Volume and Area Answers - Calculator

1.

25.9	P1	for process to find volume of hemisphere, eg $\frac{1}{2}\times\frac{4}{3}\times\pi\times3.5^3$ (=89.797…) $\left(\frac{343\pi}{12}\right)$ **or** for a correct expression for the volume of the cone, eg $\frac{1}{3}\times\pi\times3.5^2(y-3.5)$ or $\frac{1}{3}\times\pi\times3.5^2\times h$
	P1	for setting up an equation linking all three aspects, eg $\frac{1}{2}\times\frac{4}{3}\times\pi\times3.5^3+\frac{1}{3}\times\pi\times3.5^2(y-3.5)=120\pi$ **or** "89.797…" + "12.828…"$(y-3.5)$ = "376.99 …" **or** "28.5833…" π + "4.0833..." $\pi(y-3.5)=120\pi$
	P1	for process to isolate y or $(y-3.5)$ or h in their equation, eg $\frac{120\pi-\frac{1}{2}\times\frac{4}{3}\pi3.5^3+\frac{1}{3}\pi3.5^3}{\frac{1}{3}\pi3.5^2}$ **or** $\frac{\text{"376.99..."}-\text{"89.797..."}+\text{"44.898..."}}{\text{"12.828..."}}$ **or** $\frac{120\pi-\text{"28.583..."}\pi+\text{"14.291..."}\pi}{\text{"4.083..."}\pi}$ oe
	A1	for answer in range 25.8 to 26.3 SCB3 for an answer in the range 22.3 to 22.8 or $\frac{1097}{49}$

explanation	C1	for explanation, eg **Acceptable examples** the height would decrease the height would be 0 at 14.227 y would be smaller it would decrease **Not acceptable examples** the height would increase

2.

160π	P1	for process to find curved surface area of cone, eg $\pi \times 10 \times 25$ (= 250π) (= 785…..)
	P1	for process to find the radius or diameter of the smaller cone eg $10 \times \frac{15}{25}$ (= 6) **or** $20 \times \frac{15}{25}$ (= 12) oe **OR** uses area scale factor, eg "250π" $\times \left(\frac{15}{25}\right)^2$ (= 90π)
	P1	for a complete process, eg "250π" – $\pi \times$ "6" $\times$ 15 (= 785… – 282…) **or** answer in range 502 to 503
	A1	for 160π

3.

Answer	Mark	Mark scheme
2820	P1	for start to process to find height of triangle, eg $\tan(40) = \frac{h}{5}$ oe **or** equivalent process to find the height of the triangle **or** start to process to find slant height, eg $\frac{10}{\sin 100} = \frac{x}{\sin 40}$
	P1	for complete process to find height of triangle, eg 5tan 40 (= 4.19...) **or** complete process to find the slant height, eg $\frac{10}{\sin 100} \times \sin 40$ (= 6.5...)
	P1	for start of process to find volume of prism, eg 10 × 20 × 12 (= 2400) or 0.5 × 10 × "4.19..."× 20 (= 419....) or $\frac{1}{2}$ × 10 ×"6.52..." ×sin 40 × 20 (419....) **or** process to find total area of cross section, eg 0.5 × 10 × "4.19..." + 10 × 12 (= 140.9...) or $\frac{1}{2}$ × "6.52..." ×"6.52..." × sin 100 + 10 × 12 (= 140.9...)
	P1	for complete process to find total volume, eg (0.5 × 10 × "4.19..." + 10 × 12) × 20
	A1	for an answer in the range 2810 to 2820

4.

8	P1	for working with volume of the cuboid, eg $30 \times 6 \times 19$ (= 3420) **OR** for using $\frac{2}{3}$ with one dimension, eg. $30 \times 2 \div 3$ (= 20)
	P1	for "3420" × 2 ÷ 3 (= 2280) **or** "3420" ÷ 3 (= 1140) **OR** "20" × 6 × 19 (= 2280) **OR** "3420" ÷ 275 (= 12.4… = 12 cups)
	P1	(dep on P2) for "2280" ÷ 275 (= 8(.29...)) **or** "1140" ÷ 275 (= 4(.14...)) **OR** "12" × 2 ÷ 3 **OR** for 275 × 8 (= 2200) **or** 275 × 9 (= 2475)
	A1	cao

5.

