

GCSE MATHS

Constructions and loci

Worked Solutions

Q1

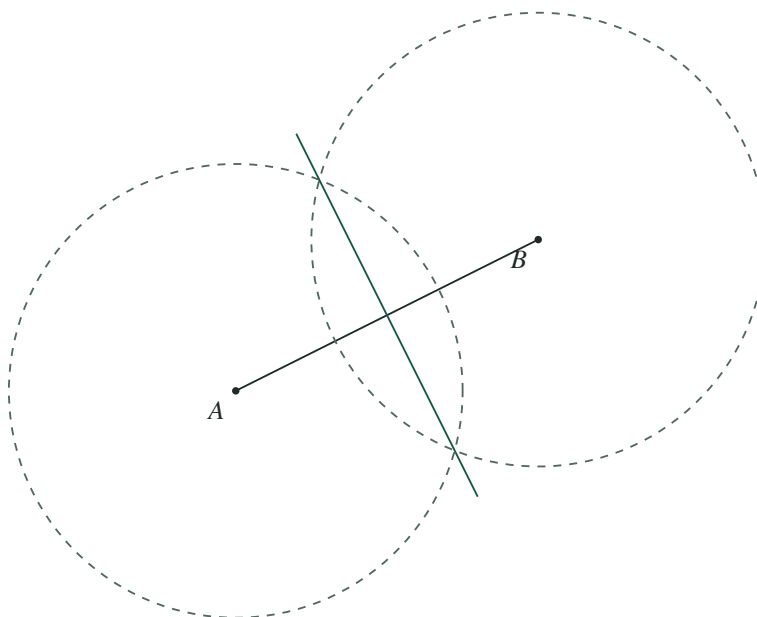
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Draw equal-radius arcs from A and B

Choose a compass width greater than half AB .

Join the two arc intersections

The line passes through the midpoint at a right angle.



Q2

**

$PA = PB = 5 \text{ cm}$

Points on the perpendicular bisector are equally far from A and B.

Q3

**

Choose a radius greater than 3 cm

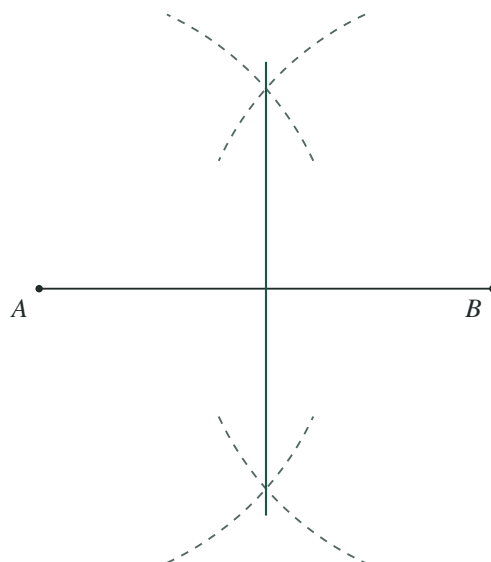
Use the same compass width at A and B .

Draw crossing arcs above and below AB

Their intersections are equally far from A and B .

Join the intersections

This is the perpendicular bisector.



Q4

**

Construct the midpoint M of AB

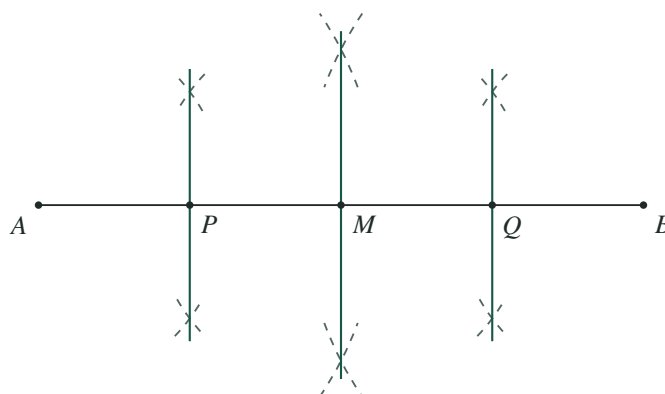
Draw equal-radius arcs from A and B , then join their intersections.

