Ch. 10 ... Volume Solutions

(1-5) Definitions for solids & Euler's Formula for Solids

6) 

$V = ?$

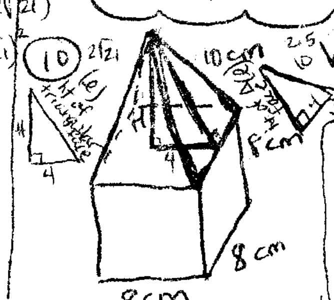
$V = BH$

$V = bh\ H$

$V = 6(8)(4)$

$V = 192$

$192\ cm^3$

(10) 

$H^2 + 4^2 = (2\sqrt{21})^2$

or

$H^2 + 2^2 = (\sqrt{21})^2$

$H^2 + 4 = 21$

$H^2 = 17$

$H = \sqrt{17}$

$H = 2\sqrt{17}$

$V = ?$ (Round to nearest whole #)

$\ell^2 + 2^2 = 5^2$

$\ell^2 + 4 = 25$

$\ell^2 = 21;\ \ell = \sqrt{21}$

$\therefore$ ht of Δ face $= 2\sqrt{21}$

$V = V_{cube} + V_{sq.pyramid}$

$V = BH + \frac{1}{3}BH$

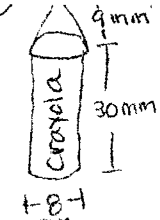
$V = S^2(S) + \frac{1}{3}S^2H$

$V = S^3 + \frac{1}{3}S^2H$

$V = 8^3 + \frac{1}{3}(8)^2(2\sqrt{17})$

$V = 512 + \frac{128\sqrt{17}}{3}$

$V \approx 688\ cm^3$

(16) 

$V = ?$

$V = V_{cylinder} + V_{cone}$

$V = BH + \frac{1}{3}BH$

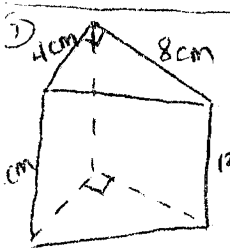
$V = \pi r^2 H + \frac{1}{3}\pi r^2 H$

$V = \pi(4)^2(30) + \frac{1}{3}\pi(4)^2(9)$

$V = \pi(16)(30) + \pi(16)(3)$

$V = 480\pi + 48\pi$

$528\pi\ mm^3$

7) 

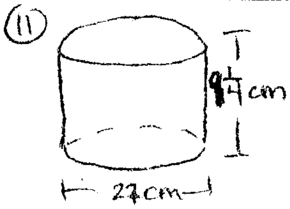
$V = ?\ BH$

$V = \frac{1}{2}bh\ H$

$V = \frac{1}{2}(4)(8)(12)$

$V = 192\ cm^3$

$192\ cm^3$

(11) 

$V = ?$

$V = BH$

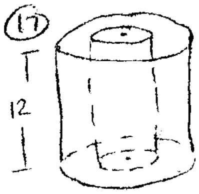
$V = \pi r^2 H$

$V = \pi\left(\frac{27}{2}\right)^2\left(9\frac{1}{4}\right)$

$V = \pi\left(\frac{27}{2}\cdot\frac{27}{2}\right)\left(\frac{37}{4}\right)$

$V = \frac{26,973}{16}\pi$

$\frac{26,973}{16}\pi\ cm^3$

(17) 

$R = 10$ in

$r = 6$ in.

Find the volume btwn. the cylinders.

$V_{btwn\ cyl} = V_{big\ cyl} - V_{sm\ cyl}$

$V_{btwn\ cyl} = B_1H_1 - B_2H_2$

$V = \pi R^2 H - \pi r^2 H$

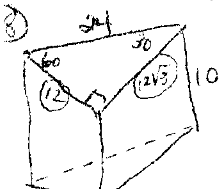
$V = \pi(10)^2(12) - \pi(6)^2(12)$

$V = \pi(100)(12) - \pi(36)(12)$

$V = 1200\pi - 432\pi$

$V = 768\pi$

$768\pi\ in^3$

8) 

$V = ?$

$\rightarrow V = 720\sqrt{3}$

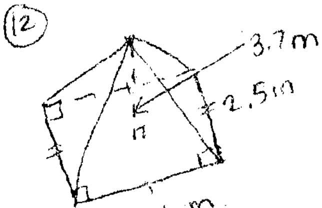
if the hypotenuse of a 30-60-90 Δ is 24, then the short leg is 12 & the long leg is $12\sqrt{3}$.

