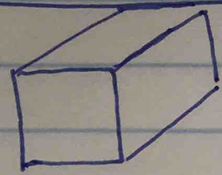
HM3 Volume WS : 1-12, 18-24

1.



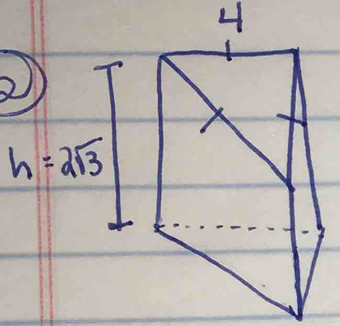
$V = l \cdot w \cdot h$ ☆ it doesn't matter which ones you change!

$V = 4l \cdot \frac{1}{2}w \cdot \frac{1}{2}h$

$V = (4 \cdot \frac{1}{2} \cdot \frac{1}{2})\, l \cdot w \cdot h$

$V = l \cdot w \cdot h$ $\boxed{\text{☆ the volume stays the same!}}$

2.



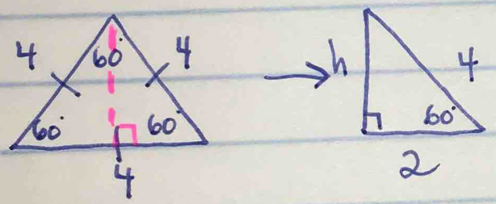
V = Area of Base · Height

V = Area of △ · Height

$V = \frac{1}{2} \cdot b \cdot h \cdot h$

$V = \frac{1}{2} \cdot 4 \cdot h \cdot 2\sqrt{3}$

☆need height of the triangle☆



30-60-90 rules:

$h = 2\sqrt{3}$

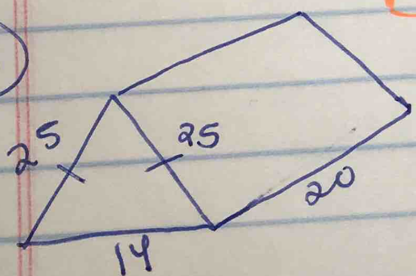
☆ it ends up being the same as the height of the lateral face.... that's just a coincidence!

$V = \frac{1}{2} \cdot 4 \cdot 2\sqrt{3} \cdot 2\sqrt{3}$

$V = 2 \cdot 4 \cdot 3$

$\boxed{V = 24 \text{ units}^3}$

3.



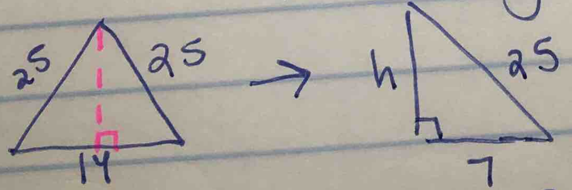
V = Area of Base · Height

V = Area of △ · Height

$V = \frac{1}{2} \cdot b \cdot h \cdot h$

$V = \frac{1}{2} \cdot 14 \cdot h \cdot 20$

☆need height of the triangle☆



☆☆☆ $h \neq 7\sqrt{3}$ b/c the original triangle was not equilateral so we can't use 30-60-90 rules!

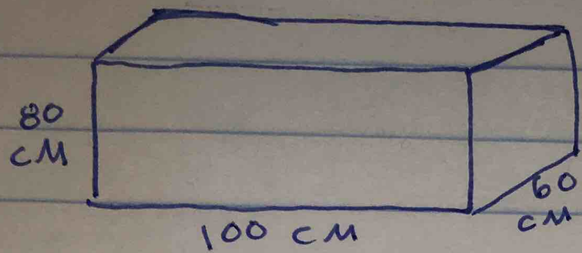
$h^2 + 7^2 = 25^2$

$h = 24$

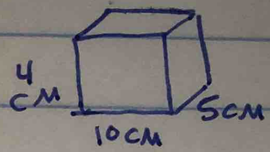
$V = \frac{1}{2} \cdot 14 \cdot 24 \cdot 20$

$\boxed{V = 3360 \text{ units}^3}$

(4)



BLOCK:



$V = 80 \cdot 100 \cdot 60$

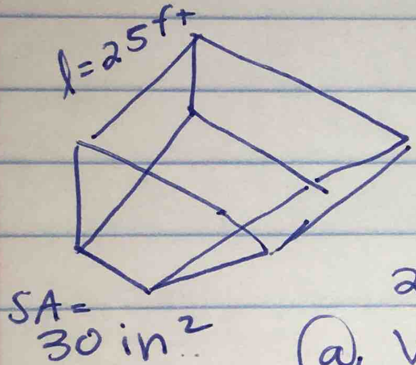
$V = 480{,}000$

$V = 4 \cdot 10 \cdot 5$

$V = 200$

$\frac{480{,}000}{200} = \boxed{2400 \text{ blocks}}$

(5)



★BE CAREFUL! measurements given have different units!

