, so the radius is $7 \div 2 = 3.5$ cm.

Open the compasses to 3.5 cm.

Put the point of the compasses on O and draw the circle.



Answer: Circle, centre O, radius 3.5 cm

Tip: The diameter goes all the way across the circle. Open the compasses to the radius, which is half of the diameter.

2 (1 mark)

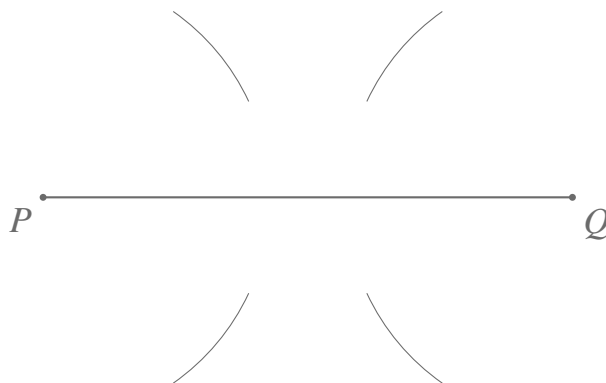
Nadia wants to construct the perpendicular bisector of the line PQ .
Here is her method.

Open the compasses to 3 cm.

Draw arcs from P and from Q , above and below the line.

Join the points where the arcs cross.

Here is her diagram.



What has Nadia done wrong?

PQ is 7 cm long, so half of PQ is 3.5 cm.

Her arcs have radius 3 cm, which is less than half of PQ .

So the arcs from P and from Q never cross.

She must open the compasses to more than half of PQ (more than 3.5 cm).

Answer: Her radius (3 cm) is less than half of PQ , so the arcs do not cross

Tip: For a perpendicular bisector, the compasses must be open to **more than half** the length of the line.

3 (2 marks)

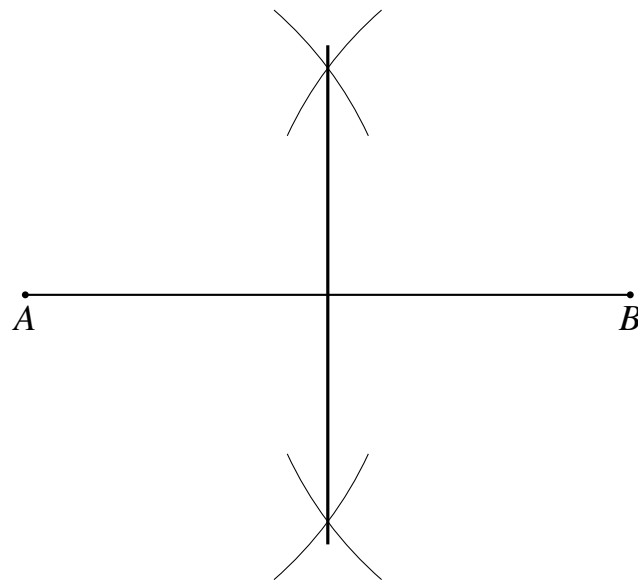
Use a ruler and compasses to construct the perpendicular bisector of AB .
You must show your construction arcs.

Open the compasses to more than half of AB .

Draw arcs from A , above and below the line.

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

Join the two points where the arcs cross.



Answer: Perpendicular bisector with arcs

Tip: Leave your construction arcs on the diagram. A line drawn with a ruler and protractor, without arcs, does not score full marks.

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

4 (2 marks)

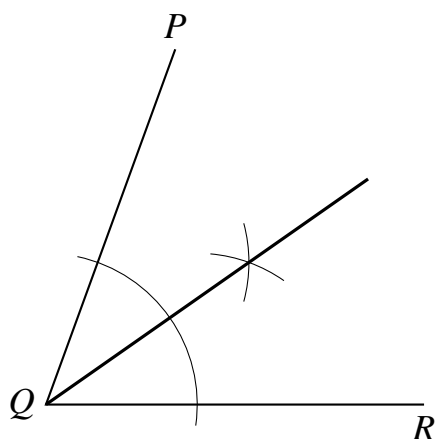
Use a ruler and compasses to construct the bisector of angle PQR .
You must show your construction arcs.

Put the compasses on Q 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 Q through the point where these two arcs cross.



Answer: Angle bisector with arcs (35° each side)

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

5 (2 marks)

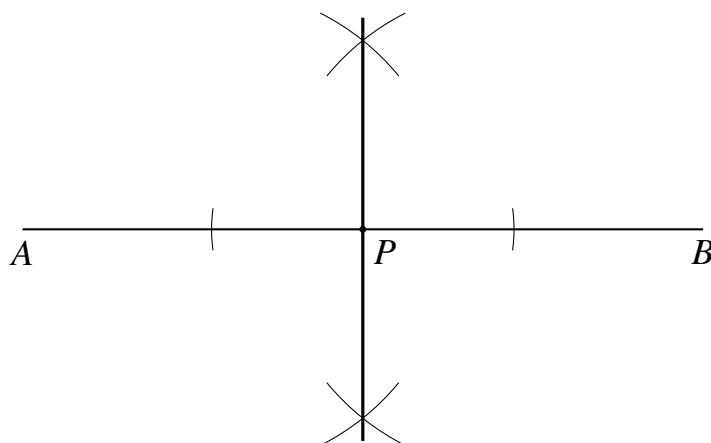
Use a ruler and compasses to construct a line perpendicular to AB at the point P .
You must show your construction arcs.

