

GCSE MATHS

Scale drawings and bearings

Worked Solutions

Q1

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$$3 \times 50000 = 150000 \text{ cm} = 1.5 \text{ km}$$

Multiply by the scale and convert units.

Q2

★★

$$2 \text{ km} = 200000 \text{ cm}$$

Match the units.

$$200000/25000 = 8 \text{ cm}$$

Divide by the scale factor.

Q3

★★

$$12 \text{ m} = 1200 \text{ cm}$$

Convert before comparing.

$$6 : 1200 = 1 : 200$$

Divide both parts by six.

Q4

★★

$$4(150) = 600 \text{ cm} = 6 \text{ m}$$

Find the actual length.

$$3(150) = 450 \text{ cm} = 4.5 \text{ m}$$

Find the actual width.

$$P = 2(6 + 4.5) = 21 \text{ m}$$

Use both pairs of sides.

Q5

★★

$$600/100 = 6 \text{ cm}$$

Convert the real dimensions to centimetres and divide by 100.

$$400/100 = 4 \text{ cm}$$

Q6

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$$4(200)/100 = 8 \text{ m}$$

Find the real side lengths.

$$3.5(200)/100 = 7 \text{ m}$$

$$A = 8 \times 7 = 56 \text{ m}^2$$

Multiply the actual dimensions.

Q7

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$$090^\circ$$

East is a quarter-turn clockwise from north.

Q8

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$$180^\circ + 45^\circ = 225^\circ$$

South-west lies halfway between south and west.

Q9

★★

$$65^\circ + 180^\circ = 245^\circ$$

Turn through half a circle.

Q10

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$$310^\circ - 180^\circ = 130^\circ$$

Subtract 180° to stay within one turn.**Q11**

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$$115^\circ - 40^\circ = 75^\circ$$

Both bearings start at the same north line.

Q12

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$$\text{Bearing BA} = 230^\circ$$

Reverse the first bearing.

$$\angle ABC = 230^\circ - 140^\circ = 90^\circ$$

Compare the two directions leaving B .**Q13**

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$$AC = \sqrt{8^2 + 6^2} = 10 \text{ km}$$

Use Pythagoras on the perpendicular legs.

Q14

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$$\theta = \tan^{-1} \left(\frac{5}{12} \right) \approx 023^\circ$$

Measure clockwise from north; give the bearing to the nearest degree.

Q15

$$\theta = \tan^{-1} \left(\frac{12}{5} \right) + 180^\circ \approx 247^\circ$$

Measure clockwise from north; give the bearing to the nearest degree.

Q16

$$E = 10 \sin 60^\circ \approx 8.66 \text{ km}$$

The route is 60° east of south. Use the right-angled triangle.

Q17

$$N = 12 \cos 30^\circ \approx 10.39 \text{ km}$$

The northward side is adjacent to the 30° angle.

Q18

(a) $AB = \sqrt{12^2 + 5^2} = 13 \text{ km}$

Use Pythagoras.

(b) $\theta = \tan^{-1}(12/5) \approx 67.38^\circ$

Measure from north.

$$067^\circ$$

Give a three-figure bearing.

Q19

$$N = 8 - 3 = 5$$

$$E = 6$$

Work out the total distance north and the total distance east.

$$d = \sqrt{5^2 + 6^2} \approx 7.81 \text{ km}$$

Use Pythagoras.

Q20

$$\text{Distance north} = 9 - 6 = 3 \text{ km}$$

Subtract the southward part of the route.

$$\theta = \tan^{-1}(4/3) \approx 53^\circ$$

Measure clockwise from north.

Q21

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(a) $N = 20 \cos 60^\circ - 20 \cos 60^\circ = 0$

$$E = 2(20 \sin 60^\circ) \approx 34.64$$

$$d \approx 34.64 \text{ km}$$

(b) bearing 090°

The first journey goes north as far as the second goes south.

Both journeys go the same distance east.

The finish is directly east of the start.

Due east has bearing 090° .

Q22

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$$\text{Reverse first bearing} = 225^\circ$$

$$\text{Interior angle} = 225^\circ - 105^\circ = 120^\circ$$

$$d^2 = 10^2 + 8^2 - 2(10)(8) \cos 120^\circ$$

$$d = \sqrt{244} \approx 15.62 \text{ km}$$

Find the direction back to the start.

Use the angle between the two sides at the turn.

Use the cosine rule.

Take the positive square root.

Q23

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$$\angle A = 60^\circ$$

$$\angle B = 60^\circ$$

$$\angle C = 60^\circ$$

$$AC = 12 \text{ km}$$

Convert the bearings to internal angles.

The triangle is equilateral.

All its sides are equal.

Q24

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(a) $\angle A = \angle B = 50^\circ$

$$\angle C = 80^\circ$$

$$AC = \frac{8 \sin 50^\circ}{\sin 80^\circ} \approx 6.22 \text{ km}$$

(b) $h = 4 \tan 50^\circ \approx 4.77 \text{ km}$

Find the triangle angles.

Use the sine rule.

The perpendicular bisects the base; use one half-triangle.