25 feet = 300 inches

(a) V = Area of Base · Height

$V = 30 \cdot 300 = \boxed{9000 \text{ in}^3}$

(b) per cubic foot! our answer to (a) is in cubic inches so we must change it!

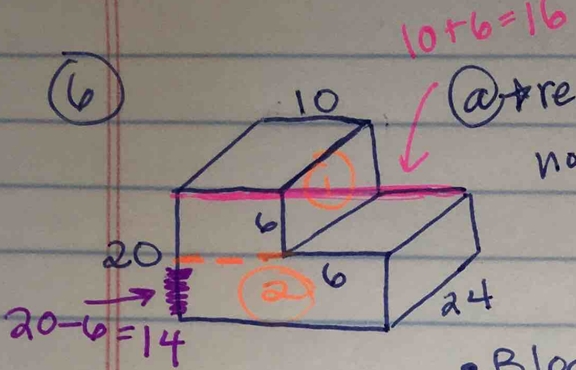
$9000 \text{ in}^3 \div 12^3$

$9000 \div 1728$

5.208 ft^3

$5.208(62.4) = \boxed{325 \text{ pounds}}$

(6)



(a) ★ remember that we are doing VOLUME, not SURFACE AREA!

split them into 2 Blocks: Block (1) + Block (2)

- Block 1: $10 \cdot 6 \cdot 24 = 1440 \text{ in}^3$
- Block 2: $24 \cdot \underline{14} \cdot \underline{16} = 5376 \text{ in}^3$

total concrete: $1440 + 5376 = \boxed{6816 \text{ in}^3}$

(b) cubic feet → ÷ inches by 12^3

$6816 \div 12^3$

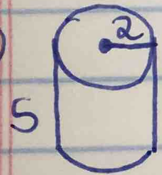
$6816 \div 1728 = \boxed{3.94 \text{ ft}^3}$

(c) cubic yards → ÷ inches by 36^3

$6816 \div 36^3$

$6816 \div 46656 = \boxed{.15 \text{ yd}^3}$

(7)

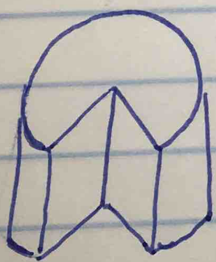


$V = \pi r^2 h$

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

$\boxed{V = 20\pi \text{ cm}^3}$

(8)



45° slice removed → $45/360 = 1/8$ of the cake has been removed, so $7/8$ of the cake still remains!

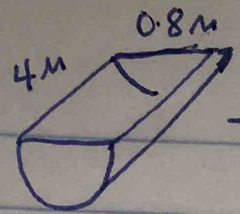
$h = 5 \quad r = 8$

$V = 7/8 \cdot \pi r^2 h$

$V = 7/8 \cdot \pi (8)^2 (5)$

$\boxed{V = 280\pi \text{ in}^3}$

(9)



★only 1/2 a cylinder★

$V = \frac{1}{2}\pi r^2 h$ ★the RADIUS is 0.4!

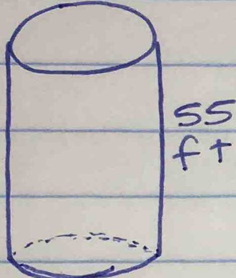
$V = \frac{1}{2}\pi(0.4)^2(4)$

$V = \frac{1}{2}\cdot\pi\cdot .16\cdot 4$

$V = \frac{1}{2}\cdot\pi\cdot .64$

$\boxed{V = .32\pi \qquad V = \frac{8\pi}{25}\,m^3}$

(10)



$V = \pi r^2 h$

$V = \pi(40)^2(55)$

$V = 88000\pi$

$V = 276{,}460.15\ ft^3$

★each cubic foot can hold 7.48 gallons of oil

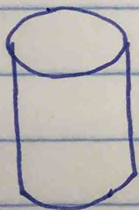
$276{,}460.15 \cdot 7.48$

$\approx 2{,}067{,}921.9$ gallons

★to the nearest thousand gallons:

$\boxed{2{,}068{,}000 \text{ gallons}}$

(11)



$V = 200\pi\ cm^3$

$r = 6$ cm

$h = ?$

$V = \pi r^2 h$

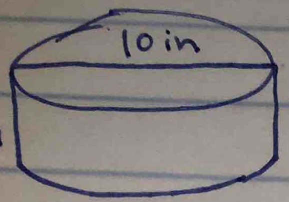
$200\pi = \pi(6)^2 h$

$200\pi = 36\pi h$

$200 = 36h$

$\boxed{\frac{50}{9}\ cm = h \quad \text{or} \quad h = 5.56\ cm}$

(12)



☆ the total volume of the cake pan doesn't really matter!
Just use the volume of the actual cake to find the height!

