Volume Problems : Solutions

#1 (a) $V = A_{base_1} \cdot h_1 + A_{base_2} \cdot h_2$

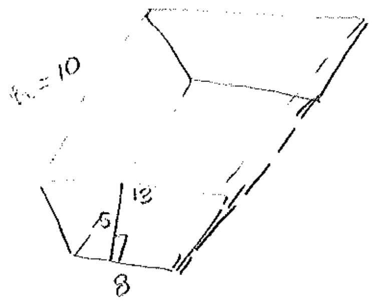
$= (210\ cm^2) \cdot 8\ cm + (42\ cm^2)(3.6\ cm)$

$= \boxed{1831.2\ cm^3}$

(b) V = Volume of trapezoidal prism − Volume of rectangular prism

$= \left(\frac{1}{2}(5)(8+13)\right) \cdot 10 - (3 \cdot 10 \cdot 1.5)$

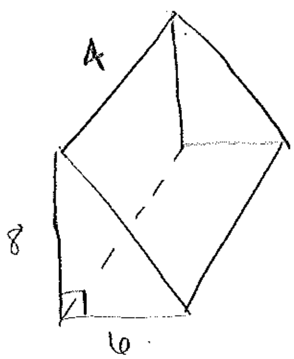
$= 525\ m^3 - 45\ m^3 = \boxed{480\ m^3}$



#2 2 triangular bases + 3 rectangular lateral faces = triangular prism

$V = \frac{1}{2}(6)(8) \cdot (4)$

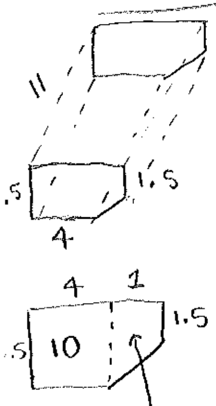
$= \boxed{96\ cm^3}$



#3 Find volume of the paint tray.

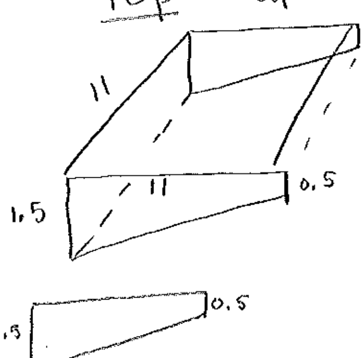
Bottom : $V_{bottom} = (\text{Area of Base})(11)$

$= 12 \times 11 = 132$



$\frac{1}{2}(1)(2.5+1.5)$
$= 2$

Top : $V_{top} = (\text{Area of Base})(11) = 11^2$
$= 121$



area $= \frac{1}{2}(11)(1.5+0.5)$
$= 11$

$\boxed{4g}$

$\Rightarrow$ Total volume $= (132 + 121)\ in^3 = 253\ in^3 \cdot \frac{1g}{57.75\ in^3} = 4.38$

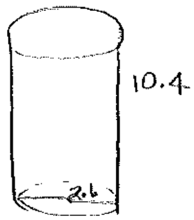
#4 V = Volume of cylinder + Volume half sphere

$$= \pi(4.4)^2 \cdot 5 + \frac{4}{2\cdot 3}\pi(4.4)^3$$

$$\sim 304.106 + \cancel{356.82}\ 178.32$$

$$\boxed{\sim \cancel{660.9}\ m^3} \quad \boxed{482.4\ m^3}$$

#5



(a) $V_{ball} = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi\left(\frac{2.6}{2}\right)^3 \sim 9.2\ in^3$

(b) total volume of four balls $= 4(9.2) = 36.8\ in^3$

$Volume_{can} = \left(\pi\left(\frac{2.6}{2}\right)^2\right) \times 10.4$

~ 55.216

Volume not occupied $= 55.216 - 36.8$

$= 18.416$

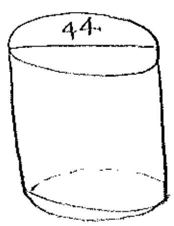
$$\Rightarrow \frac{18.416}{55.216} = \frac{x}{100} \Rightarrow \boxed{x \sim 33.4\%}$$

#6 $V_{tank} = 24 \times 12 \times h = 288h$

$V_{tank\ w/\ rock} = 288(h + 1.25) = 288h + 360$

$V_{rock} = V_{tank\ w/\ rock} - V_{tank} = 288h + 360 - 288h \quad \boxed{= 360\ in^3}$

#7

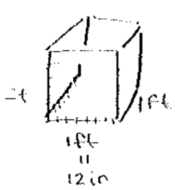


$V_{tank} = \pi\left(\frac{44}{2}\right)^2 \cdot h \sim 1520.5\ h\ in^3$

$V_{tank\ w/\ man} = 1520.5(h + 3.4) = (1520.5h + 5169.7)\ in^3$

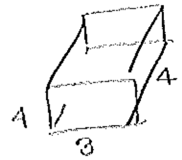
$V_{man} = 5169.7\ in^3 \cdot \frac{1\ ft^3}{1728\ in^3} \sim 2.9\ ft^3 \cdot \frac{62.2\ lbs}{1\ ft^3}$

$\boxed{\sim 186.1\ lbs}$



$1ft^3 = (12)^3 in^3$

$= 1728\ in^3$

#8| 1 juice box  $V = 4 \times 3 \times 4 = 48 \text{ in}^3$

$\left(48 \text{in}^3 \times 2 \times 10^5\right) = 96 \times 10^5 \text{ in}^3$ = how much space 200,000 juice boxes take up.

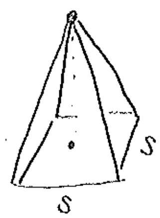
Volume of warehouse $= (40 \times 30 \times 20) \text{ ft}^3$

$= 24 \times 10^3 \text{ ft}^3 \cdot \dfrac{1728 \text{ in}^3}{1 \text{ ft}^3} = 41{,}472{,}000 \text{ in}^3$

$\boxed{\text{yes}}$ can store all the juice.

$= 414 \times 10 \text{ in}^3$

$>$ volume of juice

#9| 

$V_1 = \frac{1}{3} A_{base} \cdot h = \frac{1}{3} s^2 h$

take $s \mapsto \sqrt{2}\, s$

then $V_2 = \frac{1}{3}(\sqrt{2}\, s)^2 \cdot h = 2\left(\frac{1}{3} s^2 h\right)$

$= 2V_1$

Need to multiply side length by $\sqrt{2}$ in order to double the volume.

#10| $V_{sphere} = \frac{4}{3}\pi (5)^2 = \dfrac{100\pi}{3}$

$V_{gumball} = \frac{4}{3}\pi \left(\frac{1}{2}\right)^2 = \dfrac{\pi}{3}$

} only 100 gum balls will fit in the machine

$\boxed{\text{No!}}$ $\left(1{,}000 \times \frac{\pi}{3}\right) > \frac{100\pi}{3} = V_{sphere}$