Key 2018

Volume of Prisms and Pyramids Homework

1. *Application* A cord of firewood is 128 cubic feet. Margaretta has three storage boxes for firewood that each measure 2 feet by 3 feet by 4 feet. Does she have enough space to order a full cord of firewood? A half cord? A quarter cord? Explain.

3 of these

$V = (2 \cdot 3 \cdot 4)3$

$\boxed{V = 72 ft^3}$

Not enough to fit a full cord @ $128 ft^3$ but it has enough for a ½ and quarter.

2. Mount Rainier, which is an active volcano in Washington, is 4.392 km tall and about 18 km across its base. Assume that it can be modeled by a cone. Find the volume of rock it would take to fill Mt. Rainier.

$r = 9 km$

$H = 4.392$

$V = \frac{1}{3}\pi 9^2 \cdot 4.392$

$V \approx 372.5 km^3$

3. The Great Pyramid of Khufu is a square pyramid. The lengths of the sides of the base are 755 feet. The original height was 481 feet. The current height is 449 feet. What volume of material has been lost?

$V = \frac{1}{3} 755 \cdot 755 \times 481$

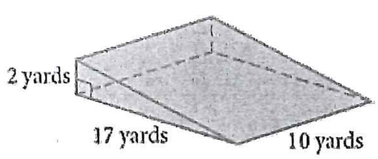
$V = 91,394,008.3 ft^3$ ← original

$V = \frac{1}{3} 755 \times 755 \cdot 449$

$V = 85313741.7 ft^3$ ← current

$\boxed{\therefore \text{Lost } 6,080,266.6 ft^3}$

4. *Application* A contractor needs to build a ramp, as shown at right, from the street to the front of a garage door. How many cubic yards of fill will she need?



B · H

$V = \left(\frac{1}{2} 17 \cdot 2\right)10$

$V = 170 yd^3$

TUNNELS For Exercises 5 and 6, use the following information.

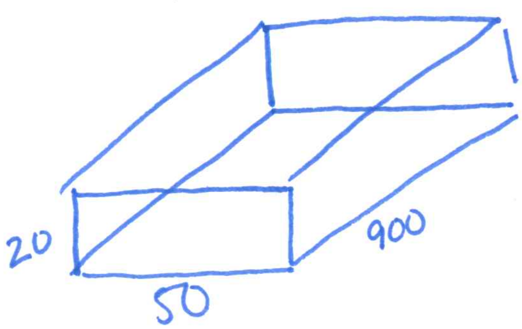
Construction workers are digging a tunnel through a mountain. The space inside the tunnel is going to be shaped like a rectangular prism. The mouth of the tunnel will be a rectangle 20 feet high and 50 feet wide and the length of the tunnel will be 900 feet.

5. What will the volume of the tunnel be?

6. If instead of a rectangular shape, the tunnel had a semicircular shape with a 50-foot diameter, what would be its volume? Round your answer to the nearest cubic foot.

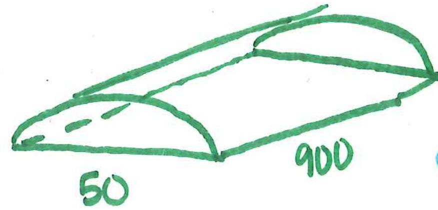
$V = 20 \cdot 50 \cdot 900$

$\boxed{V = 900,000 ft^3}$



$V = \frac{1}{2}\pi 25^2 \cdot 900$

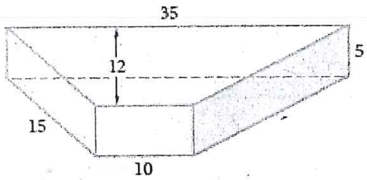
$\boxed{V = 883,573.0 ft^3}$



The prism

Directions: Find the Surface Area and Volume of the following figures. Round to the nearest tenth.

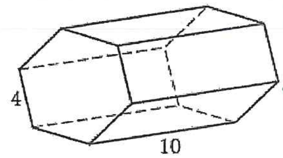
7.