Construct the midpoint P of AM

Repeat the perpendicular-bisector construction on the left half.

Construct the midpoint Q of MB

Repeat on the right half. The four lengths AP , PM , MQ and QB are equal.



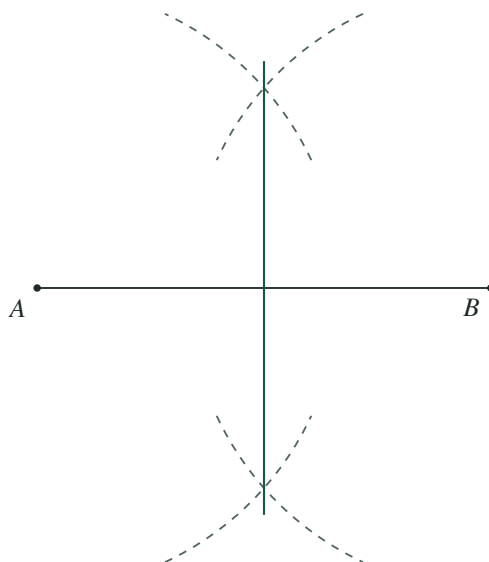
Q5

$$PA = PB$$

Equal distances identify the perpendicular bisector.

Construct the perpendicular bisector

Use equal-radius arcs from A and B , then join their intersections.



Q6

$$PA = PB$$

Each length is a radius of one of the equal circles.

$$QA = QB$$

Both P and Q are equally far from A and B

Points equally far from the two endpoints lie on their perpendicular bisector.

$$PQ \perp AB$$

The line through those two points is the perpendicular bisector.

Q7

**

Draw one arc centred at O

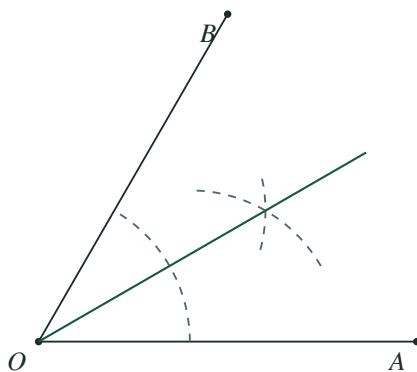
Mark where it meets the two rays.

Draw equal arcs from those marks

Use their intersection inside the angle.

Join O to the intersection

The new ray bisects the angle.



Q8

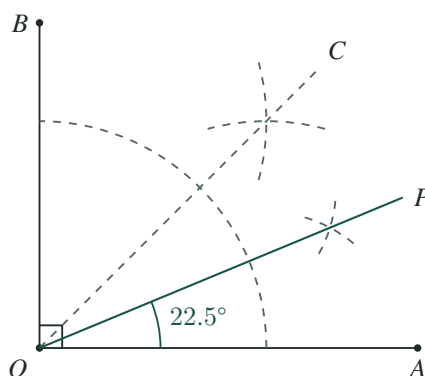
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$$\angle AOC = 90^\circ \div 2 = 45^\circ$$

Construct the bisector OC of the right angle.

$$\angle AOP = 45^\circ \div 2 = 22.5^\circ$$

Construct the bisector OP of angle AOC .



Q9

Use P as centre to mark two points on AB

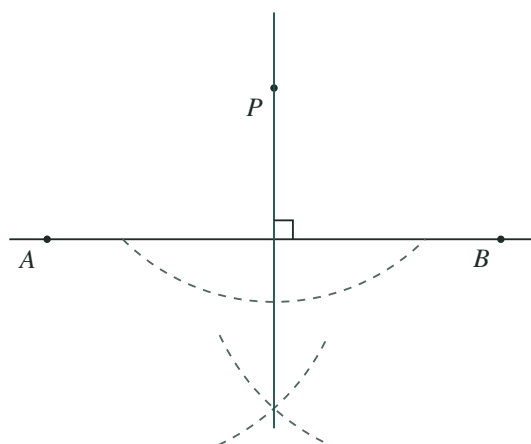
Choose a radius large enough to cross the line twice.