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

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

6 (2 marks)

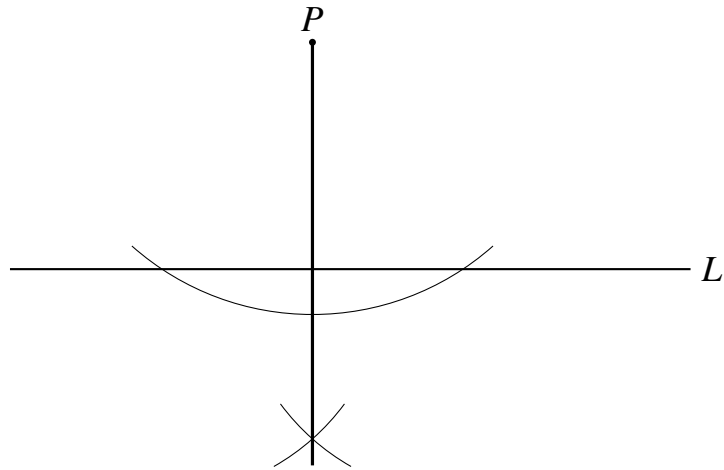
Use a ruler and compasses to construct the perpendicular from P to the line L .
You must show your construction arcs.

Put the compasses on P and draw an arc that crosses L twice.

From each crossing point, draw arcs with the same radius below L , so that they cross.

Join P to the point where these arcs cross.

This line is perpendicular to L .



Answer: Perpendicular from P to L , meeting L 4 cm from its left end

Tip: The line must go through P . Do not construct the perpendicular bisector of the whole line L .

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

7 (2 marks)

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

Use AB as one arm of the angle.

You must show your construction arcs.

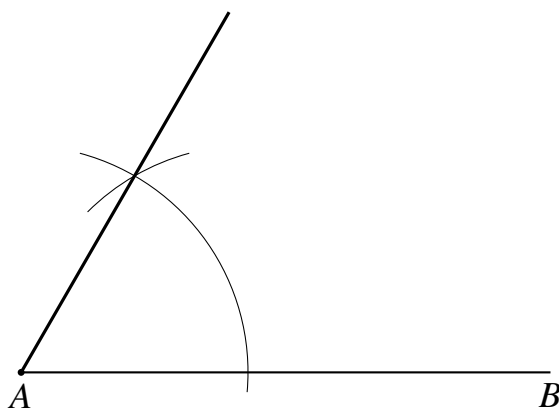
Put the compasses on A and draw a large arc that crosses AB .

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.

8 (2 marks)

Construct triangle ABC with $AC = 6$ cm and $BC = 5$ cm.

The side AB has been drawn for you.

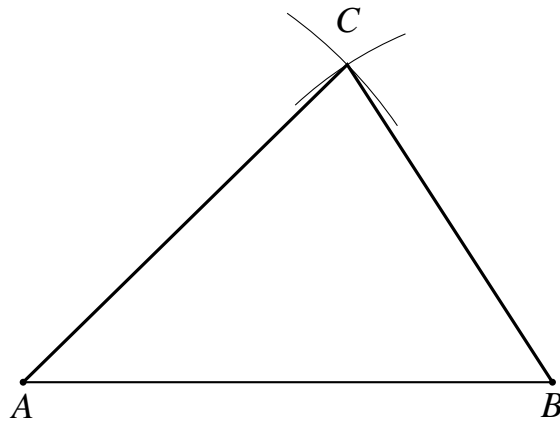
You must show your construction arcs.

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

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

The arcs cross at C .

Join C to A and to B .



Answer: Accurate triangle with arcs

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

9 (2 marks)

Triangle PQR is isosceles with $PQ = PR$.

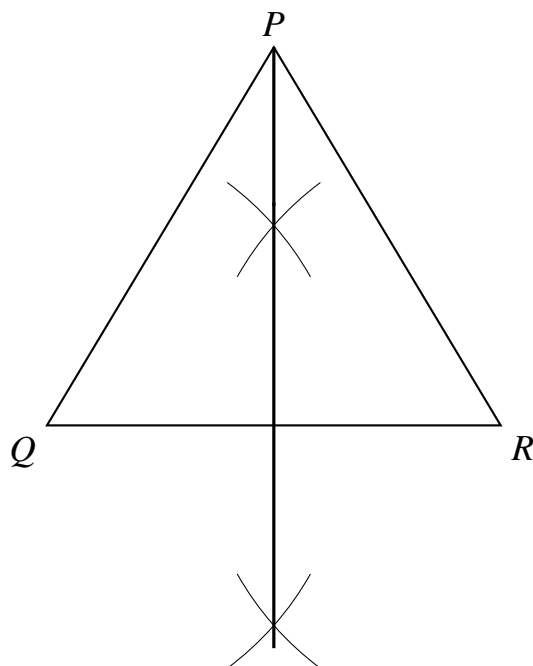
Using a pair of compasses and a ruler, construct the line of symmetry of the triangle. You must show your construction arcs.