$V = BH$

$V = \frac{1}{2}bh\ H$

$V = \frac{1}{2}(12)(12\sqrt{3})(10)$

$720\sqrt{3}$ units^3

(12) 

$V = \frac{1}{3}BH$

$V = \frac{1}{3}bh\ H$

$V = \frac{1}{3}(10.6)(2.5)(3.7)$

$V = \frac{1}{3}(98.05) =$

$32.68\bar{3}\ m^3$

(18) 

$V = ?$

$V_{hemisphere} = \frac{2}{3}\pi r^3$

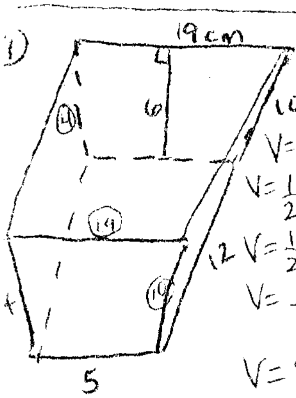
$V = \frac{2}{3}\pi(15)^3$

$V = \frac{2}{3}\pi(15)(15)(15)$

$V = 2\pi(5)(15)(15)$

$V = 2250\pi$

2250π units^3

9) 

$V = ?$

$V = BH$

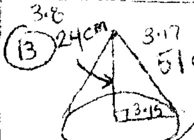
$V = \frac{1}{2}(b_1 + b_2)h\ H$

$V = \frac{1}{2}(19+5)(6)(12)$

$V = \frac{1}{2}(24)(6)(12)$

$V = 864\ cm^3$

$864\ cm^3$

(13) 

$V = ?$

$V = \frac{1}{3}BH$

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

$\frac{1}{3}\pi(45)^2(24)$

$\pi(45)^2(8)$

$16,200\ cm^3$

$\boxed{16,200\pi\ cm^3}$

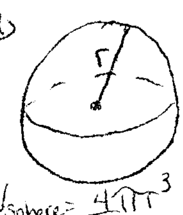
(25) Surface area = ?

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

$S = \pi(45)(51) + \pi(45)^2$

$S = 2295\pi + 2025\pi$

$S = 4320\pi\ cm^2$

(19) 

$r = 20$ yds

$V = ?$

$V_{sphere} = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi(20)^3$

$V = \frac{4}{3}\pi(8000)$

$\frac{32,000\pi}{3}$

(14-15) Joker problems involving Algebraic expressions

(20-21) 2 Spicy problems

$V = 925\pi\ cm^3$

$= BH$

$= \pi r^2 H$

$= \pi(5)^2(H)$

$= 25\pi H$

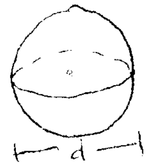
$925\pi = 25\pi H$

$925 = 25H$

$37 = H$

37 cm

$V = \frac{2048\pi}{3}\ cm^3$



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

$\frac{2048\pi}{3} = \frac{4}{3}\pi r^3$

$\frac{2048}{3} = \frac{4}{3} r^3$

$r^3 = \frac{2048}{3} \cdot \frac{3}{4}$

$r^3 = 512$ → $r = \sqrt[3]{512}$

$r = 8$ cm

$\therefore d = 16$ cm

16 cm

$S = ?$

$r = 7\sqrt{6}$ cm

$S = 4\pi r^2$

$S = 4\pi(7\sqrt{6})^2$

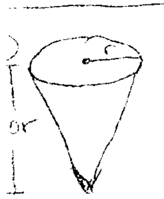
$= 4\pi(7^2)(\sqrt{6})^2$

$= 4\pi(49)(6)$

$S = 1176\pi\ cm^2$

$1176\pi\ cm^2$

$V = ?$



$B = 45\pi\ cm^2$

$\pi r^2 = 45\pi$

$r^2 = 45$

$r = \sqrt{45}$

$r = \sqrt{9} \cdot \sqrt{5}$

$r = 3\sqrt{5}$

$= \frac{1}{3} BH$

$= \frac{1}{3} \pi r^2 H$

$= \frac{1}{3} \pi (3\sqrt{5})^2 (10r)$

$= \frac{1}{3} \pi (3\sqrt{5})^2 (10 \cdot 3\sqrt{5})$

$= \frac{1}{3} \pi (3^2)(\sqrt{5})^2 (15\sqrt{5})$

$= \pi (3)(5)(15\sqrt{5}) =$ **$225\pi\sqrt{5}\ cm^3$**

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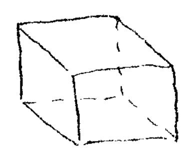
(28) $V_{greatest\ sphere}$ with a cube V of $8000\ cm^3$?