Construct their perpendicular bisector

P is equally far from the two marked points.

Draw the line through P

It meets AB at a right angle.



Q10

Mark equal distances on each side of P

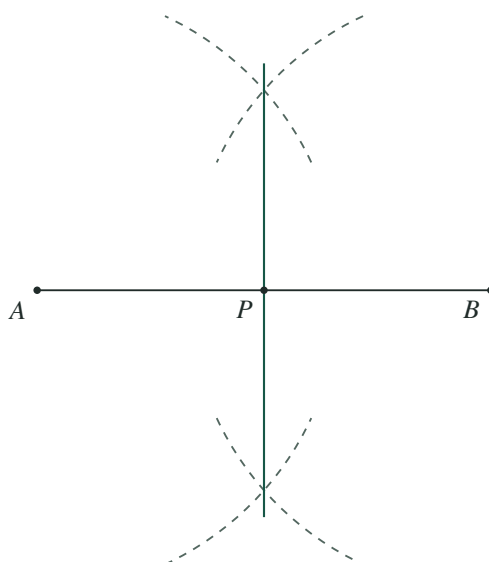
Use the same compass radius.

Draw equal arcs from those two marks

Their intersection lies on the perpendicular through P .

Join P to the intersection

Keep the arcs visible.



Q11

Set compass width to AB

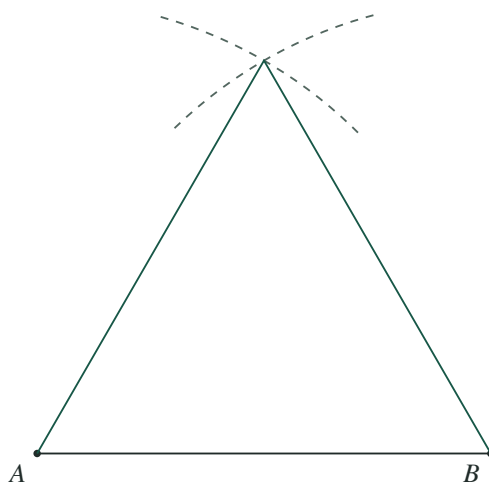
Keep that width for both arcs.

Draw arcs from A and B above AB

Their intersection is the third vertex.

Join it to A and B

All three sides equal the compass width.



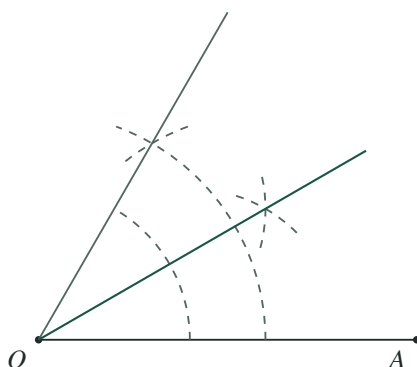
Q12

 60°

An equilateral triangle gives a sixty-degree angle.

 $60^\circ / 2 = 30^\circ$

Bisect it using the angle-bisector construction.



Q13

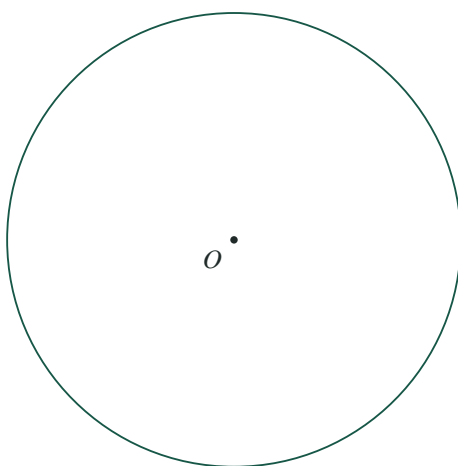
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Set the compass radius to 3 cm

Measure the radius with a ruler.

