HM3 Volume WS: 13-17, 25-35

(13) Volume = $\frac{1}{3}$ · Area of Base · Height

Usual formula: $V = \frac{1}{3} \cdot \text{Area} \cdot H$

Triple the Height: $V = \frac{1}{3} \cdot \text{Area} \cdot 3H$

$V = \text{Area} \cdot H$

*it will increase by a factor of 3

(14) Volume = $\frac{1}{3} \cdot \pi \cdot r^2 \cdot h$

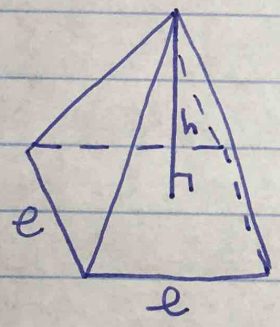
Double Radius & Triple H: $V = \frac{1}{3} \cdot \pi \cdot (2r)^2 \cdot 3h$

$V = \frac{1}{3} \cdot \pi \cdot 4r \cdot 3h$

$V = \frac{1}{3} \cdot \pi \cdot r^2 \cdot h \cdot 12$

*increases by a factor of 12

(15)



$h = 10 \quad e = 4$

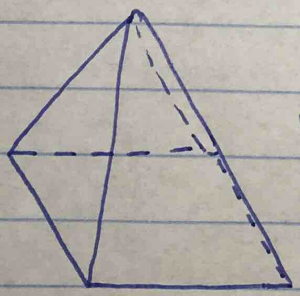
Volume = $\frac{1}{3}$ · Area of Base · Height

$V = \frac{1}{3}(4 \cdot 4)10$

$V = \frac{1}{3} \cdot 160$

$V = \frac{160}{3}$ units^3

(16)



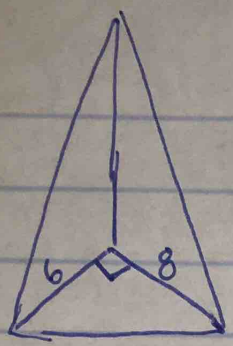
Base Area = 24 cm^2 $\quad V = 128$ cm^3

$V = \frac{1}{3} \cdot \text{Area of Base} \cdot \text{Height}$

$128 = \frac{1}{3} \cdot 24 \cdot h$

$128 = 8h$

$h = 16$ cm

(17) 

$h = 12$

$V = \frac{1}{3} \cdot \text{Area of Base} \cdot \text{Height}$

$V = \frac{1}{3} \cdot \left(\frac{1}{2} \cdot b \cdot h\right) \cdot h$

$V = \frac{1}{3} \cdot \frac{1}{2} \cdot 6 \cdot 8 \cdot 12$

$V = \frac{1}{3} \cdot 24 \cdot 12$

$V = 96 \text{ units}^3$

(25) 

$d = 10$

$V = \frac{4\pi r^3}{3} \qquad V = \frac{4\pi (5)^3}{3}$

$V = \frac{500\pi}{3} \text{ units}^3$

(26) 

$V = 972\pi \text{ in}^3 \qquad V = \frac{4\pi r^3}{3}$

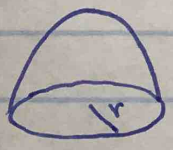
$972\pi = \frac{4\pi r^3}{3}$

$2916\pi = 4\pi r^3$

$729\pi = \pi r^3$

$729 = r^3$

$r = 9 \text{ in}$

(27) 

$r = 1/4$

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

$V = \frac{1}{2} \cdot \frac{4\pi (1/4)^3}{3}$

$V = \frac{1}{2} \cdot \frac{4\pi \cdot 1/64}{3}$

$V = \frac{1}{2} \cdot \frac{\pi/16}{3}$

$V = \frac{1}{2} \cdot \frac{\pi}{48}$

$V = \frac{\pi}{96} \text{ units}^3$

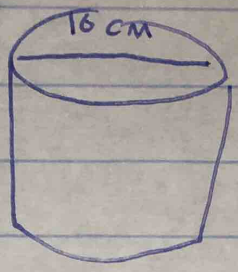
(28)

$V = \frac{4\pi r^3}{3}$

$V = \frac{1}{2} \cdot \frac{4\pi(7)^3}{3}$

$V = \frac{1372\pi}{6}$

$V = 718.38\ cm^3$



$r = 5$

★ now imagine pouring this much sand into the cylinder!

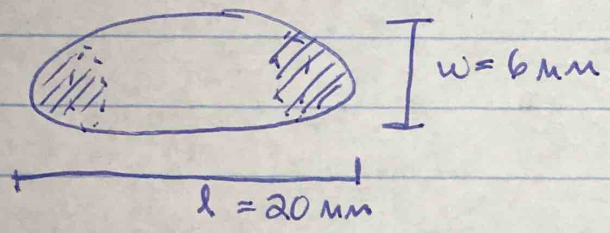
$V = \pi r^2 h$

$718.38 = \pi(5)^2 h$

$718.38 = 25\pi h$

$9.15\ cm = h$

(29)



★ two hemispheres make one whole sphere:

$V = \frac{4\pi r^3}{3}$

$V = \frac{4\pi(3)^3}{3}$

$V = 36\pi$

★ cylinder in the middle:

$V = \pi r^2 h$

$V = \pi(3)^2(14)$ ← ★ not 20 b/c you have to "take off" the hemispheres on the ends!