$SA = 2\left(\frac{1}{2}12(35+10)\right)$
$+ 5 \cdot 20$
$+ 35 \cdot 5$
$+ 5 \cdot 15$
$+ 10 \cdot 5$
$SA = 940 \text{units}^2$

$B = \frac{1}{2}12(35+10)$
$V = B \cdot H$
$V = \frac{1}{2}12(35+10) \cdot 5$ $V = 1350 \text{units}^3$

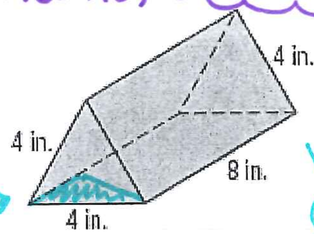
8.



$B = 6\frac{1}{2}4^2\sin(60)$
$V = 6\frac{1}{2}4^2\sin(60)10$
$V = 415.7 \text{units}^3$

$SA = 2\left(6\frac{1}{2}4^2\sin(60)\right)$
$+ 6(4 \times 10)$
$SA \approx 323.1 \text{units}^2$

9.

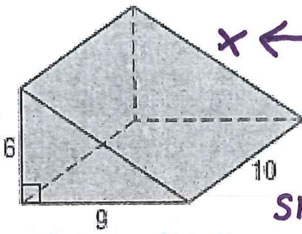


$B = \frac{1}{2}4 \cdot 4\sin(60)$
$V = \frac{1}{2}4 \cdot 4\sin(60) \cdot 8$
$V = 55.2 \text{in}^3$

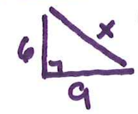
I used Full Δ not this central angle Δ.

$SA = 2 \cdot \frac{1}{2}4 \cdot 4\sin(60)$
$+ 3(4 \cdot 8)$
$SA = 109.9 \text{in}^2$

10.



$x \leftarrow$ Find 1st

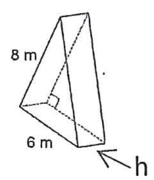


$6^2 + 9^2 = x^2$
$\boxed{x = 3\sqrt{13}}$

$V = B \cdot H$
$B = \frac{1}{2}6 \cdot 9$
$V = \frac{1}{2}6 \cdot 9 \cdot 10$
$V = 270 \text{units}^3$

$SA = 2\left(\frac{1}{2}6 \cdot 9\right)$
$+ 10 \cdot 9$
$+ 10 \cdot 6$
$+ 10 \cdot 3\sqrt{13}$
$SA \approx 312.2 \text{units}^2$

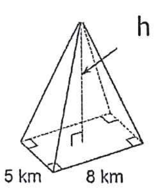
11. The volume of a triangular prism is $96m^3$. The prism has a right triangle base with legs of 8 meters and 6 meters. Find the height of the prism.



$V = B \cdot H$
$V = 96$
$B = \frac{1}{2}6 \cdot 8$
$H = ?$

$96 = \frac{1}{2}6 \cdot 8 \cdot H$
$96 = 24H$
$4m = H$

12. The volume of the rectangular pyramid has a volume of about 146.67 km^3. The base of the pyramid is a rectangle that is 5 km by 8 km. Find the height of the pyramid.



$V = \frac{1}{3}B \cdot H$
$B = 5 \cdot 8$
$H = h?$
$V = 146.67$

$146.67 = \frac{1}{3}(5 \cdot 8)H$
$146.67 = 13.3H$
$11.0 km = H$

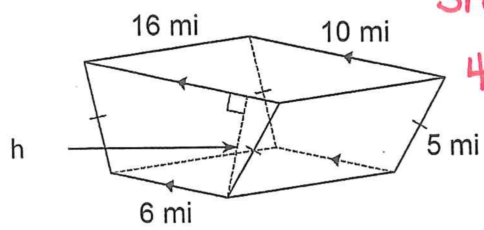
13. The volume of a rectangular prism is 1152 cubic inches and the area of the base is 64 square inches. Find the height of the prism.

