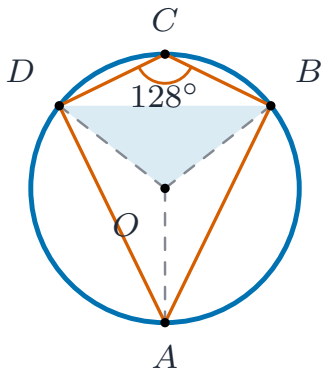
Exercise walk-through

4.3 Circles

Pearson Edexcel · International GCSE · Mathematics A

Figure: Circle geometry with reasons (2)



cyclic quad: $\angle BAD = 52°$
centre $= 2\times$ rim: $\angle BOD = 104°$
$OB = OD$ (radii): isosceles
$\angle OBD = \frac{180-104}{2} = 38°$

every numerical step names its reason

- Worked example 2: a circle centre O with **cyclic quadrilateral** ABCD, angle BCD = 128°, and the chain BAD = 52°, BOD = 104°, OBD = 38°.
- Match each part of the diagram to the text.

Pythagoras and trigonometry in 2D

- $\tan 62° = \frac{h}{50}$, so $h = 50 \tan 62° = 94.0$ m (3 s.f.).
- The **sine rule** , $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$, works when you know a side and its opposite angle.
- The **cosine rule** , $a^2 = b^2 + c^2 - 2bc\cos A$, works when you know two sides and the angle between them, or all three sides.

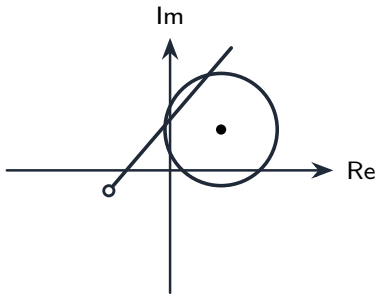
$$\sin\theta = \frac{\text{opp}}{\text{hyp}}, \quad \cos\theta = \frac{\text{adj}}{\text{hyp}}, \quad \tan\theta = \frac{\text{opp}}{\text{adj}}$$

Pythagoras and trigonometry in 2D (2)

- The area of a triangle is $\frac{1}{2}ab\sin C$. It also works backwards: if the area is 15, $a = 6$ and $b = 10$, then $30\sin C = 15$, so $\sin C = 0.5$ and $C = 30°$ (or $150°$ if the angle is obtuse).
- $BC = a$ is opposite A, and $AC = b$ is opposite B. By the **sine rule**, $$\frac{b}{\sin 65°} = \frac{8}{\sin 40°}.$$
- $b = \dfrac{8\sin 65°}{\sin 40°} = 11.3$ cm (3 s.f.).

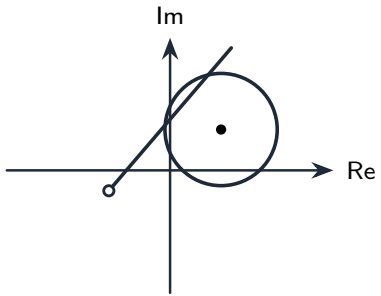
Exercise 2.1

2.1 Describe the locus of points exactly 3 cm from a given straight line segment of length 8 cm. [2]



Exercise 2.1

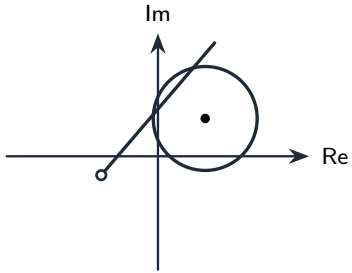
2.1 Describe the locus of points exactly 3 cm from a given straight line segment of length 8 cm. [2]



2.1 Two lines parallel to the segment, 3 cm either side, joined by semicircles of radius 3 cm centred on the endpoints (a “stadium” shape).

Setup for exercise 2.2

2.2 Describe the locus of points equidistant from two fixed points P and Q. [1]

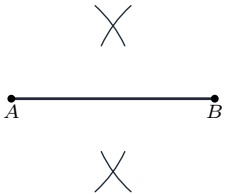


Exercise 2.2

2.3 On a 1 : 50 000 map, two towns are 4.8 cm apart. Find the real distance in km. [3]



2.4 List the compass-and-ruler steps to bisect an angle. [3]

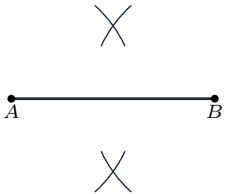


Exercise 2.2

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2.2 The perpendicular bisector of PQ.

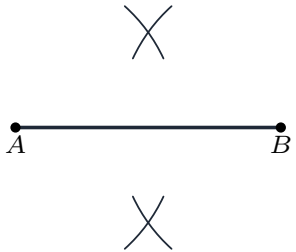
2.3 $4.8 \times 50\,000 = 240\,000$ cm $= 2.4$ km.

2.4 Arc of any radius centred on the vertex crossing both arms; from the two crossing points, equal arcs that intersect; join the vertex to that intersection.

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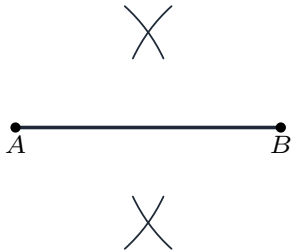
Exercise 3.1

3.1 *(Original.)* A treasure lies within 4 cm of a fence AB (a straight segment) and closer to A than to B. Describe, or sketch with construction lines, the region in which the treasure can lie. [3]



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3.1 The region within 4 cm of segment AB (the stadium shape around AB) intersected with the half-plane on A's side of the perpendicular bisector of AB – shade the overlap.

Exercise 3.2

3.2 *(Original.)* Construct triangle PQR with $PQ = 8$ cm, $QR = 6$ cm and $\angle PQR = 55°$.

(a) Which congruence condition does the construction use? (b) Without measuring, use the cosine rule to calculate PR to 1 decimal place. [5]

3.3 *(Original.)* A map scale is $1 : 25\,000$. A rectangular field measures 6 cm by 4 cm on the map. (a) Find its real dimensions in km. (b) Find its real area in km^2. [5]



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3.2 (a) SAS (two sides and the included angle). (b) $PR^2 = 8^2 + 6^2 - 2 \times 8 \times 6 \cos 55° = 100 - 96 \times 0.5736 = 100 - 55.07 = 44.93$, so $PR = 6.7$ cm (1 d.p.).

3.3 (a) $6 \times 25\,000 = 150\,000$ cm $= 1.5$ km; $4 \times 25\,000 = 100\,000$ cm $= 1.0$ km. (b) $1.5 \times 1.0 = 1.5$ km^2.

Local review guidance: construction steps in order with radii stated; exact scale conversions with units; locus answers name the boundary shape, not just “near the line”. This is authored classroom guidance.