Answer	Mark	Mark scheme
3.75	P1	works to find vol of frustum eg $1/3\pi(3.6)^2\times6.4 - 1/3\pi(1.8)^2\times3.2$ or 86.858.. − 10.857… (=24.192π or 76.00..)
	P1	works to find vol of hemisphere eg $\frac{1}{2}\times\frac{4}{3}\pi\times3.6^3$ (=31.104π or 97.7....)
	P1	mass of frustum as [vol]×density eg "76.00" × 2.4 (=182.4..) **or** mass of hemisphere as [vol]×density eg "97.7...."×4.8 (=469.037...)
	P1	mean density as total mass ÷ total volume eg ("182.4.." + "469.037") ÷ ("76…" + "97.7..") or "651.4..". ÷ "173.7...."
	A1	answer in the range 3.7 to 3.8

6.

8	P1	process to start the problem eg $xy = 45$ **and** $xz = 15$ **and** $yz = 27$ **or** 5×9 (=45) **and** 3×9 (=27) **and** 3×5 (=15) **or** 3, 5 and 9 stated
	P1	for $3 \times 5 \times 9$ (=135) **or** 2 of "9" ÷ 2.5 (=3.6) **or** "5" ÷ 2.5 (=2) **or** "3" ÷ 2.5 (=1.2)
	P1	for 2.5^3 (=15.625) **or** all of "9" ÷ 2.5 (=3.6) **and** "5" ÷ 2.5 (=2) **and** "3" ÷ 2.5 (=1.2)
	P1	for a complete process to find the number of cubes possible eg [volume] ÷ "15.625" (=8.64) **or** "3.6" × "2" × "1.2" (=8.64)
	A1	cao

7.

Answer	Mark	Mark scheme
905	P1	for correct use of formula for the volume of a sphere eg $\frac{1}{4} \times \frac{4}{3} \times \pi \times r^3$ (= 576π or 1809…) **OR** $576\pi \times 4$ **or** 2304π **or** 7238…($=\frac{4}{3} \times \pi \times r^3$)
	P1	for a complete correct process to find r, eg $r = \sqrt[3]{\frac{576 \times 4 \times 3}{4}}$ **or** $r = 12$
	P1	for a process to find the curved surface area eg $\frac{4 \times \pi \times [radius]^2}{4}$ (=144π or 452…) **OR** the surface area of both flat surfaces eg $(2 \times \frac{\pi \times [radius]^2}{2})$ **OR** complete expression for the total surface area eg $\frac{4\pi r^2}{4} + \frac{\pi r^2}{2} \times 2$ oe
	P1	for process to find the complete surface area eg $\frac{4 \times \pi \times [radius]^2}{4} + (2 \times \frac{\pi \times [radius]^2}{2})$
	A1	answer in the range 904.7 – 905 or 288π (SCB2 for an answer in the range 358.1 – 359.2)

8.

36.4	P1	start process eg method to find area of trapezium
	P1	complete process to find volume of tank
	P1	process to find time eg volume × 1000 ÷ 300
	P1	process to find 85% of volume or of time
	A1	for 36.4 or 36 mins 24 secs
	C1	explanation eg if the average rate was slower it would take more time, if the average rate was faster it would take less time

9.

$l = 20x$ $x = 3$	20736	P1 for a first step to solve the problem eg method to find the slant height of the cone or the volume equals $768\pi x^3$ P1 for setting up an equation for the curved surface area in terms of x eg $2160\pi = \pi \times 12x \times 20x$ P1 for complete method to find the value of x P1 for a method to find the volume or value of V A1 cao

10.

1361	P1	process using similar triangles to find base of small cone eg. 4 cm used as diameter or 2 cm used as radius
	P1	process to find volume of one cone
	P1	complete process to find volume of frustum
	P1	complete process to find mass or 1360 – 1362
	A1	1361 or 1360 or 1400