Test answers - Constructions, loci, bearings, plans and elevations

Year: Year 11 · Duration: 45 minutes · /20

Answer to Question 1 (4 marks)

a. $072 + 180 = 252^\circ$ (1)
b. 000° (due north) (1)
c. From B, the bearing of A is 252° and the direction to C is 180°; $252 - 180 = 72$, so the interior angle is $180 - 72 = 108^\circ$ (2)

In (a), a back bearing is found by adding or subtracting 180°, and bearings are always written with three figures. In (b), C is due south of B, so B is due north of C, a bearing of 000°. In (c), the north lines at A and B are parallel, so co-interior angles add up to 180°, which gives $180 - 72 = 108^\circ$.

Answer to Question 2 (4 marks)

a. $6.5 \times 20\,000 = 130\,000$ cm (1) $=$ **1.3 km** (1)
b. 2.4 km $= 240\,000$ cm (1), $240\,000 \div 20\,000 =$ **12 cm** (1)

In (a), multiply the map length by the scale factor 20 000 to get 130 000 cm in real life. Then divide by 100 to change centimetres into metres, 1300 m, and by 1000 to change metres into kilometres. In (b), reverse the process: change 2.4 km into centimetres by multiplying by 100 000, then divide by the scale factor. Check: $12 \times 20\,000 = 240\,000$ cm, which is 2.4 km.

Answer to Question 3 (4 marks)

a. Two straight lines 3 m from AB, joined at each end by a semicircle of radius 3 m (2)
b. $2 \times 5 + 2\pi \times 3 = 10 + 18.85 =$ **28.8 m** (1 for the formula, 1 for the answer; allow 28.9)

In (a), the boundary is a stadium shape: a common error is to draw a rectangle, forgetting that points beyond the ends of the path lie on circular arcs centred at A and B. In (b), the two semicircles together make one full circle of radius 3 m, with circumference 6π.

Answer to Question 4 (4 marks)

a. Compasses wider than 4.5 cm (1); arcs from P and Q above and below, crossing

(1); join the crossing points with a ruler, leaving arcs (1)

b. Every point is the same distance from P and Q (1)

In (a), the compass width must stay the same for all four arcs, and the construction arcs must be left visible. In (b), this is why the perpendicular bisector is the locus of points equidistant from two points.

Answer to Question 5 (4 marks)

a. Right angle between the legs ($120 - 30 = 90$): $\sqrt{15^2 + 20^2} = \mathbf{25\ km}$ (1 for Pythagoras, 1 for the answer)

b. $\tan^{-1}\left(\frac{20}{15}\right) = 53.1^\circ$ (1), bearing $30 + 53.1 = 83.1 \approx 083^\circ$ (1)

In (a), draw a sketch: the angle between the two legs at the turning point is $180 - (120 - 30)$, which is 90°, since the north lines are parallel. This gives a right-angled triangle with legs 15 and 20 km. In (b), the angle at the start is measured from the first leg, so add it to 030°.