

GCSE Maths: Loci: the four basic rules (Higher): answers

GCSE Maths - Loci, Bearings and Vectors - Higher - Lesson 22.4

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch22-constructions-loci-bearings-vectors/higher/loci-the-four-basic-rules/

Exercise 22E Basic loci Non-calculator

1 Describe each locus in words, then say what shape it is.

- (a) The points that are exactly 5 cm from a fixed point P.

Answer: A circle, centre P, radius 5 cm

- (b) The points that are the same distance from two fixed points A and B.

Answer: The perpendicular bisector of AB

- (c) The points that are the same distance from two lines that cross at O.

Answer: The bisector of the angle between the lines

- (d) The points that are exactly 2 cm from a line segment AB.

Answer: Two parallel lines 2 cm from AB, with a semicircle at each end

2 Say what the locus of each point is.

- (a) The tip of the second hand of a clock, as the clock runs.

Answer: A circle (radius = length of the hand)

- (b) A person walking so that she is always the same distance from two lamp posts.

Answer: The perpendicular bisector of the line between the posts

- (c) The centre of a wheel of radius 30 cm rolling along flat ground.

Answer: A straight line parallel to the ground, 30 cm above it

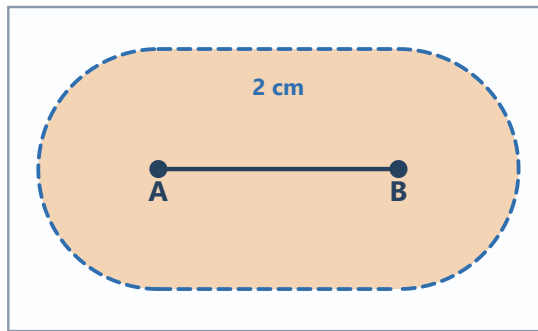
- (d) The end of a swing seat that hangs from a bar by a 2 m chain.

Answer: An arc of a circle, centre at the bar, radius 2 m

3 Draw a point A. Draw the locus of points that are 3 cm from A. Shade the region where points are **less than** 3 cm from A.

Answer: Circle of radius 3 cm centred on A, inside shaded.

4 The locus of points exactly 2 cm from a line segment AB of length 4 cm is a stadium shape. Work out the total length of the boundary of the stadium. Give your answer correct to 1 decimal place.



Answer: 20.6 cm

- 5 A is the point (1, 1) and B is the point (7, 1). For each point say whether it is closer to A, closer to B, or the same distance from A and B.

(a) P (3, 5)

Answer: Closer to A

(b) P (5, 2)

Answer: Closer to B

(c) P (4, 7)

Answer: Equidistant from A and B

(d) P (4.5, 0)

Answer: Closer to B

- 6 C is the point (4, 4). For each point say whether it is within 3 units of C.

(a) Q (6, 5)

Answer: Yes, within 3

(b) Q (1, 1)

Answer: No, outside

(c) Q (7, 4)

Answer: Yes, within 3

(d) Q (4, 7.5)

Answer: No, outside

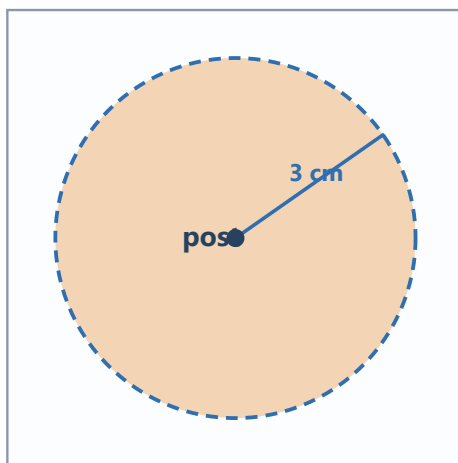
- 7 A and B are 8 cm apart. P is a point on the perpendicular bisector of AB, and P is 5 cm from A. Work out the distance from P to the midpoint M of AB.

Answer: 3 cm

- 8 Two straight lines OA and OB meet at O with angle $AOB = 80^\circ$. P is a point on the bisector of the angle and $OP = 4$ cm. Work out the perpendicular distance from P to OA. Give your answer to 2 decimal places.

Answer: 2.57 cm

- 9 A goat is tied to a post by a rope 6 m long on a large flat field. Work out the area of the field that the goat can reach. Give your answer in m^2 to the nearest whole number.



Answer: 113 m^2

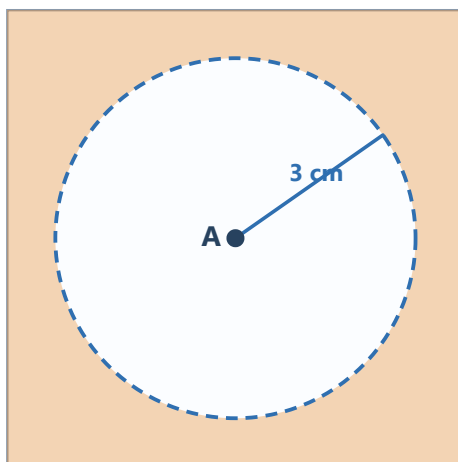
- 10 A radio transmitter can be heard up to 25 km away. A map has a scale of 1 : 500 000. What radius should be drawn on the map to show the region where the radio can be heard? Give the radius in cm.

Answer: 5 cm

- 11 Explain why the locus of points the same distance from two fixed points A and B is a whole **line** and not just the midpoint of AB.

Answer: Any point on the perpendicular bisector is equidistant, e.g. one 3 cm above the midpoint.

- 12 Tom is asked to shade the locus of points that are **at least** 3 cm from A. He shades inside the circle of radius 3 cm. Explain his mistake and say which part should be shaded.



Answer: Outside the circle (and the circle itself).

- 13 M is the midpoint of AB, where B is a point that moves around a circle of radius 4 cm with centre A. Describe the locus of M.

Answer: A circle of radius 2 cm, centre A

- 14** A is the point (0, 2) and B is the point (6, 8). Find the equation of the locus of points that are the same distance from A and from B.

Answer: $x + y = 8$ (or $y = 8 - x$)