

Similar shapes

Foundation and Higher tiers | Total marks: 63

Marks

- M** Method mark, for a correct method. It can be implied by a correct answer.
- A** Accuracy mark, for a correct answer. It needs the method mark before it.
- B** A mark for a correct value or statement, with or without working.
- ft** Follow through: the mark is given for using an earlier wrong answer correctly.
- oe** Or equivalent.
- [a, b]** Any value from a to b inclusive.

Questions

Q	Skill	Spec	Tier	Grade	Calculator	Marks
1	Recognise similar rectangles	G7	Foundation	3	No	1
2	Lengths in similar triangles	G19	Common	4	No	4
3	Perimeters of similar shapes	R12 G19	Common	5	No	2
4	Similar triangles in context	G19 R12	Common	5	No	3
5	Similar triangles: a decision with angles	G19 G6	Common	5	No	2
6	Similar triangles that are not parallel	G19	Common	6	No	3
7	Prove triangles similar	G6 G19	Common	7	No	5
8	Areas of similar shapes	G19	Higher	7	No	2
9	Volumes of similar shapes: a two-step change	G19	Higher	8	No	4
10	From an area scale factor to a volume	G19	Higher	8	No	3
11	Areas of similar triangles, in reverse	G19 R12	Higher	8	No	3
12	Similar triangles with parallel lines	G19	Common	5	Yes	3
13	Similar triangles in a crossed shape	G19	Common	6	Yes	3
14	Volumes of similar shapes: find a length	G19	Higher	7	Yes	3
15	Areas on a map	G19 R2	Higher	7	Yes	3
16	Similar solids: percentage changes	G19 R12	Higher	8	Yes	4

Q	Skill	Spec	Tier	Grade	Calculator	Marks
17	Volume of a frustum with similar cones	G19 G17 N13	Common	8	Yes	5
18	Similar solids: mass, surface area and height	G19	Higher	9	Yes	5
19	Similar solids: cutting a volume in half	G19	Higher	9	Yes	5
	Total					63

Question 1 G7 · Foundation · Grade 3 · 1 mark

Q	Answer	Mark	Comments
1	6 cm by 9 cm	B1	

Question 2 G19 · Common · Grade 4 · 4 marks

Q	Answer	Mark	Comments
2(a)	$9 \div 6$ or 1.5 or $7 \times \frac{9}{6}$	M1	oe, a scale factor
	10.5	A1	
2(b)	$15 \div 1.5$ or $15 \times \frac{6}{9}$	M1	oe, ft their scale factor
	10	A1	

Question 3 R12 G19 · Common · Grade 5 · 2 marks

Q	Answer	Mark	Comments
3	$18 \div 2 \times 5$ or 18×2.5	M1	oe
	45	A1	

Question 4 G19 R12 · Common · Grade 5 · 3 marks

Q	Answer	Mark	Comments
4	$30 \div 6$ or 5	M1	a scale factor
	18×5 or 90	M1	oe, in centimetres
	0.9	A1	

Question 5 G19 G6 · Common · Grade 5 · 2 marks

Q	Answer	Mark	Comments
5	71° for the third angle of P or 61° for the third angle of Q	B1	
	Yes, all three angles are the same in both	B1	dep on B1

Question 6 G19 · Common · Grade 6 · 3 marks

Q	Answer	Mark	Comments
6	AC = 8	M1	
	$\frac{AB}{8} = \frac{5}{4}$ or AB = 10	M1	oe, triangles ADE and ACB matched correctly
	6	A1	

Question 7 G6 G19 · Common · Grade 7 · 5 marks

Q	Answer	Mark	Comments
7(a)	angle BAX = angle DCX, alternate angles	B1	or angle ABX = angle CDX, alternate angles
	angle AXB = angle CXD, vertically opposite angles	B1	or a second pair of alternate angles
	all three angles equal so the triangles are similar	B1	a full proof with all reasons
7(b)	$\frac{AX}{XC} = \frac{6}{15}$ or $14 \times \frac{6}{21}$ or $AX : XC = 2 : 5$	M1	oe
	4	A1	

Question 8 G19 · Higher · Grade 7 · 2 marks

Q	Answer	Mark	Comments
8	$(\frac{15}{10})^2$ or 1.5^2 or 2.25	M1	oe
	540	A1	

Question 9 G19 · Higher · Grade 8 · 4 marks

Q	Answer	Mark	Comments
9	$(\frac{3}{4})^3$ or $\frac{27}{64}$	M1	oe, the first amount of water as a fraction of a full glass
	$(\frac{1}{2})^3$ or $\frac{1}{8}$ or $\frac{8}{64}$	M1	oe, the water left
	$(\frac{27}{64} - \frac{8}{64}) \div \frac{27}{64}$	M1	oe, or $1 - (\frac{2}{3})^3$ using the two depths directly
	$\frac{19}{27}$	A1	oe