$V = 1152$
$B = 64$
$H = H$

$V = B \cdot H$

$1152 = 64H$
$18 in = H$

14. The surface area of the trapezoidal prism is 489.6 mi^2. Find the missing length below.



SA = 2 traps + top + bottom + 2 faces

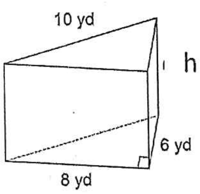
$489.6 = 2(\frac{1}{2}h(10+6)) + 10 \cdot 16 + 6 \cdot 16 + 2(5 \cdot 16)$

$489.6 = h \cdot 16 + 416$

$73.6 = 16h$

4.6mi = h

15. The volume of a triangular prism is 144 yd^3. The prism has a right triangle base with legs of 8 meters and 6 meters. Find the height of the prism.



$V = B \cdot H$

$V = 144$

$H = h$

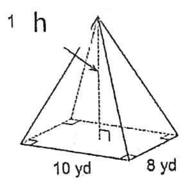
$B = \frac{1}{2} 6 \cdot 8$

$144 = \frac{1}{2} \cdot 6 \cdot 8H$

$144 = 24H$

$\boxed{6yd = H}$

16. The volume of the rectangular pyramid has a volume of about 266.67 yd^3. The base of the pyramid is a rectangle that is 10 km by 8 km. Find the height of the pyramid.



$V = \frac{1}{3} B \cdot H$

$B = 10 \cdot 8$

$H = H$

$V = 266.67$

$266.67 = \frac{1}{3} 10 \cdot 8H$

10yd = H

17. The volume of a rectangular pyramid is 84 in^3 and the area of the base is 12 in^2. Find the height of the pyramid.

$V = \frac{1}{3} B \cdot H$

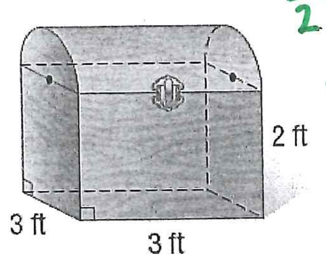
$B = 12$

$H = ?$

$84 = \frac{1}{3} 12 \cdot H$

21in = H

18. **BUILDING** Manny is building a blanket chest for his sister. His design is a composite of a square prism and half of a cylinder. What is the volume of the hope chest?



Volume:

$\frac{1}{2}$ cylinder: $\frac{1}{2}\pi 1.5^2 \cdot 3$

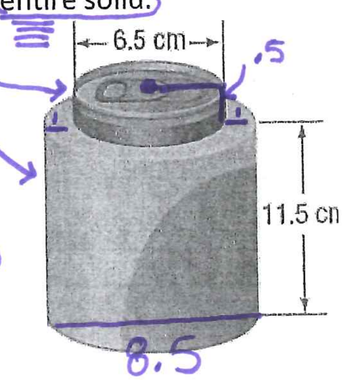
+ +

Prism: $3 \cdot 3 \cdot 2$

$V \approx 28.6ft^3$

19. If a can is 12 cm tall and fits in the holder which has 1cm thickness, what is the volume of the entire solid.

Different than text-book question!



$V = B \cdot H + B \cdot H$

$= \pi 4.25^2 \cdot 11.5 +$

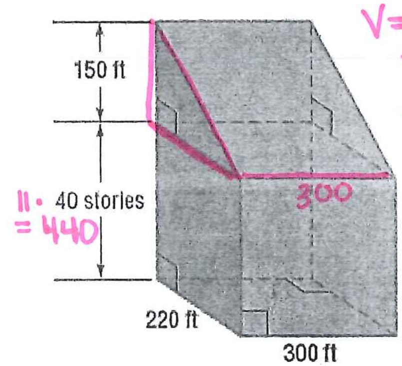
$+ \pi 3.25^2 \cdot .5$

$V = 669.2cm3$

20. **CHALLENGE** A 40-story building is a rectangular prism with a length of 300 feet and a width of 220 feet. On top of the rectangular prism is a triangular prism the base of which has a height of 150 feet and a base of 220 feet. If each story is 11 feet, find the volume of the building.

