

Oxford Revise | Edexcel GCSE Maths Higher | Answers

Chapter 22 Similarity and congruence

Question	Answer	Extra information	Marks
22.1 (a)	$DF = 24$ cm		1
22.1 (b)	$CAB = 75^\circ$		1
22.2	$\angle DCE = \angle ACB$ (opposite angles) $\angle DEC = \angle CAB$ (alternate interior angles) $\angle EDC = \angle ABC$ (alternate interior angles) $AB = DE$ is given Thus, by ASA, the triangles are congruent.	$\angle DCE = \angle ACB$ $\angle DEC = \angle CAB$ $\angle EDC = \angle ABC$ Use of ASA test for congruency	1 1 1 1
22.3	$AB = DC$ (opposite sides of a parallelogram) Angle $FEH =$ angle FGH (diagonally opposite angles of a rhombus) Angle $GAB =$ angle CJB (corresponding angles) and angle $CJB =$ angle DCE (alternate angles) Therefore, angle $GAB =$ angle DCE Triangles ABG and CDE are congruent because of AAS (Angle Angle Side).	$AB = DC$ with reason Angle $FEH =$ angle FGH with reason Angle $GAB =$ angle DCE with reason(s) or for angle $EDC =$ angle GBA with reason(s) All three conditions stated with reasons, along with conclusion e.g. AAS or ASA.	1 1 1 1
22.4	The ratio of corresponding sides is 1.5 for all three pairs: $\frac{19.5}{13} = \frac{18}{12} = \frac{7.5}{5} = 1.5$ Therefore, the triangles are similar.	Comparing at least two pairs of sides Scale factor of 1.5 with conclusion	1 1

Question	Answer	Extra information	Marks
22.5	$\frac{AC}{AB} = \frac{AD}{AE}$ $\frac{11.5}{9.2} = \frac{AD}{8.4}$ $AD = \frac{8.4 \times 11.5}{9.2} = 10.5$ $ED = AD - AE = 10.5 - 8.4 = 2.1 \text{ cm}$	<p>Comparing ratios of two pairs of sides Correct answer of 2.1 cm</p>	<p>1 1</p>
22.6	<p>Length scale factor = $22 \div 10 = 2.2$ Therefore, volume scale factor = $2.2^3 = 10.648$ Mass is proportional to volume. Mass of B = $1.5 \times 10.648 = 15.972 \text{ kg}$</p>	<p>Length scale factor of 2.2 Volume (or mass) scale factor of 10.648 Correct final answer</p>	<p>1 1 1</p>
22.7	<p>Area scale factor = $50 \div 12.5 = 4$ Therefore, length scale factor = $\sqrt{4} = 2$ Base length of shape B = $4 \times 2 = 8 \text{ cm}$</p>	<p>$50 \div 12.5 = 4$ Length scale factor = $\sqrt{4} = 2$ Correct final answer</p>	<p>1 1 1</p>
22.8	<p>Volume scale factor = $675 \div 25 = 27$ Therefore, the length scale factor = $\sqrt[3]{27} = 3$ This makes the surface area scale factor $3^2 = 9$ Smaller solid's surface area = $360 \div 9 = 40 \text{ cm}^2$</p>	<p>Length scale factor = $\sqrt[3]{27} = 3$ Surface area scale factor $3^2 = 9$ Correct final answer</p>	<p>1 1 1</p>

Question	Answer	Extra information	Marks
22.9	$80 \times 0.75 = 60$, and $120 \times 0.75 = 90$ Medium trapezoid has height $0.75h$, and parallel sides of length 60 and 90 Area of medium trapezium: $\frac{1}{2} \times (60 + 90) \times 0.75h = 56.25h$ $0.75h \times 0.5 = 0.375h$ $60 \times 0.5 = 30$ $90 \times 0.5 = 45$ Small trapezium has height $0.375h$ and parallel sides of length 30 and 45 Area of small trapezium: $\frac{1}{2} \times (30 + 45) \times 0.375h = 14.0625h$ $56.25h - 14.0625h = 4050$ $42.1875h = 4050$ $h = 96 \text{ cm}$	$0.75h$ or 60 or 90 $0.5 \times 0.75h$ or 0.5×60 , or 0.5×90 Attempt to use trapezium area formula Subtracting small from medium area Correct final answer	1 1 1 1 1

Question	Answer	Extra information	Marks
22.10	<p>Let the height of the portion of the cone that was cut off be h.</p> $\frac{24}{18} = \frac{36+h}{h}$ <p>since the cones are similar</p> $24h = 648 + 18h$ $h = 108 \text{ mm}$ <p>Radius of large cone = $24 \div 2 = 12$</p> <p>Radius of small cone = $18 \div 2 = 9$</p> <p>Volume of large cone = $\frac{1}{3}\pi \times 12^2 \times (36 + 108) = 6912\pi$</p> <p>Volume of small cone =</p> $\frac{1}{3}\pi \times 9^2 \times 108 = 2916\pi$ <p>Volume of frustum</p> $= 6912\pi - 2916\pi = 3996\pi \text{ mm}^3$	<p>Attempt to find h by equating ratios of corresponding lengths</p> <p>Solving to find h</p> <p>Using your value of h to find the volume of either the small cone or the large cone</p> <p>Finding both volumes and subtracting</p> <p>Correct final answer in terms of π.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
22.11	<p>$B = 1.2A$</p> <p>$B = 0.4C$</p> <p>So, $1.2A = 0.4C$</p> $A = \frac{0.4}{1.2}C = \frac{1}{3}C$	<p>$B = 1.2A$ or $B = 0.4C$</p> <p>Equates answers</p> <p>Correct answer in simplest form</p>	<p>1</p> <p>1</p> <p>1</p>
22.12	<p>Volume ratio = $125 : 8$</p> <p>Length ratio = $\sqrt[3]{125} : \sqrt[3]{8} = 5 : 2$</p> <p>Area ratio = $5^2 : 2^2 = 25 : 4$</p> <p>Surface area of $J = 460 \div 4 \times 25 = 2875 \text{ cm}^3$</p>	<p>Cube roots the volume ratio</p> <p>Squares this answer</p> <p>Correct calculation</p> <p>Correct final answer, showing all working</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>

Question	Answer	Extra information	Marks
22.13	<p>Create triangle CAD, by introducing point D, the midpoint of AB. The base of triangle CAD is thus 3 cm</p> $\cos CAB = \frac{3}{15}$ $CAB = 78.5^\circ \text{ (1 dp)}$	<p>Create triangle CAD Use the cosine ratio Find the angle to 1 dp</p>	<p>1 1 1</p>
22.14	<p>Let the width be w. Then the length is $2w$ Area = length \times width = $w \times 2w = 2w^2$ $2w^2 = 20$ $w^2 = 10$ $w = \sqrt{10}$ Therefore, the length = $2\sqrt{10}$ cm</p>	<p>Attributing variables to the length and width Using the area formula Solving for the width Correct final answer for the length</p>	<p>1 1 1 1</p>