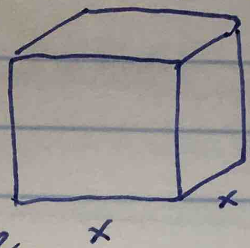
$P = 28 \rightarrow 4x = 28$

$x = 7$



① Formulas

$SA = LA + 2 \cdot \text{Area of Base}$

$SA = \text{Perimeter} \cdot \text{Height} + 2 \cdot \text{Area Base}$

$SA = 28 \cdot 7 + 2 \cdot 7 \cdot 7$

$SA = 196 + 98$

$\boxed{SA = 294\ ft^2}$

$\boxed{LA = 196\ ft^2}$

Shape-by-Shape

6 SQUARES:

$SA = 6 \cdot 7 \cdot 7$

$\boxed{SA = 294\ ft^2}$

*Lateral Area: 4 SQUARES

$LA = 4 \cdot 7 \cdot 7$

$\boxed{LA = 196\ ft^2}$

Volume: Area of Base · Height

$V = 7 \cdot 7 \cdot 7$

$\boxed{V = 343\ ft^3}$

② Formulas

$SA = LA + 2 \cdot \text{Area Base}$

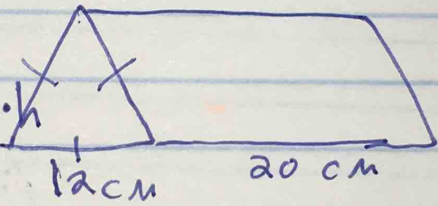
$SA = \text{Perimeter} \cdot \text{Height} + 2 \cdot \frac{1}{2} \cdot b \cdot h$

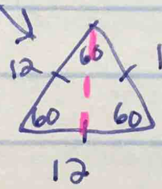
$SA = (12 \cdot 3) \cdot 20 + 2 \cdot \frac{1}{2} \cdot 12 \cdot h$

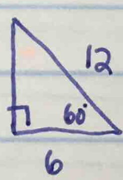
$SA = 36 \cdot 20 + 2 \cdot \frac{1}{2} \cdot 12 \cdot 6\sqrt{3}$

$\boxed{SA = 720 + 72\sqrt{3}\ cm^2}$

$\boxed{LA = 720\ cm^2}$







$h = 6\sqrt{3}$

Shape-by-Shape

2 triangles, 3 rectangles

• 2 Δs: $2 \cdot \frac{1}{2} \cdot 12 \cdot h$

$2 \cdot \frac{1}{2} \cdot 12 \cdot 6\sqrt{3}$

$72\sqrt{3}$

• 3 rectangles: $3 \cdot 12 \cdot 20$

720

$\boxed{SA = 720 + 72\sqrt{3}\ cm^2}$

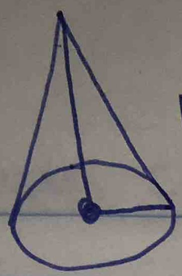
LA is just the rectangles $\boxed{LA = 720\ cm^2}$

Volume: Area of Base · Height

$V = \frac{1}{2} \cdot 12 \cdot 6\sqrt{3} \cdot 20$

$\boxed{V = 720\sqrt{3}\ cm^3}$

3



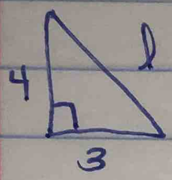
h = 4 ft

r = 3 ft

FORMULAS:

$SA = \pi r l + \pi r^2$

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



$SA = \pi \cdot 3 \cdot 5 + \pi \cdot 9$

$SA = 15\pi + 9\pi$

$\boxed{SA = 24\pi\ ft^2}$

$3^2 + 4^2 = l^2$

$l = 5$

LA is everything but the base

$\boxed{LA = 15\pi}$

$Volume = 1/3\, \pi r^2 h$

$V = 1/3 \cdot \pi \cdot 3^2 \cdot 4$

$\boxed{V = 12\pi\ ft^3}$

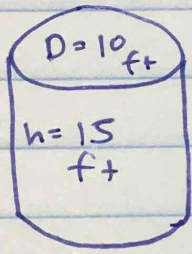
4 Formulas:

$SA = 2\pi r h + 2\pi r^2$

$SA = 2\pi \cdot 5 \cdot 15 + 2\pi \cdot 5^2$

$SA = 150\pi + 50\pi$

$SA = 200\pi\ ft^2$



Shape-by-Shape:

two circles, one rectangle

• Circles: $2 \cdot \pi r^2$

$2 \cdot \pi \cdot 5^2 = 50\pi$

• Rectangle: $2\pi r h$

$2\pi \cdot 5 \cdot 15 = 150\pi$

$\boxed{SA = 200\pi ft^2}$

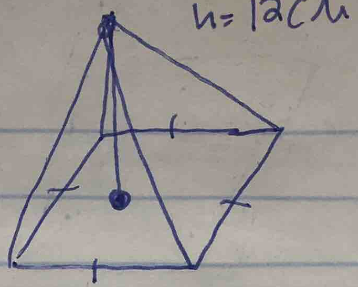
$\boxed{LA = 150\pi ft^2}$

$volume = \pi r^2 h$

$V = \pi \cdot 5^2 \cdot 15$

$\boxed{V = 375\pi\ ft^3}$

(5)