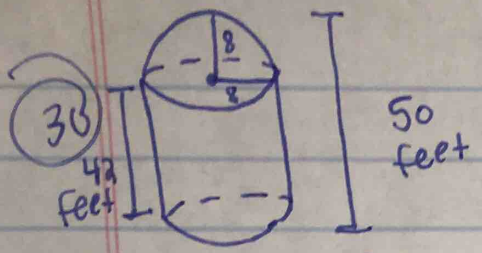
$V = 126\pi$

total volume:

$V = 36\pi + 126\pi$

$V = 162\pi\ mm^3$

30)



*remember that in a hemisphere, radius = height

*Volume of Dome

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

$V = \frac{1}{2} \cdot \frac{4\pi(8)^3}{3}$

$V = \frac{2048\pi}{6}$

$V \approx 1072.33$

*volume of cylinder

$V = \pi r^2 h$

$V = \pi(8)^2(42)$ ← *height of just the cylinder

$V = 2688\pi$

$V = 8444.60$

total volume:

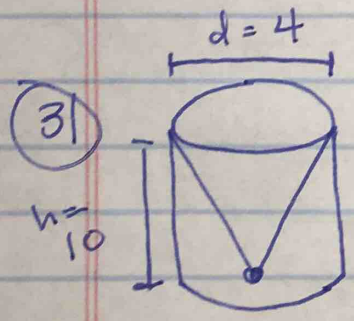
$V = 1072.33 + 8444.60$

$V = 9516.93$

*to the nearest cubic ~~foot~~

$V = 9517\ ft^3$

31)



*the cone is REMOVED so we need to find the volume of the cylinder and then subtract the volume of the cone!

*volume cylinder:

$V = \pi r^2 h$

$V = \pi \cdot 2^2 \cdot 10$

$V = 40\pi$

*volume cone:

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

$V = \frac{1}{3} \cdot \pi \cdot 2^2 \cdot 10$

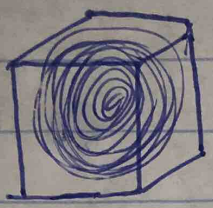
$V = 40\pi/3$

*now subtract:

$V = 40\pi - \frac{40\pi}{3}$

$V = \frac{120\pi}{3} - \frac{40\pi}{3}$

$V = \frac{80\pi}{3}\ cm^3$

(32) 

Volume of cube: $1000\ cm^3$

$V = l \cdot w \cdot h$

$1000 = x^3$

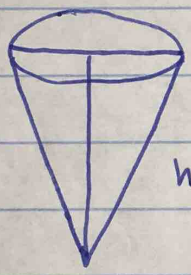
$10 = x$ ✱ length of the side of each cube AND the diameter of the circle ✱ $d = 10 \rightarrow r = 5$

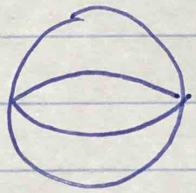
Volume of sphere:

$$V = \frac{4\pi r^3}{3}$$

$$V = \frac{4\pi(5)^3}{3}$$

$$V = \frac{500\pi}{3}\ cm^3$$

(33) 



CONE

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

$V = \frac{1}{3} \cdot \pi \left(\frac{3}{2}\right)^2 (5)$

$V = \frac{15\pi}{4}$

$V = 11.78\ in^3$

SPHERE

$V = \frac{4\pi r^3}{3}$

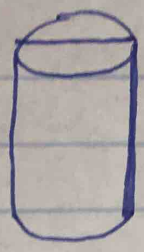
$V = \frac{4\pi(3/2)^3}{3}$

$V = \frac{9\pi}{2}$

$V = 14.14\ in^3$

✱ there is more volume in the ice cream scoop than the cone itself! So, NO, you can't fit it all in the cone without overflow!

34



d=3
h=9

*volume of cylinder: $V = \pi r^2 h$

$V = \pi(3/2)^2(9)$

$V = 81\pi/4$

$V = 63.62 \text{ in}^3$

*volume of 3 balls: $V = \frac{4\pi r^3}{3}$

multiply by 3 b/c there are 3 spheres → $V = 3 \cdot \frac{4\pi(3/2)^3}{3}$

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

$V = 27\pi/2$

$V = 42.41 \text{ in}^3$

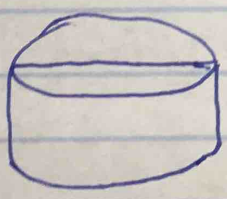
*to find wasted space → SUBTRACT!

$63.62 - 42.41$

21.21

to one decimal → 21.2 in^3

35



d=10

*we don't know the height of the bucket... which doesn't really matter! we know that the rock makes the water rise 3 inches so we can use h=3

volume of the water: $\pi r^2 h$

$V = \pi(5)^2(3)$

$V = 75\pi \text{ in}^3$