Draw a complete circle centred at O

Every point on it is 3 cm from O.



Q14

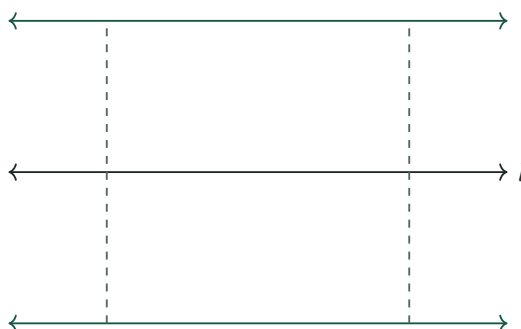
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Construct perpendiculars at two points on l

Use these to measure the distance from the line.

Mark 2 cm on each side

Join the marks on each side to draw two parallel lines.



Q15

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Two parallel lines

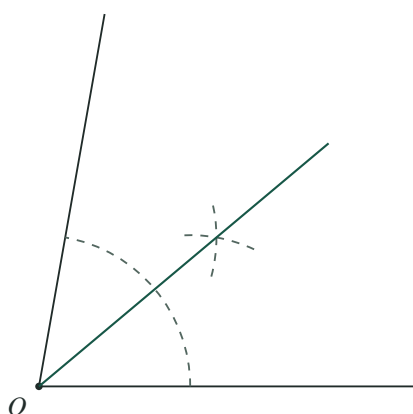
Distance from a line is measured perpendicularly on either side.

Q16

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Construct the angle bisector

Points on it have equal perpendicular distances from the two sides.



Q17

$$5 - 3 = 2 \text{ cm}$$

Move from O directly towards the line along the perpendicular.

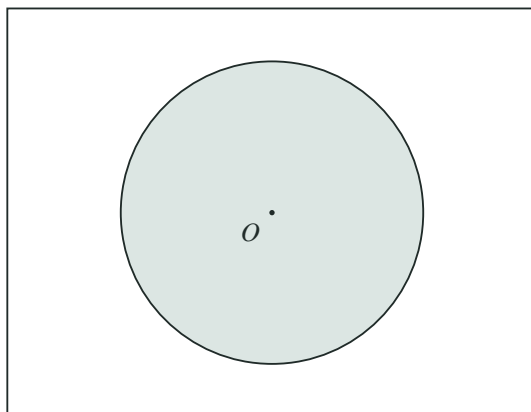
Q18

$$OP \leq 2 \text{ cm}$$

At most includes distances equal to two.

Shade the inside and include the circle

The locus is a region, not only its boundary.



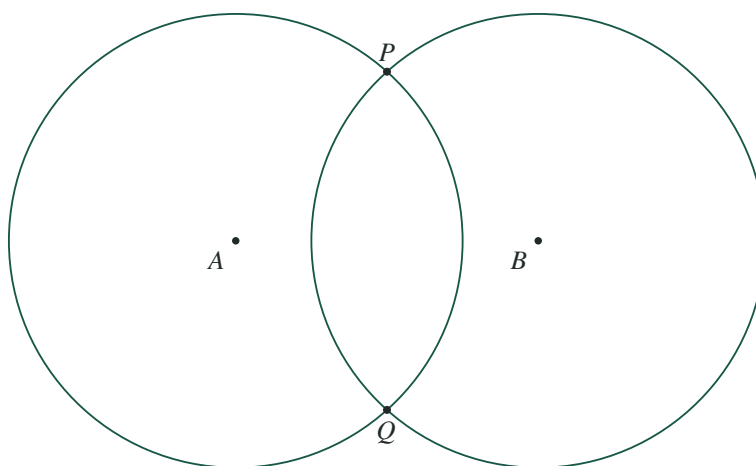
Q19

$$AP = BP = 3 \text{ cm}$$

Both distance conditions must hold.