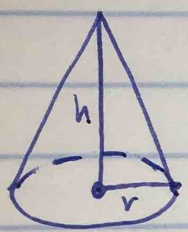
$$V = \pi r^2 h$$

$$220 = \pi (5)^2 h$$

$$220 = 25\pi h$$

$$\boxed{h = 2.8 \text{ inches}}$$

(18)



h = 15 cm   r = 7 cm

$$\text{volume} = \tfrac{1}{3}\pi r^2 h$$

$$V = \tfrac{1}{3}\pi (7)^2 (15)$$

$$V = \tfrac{1}{3}\pi (735)$$

$$\boxed{V = 245\pi \text{ cm}^3}$$

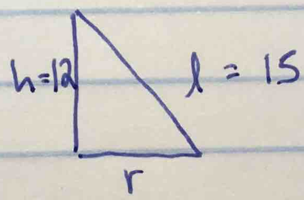
(19)

h = 12 cm   l = 15 cm   V = ?

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

$$V = \tfrac{1}{3}\pi r^2 12$$

☆ find r!



$$12^2 + r^2 = 15^2$$

$$144 + r^2 = 225$$

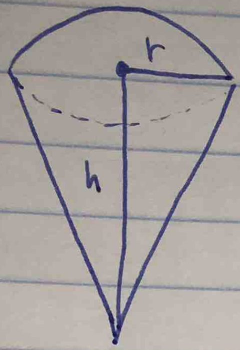
$$r^2 = 81$$

$$r = 9$$

$$V = \tfrac{1}{3}\pi (9)^2 (12)$$

$$\boxed{V = 324\pi \text{ cm}^3}$$

(20)



$h = 3r \qquad V = 343\pi \, cm^3$

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

$343\pi = \frac{1}{3}\pi r^2 \cdot 3r$

$343\pi = \frac{1}{3}\pi \cdot 3r^3$

$343\pi = \pi r^3$

$343 = r^3$

$7 = r$

$\boxed{h = 21 \text{ cm}}$

(21)

$V = 24\pi \, cm^3 \qquad h = 8 \, cm \qquad r = ?$

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

$24\pi = \frac{1}{3}\pi r^2 \cdot 8$

$24\pi = \frac{8}{3}\pi r^2$

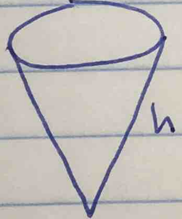
$9\pi = \pi r^2$

$9 = r^2$

$\boxed{r = 3 \text{ cm}}$

(22)

D = 7CM



D = 6CM

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

new cone:	old cone:
$V = \frac{1}{3}\pi 7^2 h$	$V = \frac{1}{3}\pi 6^2 h$
$V = \frac{1}{3} \cdot \pi \cdot 49 \cdot h$	$V = \frac{1}{3} \cdot \pi \cdot 36 \cdot h$
$V = 16.333\pi h$	$V = 12\pi h$
$V = 51.31h \, cm^3$	$V = 37.7h \, cm^2$

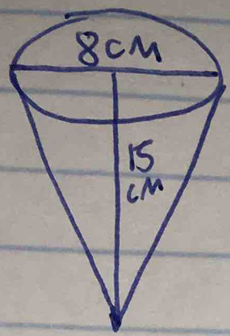
☆new cone can apparently hold 33% more:

OLD CONE × 1.33%

$37.7(1.33) = 50.14 \, cm^3$

$\boxed{\text{yes!}}$ the new cone can actually hold a little more than a 33% increase!

23



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

$V = \frac{1}{3}\pi (8)^2 (15)$

$V = \frac{1}{3} \cdot \pi \cdot 240$

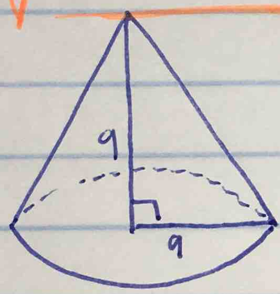
$V = 80\pi$

$V = 251.33\ cm^3$

$1000\ cm^3 \div 251.33\ cm^3 = 3.98$

☆ need to fill it 4 times to drink 1 L of water

24



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

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

$V = \frac{1}{3} \cdot \pi \cdot 81 \cdot 9$

$\boxed{V = 243\pi m^3}$