$V_{cube} = s^3$

$8000 = s^3$

$s^3 = 8000$

$s = \sqrt[3]{8000}$

$s = 20$

→ if the length of a side of a cube = 20, then the lgst. diameter of a sphere also = 20. ∴ the lgst radius = 10

$\therefore V_{greatest\ sphere} = \frac{4}{3}\pi r^3$

or $V = \frac{4}{3}\pi (10)^3$

$V = \frac{4}{3}\pi (1000) =$

$\frac{4000\pi}{3}\ cm^3$

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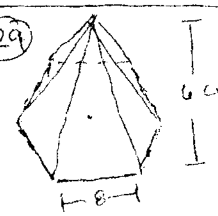
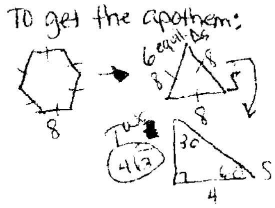
(29)



To get the apothem:



$V = \frac{1}{3} BH$

$V = \frac{1}{3} \cdot \frac{1}{2} asn H$

$V = \frac{1}{6} asn H$

$V = \frac{1}{6}(4\sqrt{3})(8)(6)(6)$

$V = (4\sqrt{3})(8)(6)$

$V = 192\sqrt{3}$

$192\sqrt{3}\ cm^3$

a regular hexagon is really made up of 6 equilateral Δs. One equilateral Δ is actually comprised of 2 30-60-90 Δs. The short leg is opposite the 30° angle has a length of s. The longer leg is opposite the 60° angle & has a length of $s\sqrt{3}$. The long leg of the 30-60-90 Δ is also the apothem of our hexagon.

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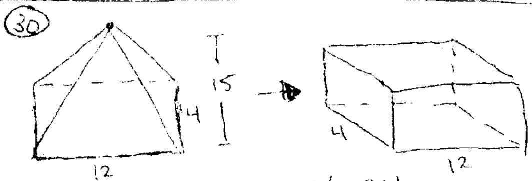
(30)



$V = \frac{1}{3} BH$

$V = \frac{1}{3} bh H$

$V = \frac{1}{3}(12)(4)(15)$

$V = 240$

$V = BH$

$V = bh H$

$V = 12(4) H$

$240 = 48H$

$5 = H$

$H = 5$

5 units

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(33) A cube is made up of 6 congruent faces or 6 squares, ∴ $6B = 384m^2$ ∴ one face (or B) is $64\ m^2$. if the Area of a square is $64 m^2$, then the length of one side of the square is $\sqrt{64}$ or 8. ∴ the $V_{cube} = s^3$ or $8^3 = 512\ m^3$

$512\ m^3$

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(35) lead rectangular prism

$B = 50\ cm^2$ $H = 12$ cm

density = $\frac{0.45\ lbs}{cm^3}$, weight = ?

$V_{prism} = BH$

$V = (50)(12)$

$V = 600\ cm^3$

→ Since lead has a density of 0.45 per cubic cm and we have $600\ cm^3$ the weight of this prism is equal to 600 (0.45 lbs) = 270 lbs.

270 lbs.

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(36) density = ?

m = 350 g.

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

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

$V = \frac{4}{3}\pi (343)$

$V = \frac{1372\pi}{3}$

→ density = $\frac{mass}{V}$

density = $\frac{350g}{\frac{1372\pi}{3}}$

density = $\frac{350}{1} \div \frac{1372\pi}{3}$

density = $\frac{350}{1} \cdot \frac{3}{1372\pi}$

density = $\frac{175}{1} \cdot \frac{3}{686\pi}$

density = $\frac{525}{686\pi} \approx \frac{0.249g}{cm^3}$

Remember.... $525 \div 686 \div \pi$ is how I got $\frac{0.249g}{cm^3}$

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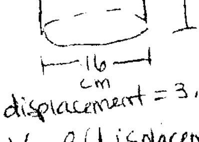
(37)



displacement = 3.2cm

V = B(displacement)

$V = \pi r^2 (dis)$

$V = \pi (8)^2 (3.2)$

$V = \pi (64)(3.2) =$ **$204.8\ cm^3$**