



- 1** Sam is asked to shade the region of all points that are less than 4 cm from a point P.

Sam shades a square with sides of length 8 cm, with P at the centre of the square.

Explain why Sam's region is wrong.

(1 mark)

All points less than 4 cm from P lie inside a circle with centre P and radius 4 cm

Sam's square is wrong because its corners are about 5.7 cm from P, which is more than 4 cm, so the square includes points that should not be shaded

- 2** Describe fully the locus of all points that are exactly 5 cm from a fixed point A.

(1 mark)

Every point at a fixed distance from a single point lies on a circle

The locus is a circle, centre A, radius 5 cm

A circle with centre A and radius 5 cm

- 3** Points A and B are 8 cm apart.

Describe how to construct the perpendicular bisector of the line segment AB, using only a pair of compasses and a straight edge.

(3 marks)

1. compasses open more than half of AB
2. point on A: arcs above and below AB
3. same radius, point on B: arcs cross the first ones
4. join the two crossing points

The line joining the crossing points is the perpendicular bisector

- 4** Two towns, Ashford and Bexley, are 60 km apart.

A new phone mast must be built so that it is exactly the same distance from Ashford as it is from Bexley.

Describe fully the locus of all possible positions of the mast.

(2 marks)

Points equidistant from two fixed points lie on the perpendicular bisector of the segment joining them

The locus is the straight line perpendicular to the line joining Ashford and Bexley, passing through its midpoint (30 km from each town)

- 5 On a coordinate grid, A is the point $(2, 1)$ and B is the point $(2, 9)$.

The region R contains all the points that are closer to A than to B .

- Write down the equation of the boundary of R .
- Is the point $(7, 6)$ in R ? Give a reason for your answer.

(2 marks)

a)

midpoint of $AB = (2, 5)$

AB is vertical so the bisector is horizontal

$$\boxed{y = 5}$$

b)

A is below the line, so R is where $y < 5$

$(7, 6)$: $y = 6$ is more than 5

$\boxed{\text{No, it is closer to } B}$

- 6 Two straight paths, PQ and PR , meet at the point P . The angle QPR is 70° .

A bench is placed so that it is the same distance from both paths.

- What is the name of the line on which the bench must lie?
- Work out the size of the angle between this line and the path PQ .

(2 marks)

a)

equal distance from two lines

$\boxed{\text{the angle bisector of } QPR}$

b)

$$70 \div 2 = 35$$

$$\boxed{35^\circ}$$

- 7 A goat is tethered to a post in the middle of a large flat field by a rope of length 7 m.

The rope stays taut or slack, so the goat can reach any point up to 7 m from the post.

- Describe fully the boundary of the region the goat can reach.
- Work out the area of grass the goat can graze. Give your answer correct to 1 decimal place.

(3 marks)

a) The goat can reach every point up to 7 m from the post, so the boundary is a circle with centre the post and radius 7 m

$$\text{b) Area} = \pi r^2 = \pi \times 7^2 = 49\pi$$

$$\text{Area} = 153.938... = 153.9 \text{ m}^2 \text{ (1 decimal place)}$$

8

A straight path AB is 10 m long. A sprinkler system waters every point of the ground that is within 2 m of the path, including both ends.

a. Describe the shape of the watered region.

b. Work out the area of the watered region. Give your answer correct to 3 significant figures.

(4 marks)

a)

rectangle 10 m by 4 m

+ a semicircle (radius 2 m) at each end

b)

$$\text{rectangle} = 10 \times 4 = 40$$

two semicircles = one circle

$$\text{circle} = \pi \times 2^2 = 12.566...$$

$$\text{total} = 40 + 12.566...$$

$$= 52.566...$$

$$\boxed{52.6 \text{ m}^2}$$

9

A rectangular shed measures 10 m by 8 m, and stands in a large flat field. A goat is tied to one corner of the shed, on the outside, with a rope 6 m long. The rope is too short to reach round either end of the shed.

Work out the area of grass the goat can reach. Give your answer correct to 3 significant figures.

(3 marks)

shed corner is 90°

$$\text{angle the goat can reach} = 360 - 90 = 270^\circ$$

$$\text{area} = \frac{270}{360} \times \pi \times 6^2$$

$$= \frac{3}{4} \times \pi \times 36$$

$$= 27\pi$$

$$= 84.823...$$

$$\boxed{84.8 \text{ m}^2}$$

10

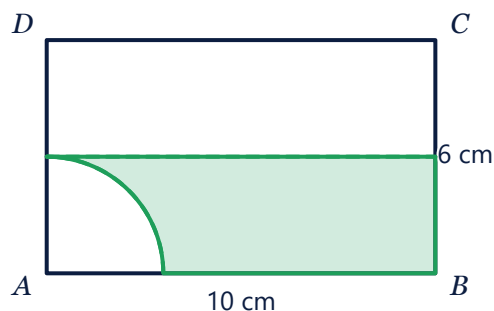
The diagram shows a scale drawing of a rectangular garden ABCD, with $AB = 10$ cm and $BC = 6$ cm on the drawing.

The scale is 1 cm to 2 m.

A pond will be dug in the garden so that it is more than 6 m from corner A

and closer to side AB than to side DC.

Shade the region of the garden where the pond can be dug. You must show all your construction lines.



(4 marks)

6 m in real life is $6 \div 2 = 3$ cm on the drawing. Draw an arc of radius 3 cm, centre A - the pond must be outside this arc

Points closer to AB than to DC lie on the AB side of the line midway between AB and DC. Draw this mid-line parallel to AB, 3 cm from it

Shade the region between AB and the mid-line that lies outside the arc centred at A

Do not include the circular arc or the mid-line: "more than" and "closer than" are strict conditions, so draw these boundaries dashed