Question 10 G19 · Higher · Grade 8 · 3 marks

Q	Answer	Mark	Comments
10	$\frac{180}{45}$ or 4	M1	an area scale factor
	$\sqrt{4}$ or 2 and 2^3 or 8	M1	a length scale factor, then the volume scale factor
	480	A1	

Question 11 G19 R12 · Higher · Grade 8 · 3 marks

Q	Answer	Mark	Comments
11	$(\frac{2}{5})^2$ or $\frac{4}{25}$ or 4 : 25	M1	oe, the ratio of the areas of ADE and ABC
	$63 \div (25 - 4)$ or $63 \div 21$ or 3	M1	oe
	12	A1	

Question 12 G19 · Common · Grade 5 · 3 marks

Q	Answer	Mark	Comments
12	$AB = 4.2 + 2.8$ or 7	M1	
	$\frac{7}{4.2}$ or 1.66... or $5.1 \times \frac{7}{4.2}$	M1	oe, a scale factor, ft their AB
	8.5	A1	

Question 13 G19 · Common · Grade 6 · 3 marks

Q	Answer	Mark	Comments
13	$\frac{45}{32}$ or $\frac{32}{45}$ or $32 + 45 = 77$	M1	oe, triangles ABC and EDC are similar
	$58 \times \frac{45}{77}$	M1	oe, or $\frac{h}{58-h} = \frac{45}{32}$
	33.9	A1	accept 33.9 or [33.89, 33.90]

Question 14 G19 · Higher · Grade 7 · 3 marks

Q	Answer	Mark	Comments
14	1.2 litres = 1200 ml or $\frac{1200}{330}$ or 3.63...	M1	oe, a volume scale factor
	$\sqrt[3]{(\frac{1200}{330})}$ or 1.53...	M1	oe, a length scale factor
	18.5	A1	accept 18.5 or [18.45, 18.46]

Question 15 G19 R2 · Higher · Grade 7 · 3 marks

Q	Answer	Mark	Comments
15	$35\,000^2$ or 1 cm represents 0.35 km	M1	oe, an area scale factor or a length in km
	9.42×0.35^2 or $9.42 \times 35\,000^2 \div 100\,000^2$	M1	oe, a correct method in km^2
	1.15	A1	accept 1.15 or [1.153, 1.154]

Question 16 G19 R12 · Higher · Grade 8 · 4 marks

Q	Answer	Mark	Comments
16(a)	1.2^2 or 1.44	M1	oe
	44	A1	
16(b)	1.2^3 or 1.728	M1	oe, the mass is in the same ratio as the volume
	No and 72.8%	A1	or No and 1.728 compared with 1.6

Question 17 G19 G17 N13 · Common · Grade 8 · 5 marks

Q	Answer	Mark	Comments
17	$\frac{x}{9} = \frac{x+24}{15}$ or $x = 36$ or a large cone of height 60	M1	oe, the height of the small cone
	$\frac{1}{3} \times \pi \times 15^2 \times 60 - \frac{1}{3} \times \pi \times 9^2 \times 36$	M1	oe, ft their heights
	11 083.5...	A1	3528π , accept [11 080, 11 090]
	their 11 084... $\times 4 \div 1000 \div 15$	M1	oe, 44.33... litres
	3	A1	from correct working

Question 18 G19 · Higher · Grade 9 · 5 marks

Q	Answer	Mark	Comments
18(a)	$\frac{42}{18}$ or $\frac{18}{42}$ or 2.333...	M1	oe, the volume scale factor
	$600 \div (\sqrt[3]{\frac{42}{18}})^2$ or $600 \times (\frac{18}{42})^{\frac{2}{3}}$	M1	oe, the area scale factor 1.759... used
	341	A1	accept [340, 342]
18(b)	$1.326...h - h = 24$ or $24 \div (\sqrt[3]{\frac{42}{18}} - 1)$	M1	oe, the length scale factor used with the difference
	73.5	A1	accept [73.4, 73.6]

Question 19 G19 · Higher · Grade 9 · 5 marks

Q	Answer	Mark	Comments
19(a)	the top piece is a pyramid similar to the whole with $\frac{1}{2}$ of its volume	M1	oe, a volume scale factor of $\frac{1}{2}$ or 2
	$\sqrt[3]{\frac{1}{2}}$ or 0.7937... or $9 \times \sqrt[3]{\frac{1}{2}} = 7.14...$	M1	oe, the length scale factor or the height of the top piece
	1.86	A1	accept 1.86 or [1.856, 1.857]
19(b)	$(\sqrt[3]{\frac{1}{2}})^2$ or 0.63 and $1 - 0.63$ or 0.37	M1	oe, the sloping faces of the bottom piece are the whole faces less the top ones
	1.70 : 1	A1	accept [1.70, 1.71] : 1