$V = \Delta \text{ prism} \left(\frac{1}{2} 220 \cdot 150\right) \cdot 300 + \square \text{ prism} + 220 \cdot 300 \cdot 440$

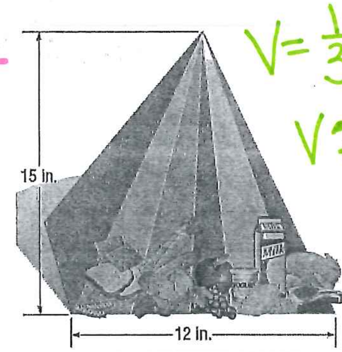
$V \approx 33{,}990{,}000 \text{ ft}^3$



21. **NUTRITION** Rebeca is making a plaster model of the Food Guide Pyramid for a class presentation. The model is a square pyramid with a base edge of 12 inches and a height of 15 inches. Find the volume of plaster needed to make the model.

$V = \frac{1}{3} 12 \cdot 12 \cdot 15$

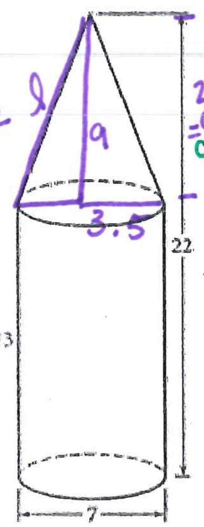
$V \approx 1080 \text{ in}^3$



Composite Figures Practice

Find the surface area and volume for the following solids. Round to the nearest tenth if needed.

22.



$3.5^2 + 9^2 = \ell^2$

$9.7 = \ell$

$22 - 13 = 9 = H$

$9 = h$

$H = 13$

$SA = \cancel{2}\pi r^2 + 2\pi r H + \cancel{\pi r^2} + \pi r \ell$

Not on surface of figure

$SA = \pi\, 3.5^2 + 2\pi(3.5)13 + \pi(3.5)(9.7)$

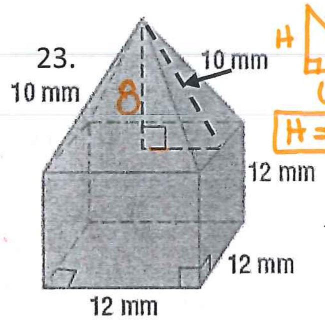
$SA = 431.0 \text{ units}^2$

$V = \frac{1}{3}\pi r^2 \cdot h + \pi r^2 \cdot H$

$V = \frac{1}{3}\pi(3.5)^2 \cdot 9 + \pi(3.5)^2 \cdot 13$

$V \approx 615.8 \text{ units}^3$

23.



H, 10, 6

$H = 8$

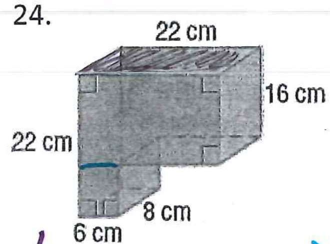
$SA = 5(12 \times 12) + 4\frac{1}{2} 12 \cdot 10$ No top Face on Surface

$SA = 960 \text{ mm}^2$

$V = \frac{1}{3}(12 \cdot 12) 8$ pyramid $+ (12 \cdot 12) 12$ prism

$V = 2112 \text{ mm}^3$

24.



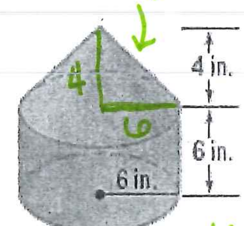
$SA = 2(16 \cdot 22) + 2(22 \cdot 8) + 2(6 \cdot 6) + 2(8 \cdot 6) + 2(8 \cdot 16)$

$SA = 1480 \text{ cm}^2$

$V = 22 \times 16 \times 8 + 6 \times 6 \times 8$

$V = 3104 \text{ cm}^3$

25.



$\sqrt{52}$

NO top circle of cylinder or Base of cone

$SA = \cancel{2}\pi r^2 + 2\pi r H + \cancel{\pi r^2} + \pi r \ell$

$= \pi r^2 + 2\pi r H + \pi r \ell$

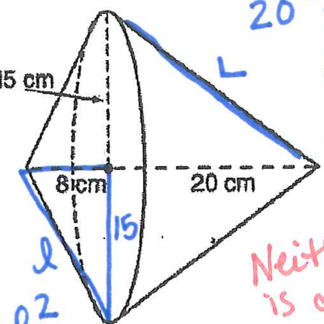
$= \pi 6^2 + 2\pi 6 \cdot 6 + \pi 6 \cdot \sqrt{52}$

$SA \approx 475.2 \text{ in}^2$

$V = \frac{1}{3}\pi 6^2 \cdot 4 + \pi 6^2 \cdot 6$

$V \approx 829.4 \text{ in}^3$

26.