Draw the two radius-3 circles

Their two intersections are the required points.



Q20

$$3 + 3 = 6 < 10$$

The radii do not bridge the distance between the centres.

No intersections

There are no points satisfying both conditions.

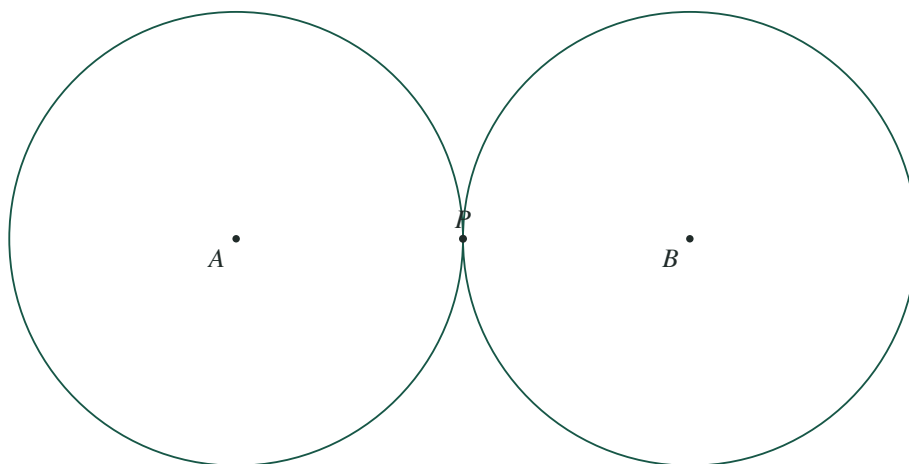
Q21

Draw circles of radius 3 cm

Use A and B as centres.

Mark their touching point

It is 3 cm from both A and B .



Q22

$AP < 2 \text{ cm}$

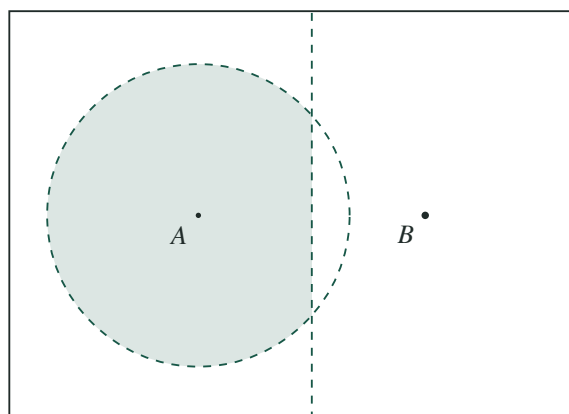
Draw a dashed circle centred at A .

$AP < BP$

Construct the perpendicular bisector and choose the side containing A .

Shade the overlap

Both strict inequalities exclude their boundary lines.



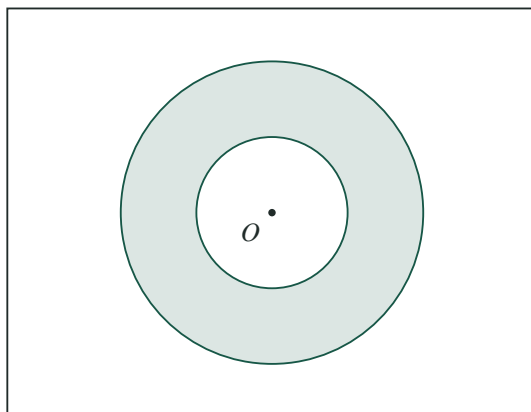
Q23

$$1 \leq OP \leq 2$$

Both inequalities include equality.

Shade between the two circles

Leave the central disc unshaded.



Q24

Construct the perpendicular bisector of AB

It gives the points equally far from A and B.

Draw a circle of radius 5 cm centred at A

Its intersections with the bisector satisfy both conditions.

