

Exercise walk-through

4.4.2

Transformations

AQA · GCSE · Mathematics

80. Circle parts and geometric definitions · Foundation

Circle parts and geometric definitions · Foundation

For centre O and radius 5 cm, every circumference point is 5 cm from O and the diameter is 10 cm. A chord 3 cm from O has half-length $\sqrt{(5^2-3^2)}=4$ cm, so its whole length is 8 cm. The perpendicular from O meets the chord at its midpoint. Joining the two chord endpoints to O creates a sector; the smaller region between chord and arc is a segment. At the rightmost circumference point, the vertical touching line is tangent and the horizontal radius is perpendicular to it. The circumference is a length, $2\pi r=10\pi$ cm, rather than an area.

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 $(180-\phi)/2$.

164. Sine rule, cosine rule and triangle area · Higher

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With sides 6 and 8 enclosing 60° , $c^2 = 36 + 64 - 96 \times (1/2) = 52$, hence $c = 2\sqrt{13}$. Its area is $(1/2) \times 6 \times 8 \times \sin 60^\circ = 12\sqrt{3}$. For $a=4$ opposite $A=30^\circ$ and $B=45^\circ$, $b=4 \sin 45^\circ / \sin 30^\circ = 4\sqrt{2}$. If sides $a=7, b=5, c=6$, $\cos A = (25 + 36 - 49) / (2 \times 5 \times 6) = 1/5$, so $A \approx 78.5^\circ$. To find an angle from area 12 with enclosing sides 6 and 8, $\sin C = 24/48 = 1/2$; C could be 30° or 150° until the remaining data selects a shape. Label opposite pairs and check triangle inequalities to reject impossible side combinations.

Exercises 2.1·2.3

2.1 (Foundation) For $C=(1,1), P=(3,2), k=2$, find the image x-coordinate.

2.2 (Foundation) For that enlargement, find the image y-coordinate.

2.3 (Foundation) Reflect $(3,2)$ in the y-axis. Find the new x-coordinate.

Exercises 2.1·2.3

2.1 (Foundation) For $C=(1,1), P=(3,2), k=2$, find the image x-coordinate.

2.1 Image $= C + 2(P - C)$. Its x-coordinate is $1 + 2(3 - 1) = 5$.

2.2 (Foundation) For that enlargement, find the image y-coordinate.

2.2 Its y-coordinate is $1 + 2(2 - 1) = 3$.

2.3 (Foundation) Reflect $(3,2)$ in the y-axis. Find the new x-coordinate.

2.3 Reflection in the vertical axis negates x: 3 becomes -3.

Exercise 3.1

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Every enlargement is centred at the origin unless its scale factor is negative.

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3.1 False. Centre $(1,1)$, positive scale factor 2 maps $(3,2)$ to $(5,3)$. The origin is not the centre; the centre is specified independently of the factor's sign.

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