Test answers - Similarity and congruence

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

Answer to Question 1 (4 marks)

a. $\frac{15}{6} = 2.5$ **2.5** (1) Divide the corresponding sides: the second length divided by the first, $15 \div 6$.

b. $8 \times 2.5 = 20$ **20 cm** (1) Multiply the other side of the first rectangle by the scale factor 2.5.

c. $2.5^2 = 6.25$, so $1 : 6.25$ or $4 : 25$ (2) The area scale factor is the square of the length scale factor. Check: $6 \times 8 = 48$ and $15 \times 20 = 300$, and $\frac{300}{48} = 6.25$.

In (c), $1 : 6.25$ is the same as $4 : 25$ after multiplying both parts by 4.

Answer to Question 2 (4 marks)

a. Equal corresponding angles (parallel lines) and a common angle at A (1) Because DE is parallel to BC, angle ADE = angle ABC and angle AED = angle ACB (corresponding angles), so the triangles have equal angles.

b. $AB = 8$, scale factor $\frac{8}{3}$ (1), $BC = 4.5 \times \frac{8}{3}$ (1) = **12 cm** (1)

$AB = AD + DB = 3 + 5$, so the scale factor from ADE to ABC is $\frac{AB}{AD} = \frac{8}{3}$. Multiply DE by this factor.

Answer to Question 3 (4 marks)

a. Area factor $\frac{25}{9}$ (1); $90 \times \frac{25}{9} =$ **250 cm²** (1) The area scale factor is the square of the length ratio: $\left(\frac{5}{3}\right)^2$. Multiply because we go from small to large.

b. Volume factor $\frac{125}{27}$ (1); $108 \times \frac{125}{27} =$ **500 cm³** (1) The volume scale factor is the cube of the length ratio: $\left(\frac{5}{3}\right)^3$.

A common error is to multiply by the length factor $\frac{5}{3}$ for both parts, which gives 150 cm² and 180 cm³ and scores no accuracy marks.

Answer to Question 4 (4 marks)

a. Triangles AMD and BMC: $AM = BM$ (M is the midpoint) (1); angle A = angle $B = 90^\circ$ (1); $AD = BC$ (opposite sides of a rectangle) (1). So they are congruent

by SAS, giving $MD = MC$ (1).

Congruent triangles have all corresponding sides equal, so the third sides MD and MC are equal. Each statement in the proof must have its reason. The condition used is SAS: two sides and the angle between them. Writing only that the diagram looks symmetrical scores no marks; the proof must name the pair of triangles.

Answer to Question 5 (4 marks)

a. $30 \times 12 = 360$ cm $=$ **3.6 m** (1) Real lengths are 12 times the model lengths. Change 360 cm into metres by dividing by 100.
b. Volume factor $12^3 = 1728$ (1); $2 \times 1728 =$ **3 456 litres** (2) Capacity is a volume, so it scales with the cube of the length scale factor.

A common error in (b) is to multiply 2 litres by 12, giving 24 litres, or by $12^2 = 144$.