

Exercise walk-through

4.4.3

Constructions

AQA · GCSE · Mathematics

45. Constructions, loci and geometric conditions · Foundation

Constructions, loci and geometric conditions · Foundation

For endpoints A and B 6 cm apart, draw equal-radius arcs above and below AB, with compass opening greater than 3 cm. Join the arc intersections to obtain the perpendicular bisector, crossing AB at its midpoint 3 cm from each end. To construct a perpendicular from P to a line, use a circle centred at P to mark two line points, then bisect their segment. For a perpendicular at P on the line, mark equal distances on each side of P and use equal arcs.

46. Constructions, loci and geometric conditions · Foundation

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For an angle bisector, draw one vertex-centred arc meeting both arms, then equal arcs from those two points; join their intersection to the vertex. Equal-radius circles centred at the endpoints of a segment construct an equilateral triangle and hence a 60° angle. For a point equally distant from A and B and 5 cm from A, intersect the bisector with a 5 cm circle centred at A. Each intersection is 4 cm perpendicular to AB by a 3–4–5 triangle. The shortest point-to-line distance follows a perpendicular, since any slanted route is a longer hypotenuse.

118. Tangents, chords and the alternate segment · Higher

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At contact T, the radius OT is perpendicular to the tangent: a non-perpendicular line through T would have a smaller centre-to-line distance than the radius and cut the circle twice. For tangents PA and PB, $OA=OB$, OP is shared and both contact angles are 90° . RHS makes OAP and OBP congruent, so $PA=PB$. For a centre perpendicular OM to chord AB, $OA=OB$ and OM is shared; RHS gives $AM=MB$. If $OA=5$ and $OM=3$, $AM=4$, hence $AB=8$. For a chord AB with minor central angle ϕ , triangle OAB has base angle $(180-\phi)/2$.

Exercises 2.1·2.3

2.1 (Foundation) Find the midpoint x-coordinate between $(0,0)$ and $(6,0)$.

2.2 (Foundation) A locus intersection is 5 cm from A and its midpoint foot is 3 cm from A. Find its perpendicular height in cm.

2.3 (Foundation) Find the distance from $(3,4)$ to $(0,0)$.

3 Exam-style questions

Exercises 2.1·2.3

2.1 (Foundation) Find the midpoint x-coordinate between (0,0) and (6,0).

2.1 Midpoint x-coordinate $= (0+6)/2 = 3$.

2.2 (Foundation) A locus intersection is 5 cm from A and its midpoint foot is 3 cm from A. Find its perpendicular height in cm.

2.2 The right triangle has hypotenuse 5 and horizontal leg 3: $h^2 = 5^2 - 3^2 = 16$, so the positive height is 4.

2.3 (Foundation) Find the distance from (3,4) to (0,0).

3 Exam-style questions

2.3 Distance $= \sqrt{3^2 + 4^2} = 5$.

Exercise 3.1

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Points equally distant from two points always lie on their angle bisector.

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3.1 False. $A=(-1,0)$, $B=(1,0)$: all points $(0,y)$ are equally distant from A and B, forming the perpendicular bisector of AB. Two points alone do not specify the vertex and two arms of an angle bisector.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.