$20^2+15^2=L^2$

$\boxed{25=L}$

$8^2+15^2=l^2$

$\boxed{17=l}$

Neither circle is on the surface ♥ Get rid of both!!!

$SA=\cancel{\pi r^2}+\pi r l+\cancel{\pi r^2}+\pi r L$

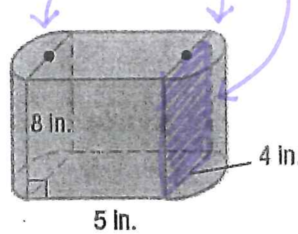
$SA=\pi 15\cdot 17+\pi 15\cdot 25$

$SA\approx 1979.2\,cm^2$

$V=\frac{1}{3}\pi 15^2\cdot 8+\frac{1}{3}\pi 15^2\cdot 20$

$V\approx 6597.3\,cm^3$

27.



Make up full SA of cylinder!

These rectangles are not on the surface

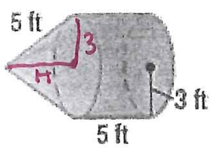
$SA=2\pi 2^2+2\pi 2\cdot 8$
$+\ 2(5\times 8)$
$+\ 2(4\times 5)$

$SA=245.7\,in^2$

$V=\pi 2^2\cdot 8+8\cdot 5\cdot 4$

$V=260.5\,in^3$

28.



H = 4 by pyth. thm.

SA = No cone base, NO top circle of cylinder.

$SA=\cancel{\pi r^2}+\pi r l+\cancel{2}\pi r^2+2\pi r H$

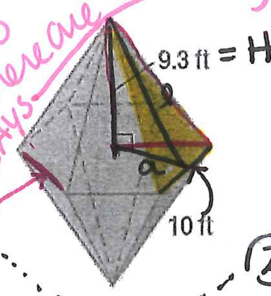
$SA=\pi 3\cdot 5+\pi 3^2+2\pi 3\cdot 5$

$SA\approx 169.6\,ft^2$

$V=\frac{1}{3}\pi 3^2\cdot 4+\pi 3^2\cdot 5$

$V\approx 179.1\,ft^3$

29.

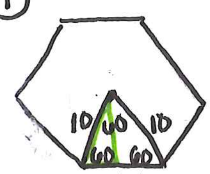


I get this 10 ft MIGHT be in two spots... here are the two WAYS

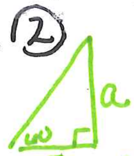
use BLACK work if:

If students used 10 as side of hexagon 10 ft = s

① ② ③

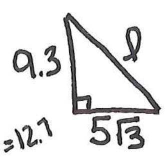


r = 10 too!



apothem $=5\sqrt{3}$

③ Find l



$9.3^2+(5\sqrt{3})^2=l^2$

$\sqrt{161.49}=l$

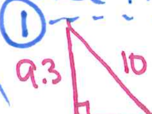
$\boxed{12.7=l}$

④ Find all 12 Lateral faces

$12\left(\frac{1}{2}10\cdot 12.7\right)=762\,ft^2=SA$

If Students used 10 ft for edge use this work.

①



$r^2+9.3^2=10^2$

$\boxed{r=3.7}$

②

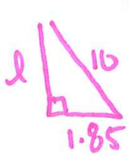
$b=\frac{1}{2}s\rightarrow s=2b$

$b=1.85$

$\times\ 2$

$\boxed{S=3.7}$

Find l ③



$l=\sqrt{96.5775}$

$l=9.8$

④ SA = 12 (triangles)

$SA=12\left(\frac{1}{2}3.7\cdot 9.8\right)$

$SA\approx 217.56\,ft^2$