The line of symmetry goes through P and the midpoint of QR .

It is the perpendicular bisector of QR .

Draw equal arcs from Q and R , above and below QR .

Join the points where the arcs cross, and extend the line up to P .



(Bisecting angle QPR with arcs gives the same line.)

Answer: Perpendicular bisector of QR (through P) with arcs

Tip: Use compasses. Measuring the middle of QR with a ruler is not a construction.

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

10 (3 marks)

Triangle ABC is shown below.

Shade the region inside the triangle of points that are
closer to side AB than to side AC

and

more than 5 cm from A .

Use a ruler and compasses. You must show your construction arcs.

Points the same distance from side AB and side AC lie on the bisector of angle BAC .

Points closer to side AB are on the AB side of this bisector (below it).

Construct the bisector: draw an arc from A that crosses AB and AC .

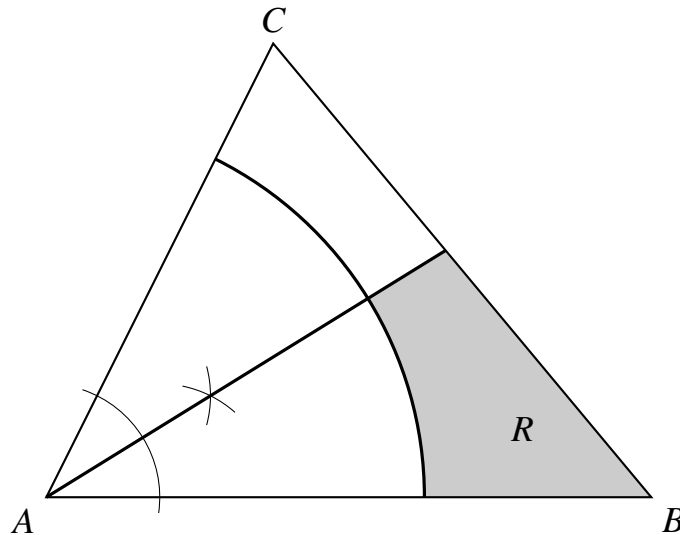
Keep the same radius and draw arcs from these two points so that they cross.

Join A to the point where these arcs cross.

Points more than 5 cm from A are outside a circle with centre A and radius 5 cm.

Open the compasses to 5 cm, put the point on A and draw the arc across the triangle.

The region is below the bisector **and** outside the arc.



Answer: Region R: below the bisector of angle BAC and outside the arc of radius 5 cm, centre A

Tip: “Closer to side AB than to side AC ” needs the bisector of the angle between the two sides, not a perpendicular bisector. “More than 5 cm from A ” is **outside** the arc, so do not shade the part near A .

Marks: 1 mark for the bisector of angle BAC with arcs. 1 mark for an arc of radius 5 cm centred on A . 1 mark for the correct region shaded.

11 (3 marks)

A flag is in the shape of an isosceles triangle.

Two sides are 1.4 m long and the other side is 1.2 m long.

Using ruler and compasses only, construct a scale drawing of the flag.

Use the scale 1 centimetre represents 20 centimetres.

You must show your construction arcs.

Change the lengths to centimetres: $1.4\text{ m} = 140\text{ cm}$ and $1.2\text{ m} = 120\text{ cm}$

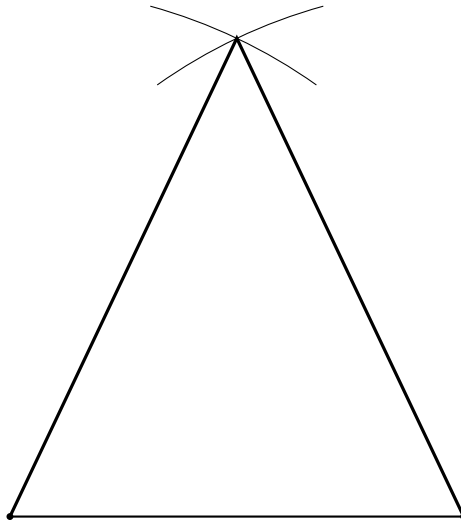
Use the scale: $140 \div 20 = 7\text{ cm}$ and $120 \div 20 = 6\text{ cm}$

Draw a line 6 cm long.

Open the compasses to 7 cm.

Draw an arc from each end of the line.

Join both ends to the point where the arcs cross.



Answer: Isosceles triangle with sides 7 cm, 7 cm and 6 cm, with arcs

Tip: Change metres to centimetres before you use the scale. Leave both arcs showing.

Marks: 1 mark for 7 cm and 6 cm. 1 mark for one side drawn with a correct arc from one end. 1 mark for a fully correct triangle with arcs.