Formulas:

$SA = LA + \text{Area of Base}$

$SA = \frac{1}{2} \cdot P \cdot l + \text{Square}$

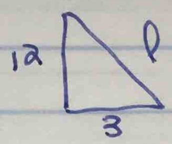
$SA = \frac{1}{2} \cdot 6 \cdot 4 \cdot l + 6 \cdot 6$

★ find l ★

$SA = \frac{1}{2} \cdot 6 \cdot 4 \cdot 3\sqrt{17} + 36$

$SA = 36\sqrt{17} + 36$

to find l:



$3^2 + 12^2 = l^2$

$153 = l^2$

$3\sqrt{17} = l$

Shape-by-Shape:

One Square, 4 △s

• SQUARE: $6 \cdot 6 = 36$

• 4 △s: $4 \cdot \frac{1}{2} \cdot b \cdot h$

$4 \cdot \frac{1}{2} \cdot 6 \cdot l$

★ find l ★

$4 \cdot \frac{1}{2} \cdot 6 \cdot 3\sqrt{17}$

$36\sqrt{17}$

$\boxed{SA = 36\sqrt{17} + 36 \text{ cm}^2}$

LA is everything but the base → $\boxed{LA = 36 \text{ cm}^3}$

Volume = ⅓ · Area of Base · Height

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

$\boxed{V = 144 \text{ cm}^3}$

(6)

★ there is no Lateral Area for spheres :)

$SA = 4\pi r^2$

$SA = 4\pi(8)^2$

$\boxed{SA = 256\pi m^2}$

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

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

$\boxed{V = \frac{2048\pi}{3} m^3}$

$h = 5cm$

(7) ★ Find Lateral Area : $LA = \pi r l$

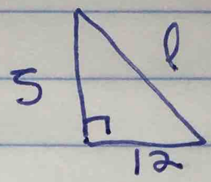
★ we need to find the Radius and the Slant Height

$Area = 144\pi cm^2$

$144\pi = \pi r^2$

$144 = r^2$

$12 = r$ →



$5^2 + 12^2 = l^2$

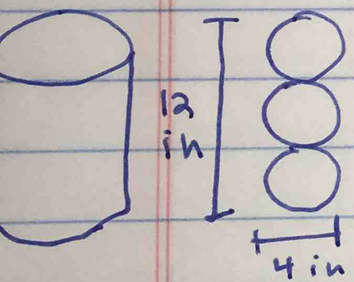
$169 = l^2$

$13 = l$

$LA = \pi \cdot 12 \cdot 13$

$\boxed{LA = 156\pi cm^2}$

(8) to find wasted space, we must find the volume of the cylinder then subtract the volume of the balls.



★ if the balls fit perfectly into the can, then you can find the dimensions of the cylinder!

$h = 12$ in $r = 2$ in

CYLINDER:

$V = \pi r^2 h$

$V = \pi \cdot 2^2 \cdot 12$

$V = 48\pi$

BALLS:

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

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

$V = 32\pi$

WASTED SPACE

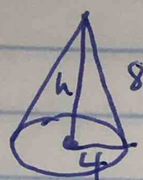
$48\pi - 32\pi$

$\boxed{16\pi \text{ in}^3}$

(9) 

rolled into a cup → creates a CONE!

* the radius of the sphere will become the slant height "l"



$h^2 + 4^2 = 8^2$

$h^2 = 48$

$h = 4\sqrt{3}$

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

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

$\boxed{V = \frac{64\pi\sqrt{3}}{3} \text{ in}^3}$

(10) 

$D = 40$ ft

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

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

$V = \frac{32000\pi}{3} \approx 33,510.32 \text{ ft}^3$

* 1 ft³ can hold 7.5 gallons:

$\frac{33510.32 \cancel{ft^3}}{1} \cdot \frac{7.5 \text{gal}}{1 \cancel{ft^3}} = \boxed{251,327.41 \text{ gallons}}$

(11) 

* this time we need Surface Area!

$SA = 4\pi r^2$

$SA = 4\pi \cdot 20^2$

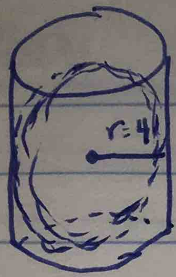
$SA = 1600\pi$

* 1 gallon per 300 sq ft:

$\frac{1600\pi \cancel{ft^2}}{1} \cdot \frac{1 \text{ gallon}}{300 \cancel{ft^2}} = 16.755$

$\boxed{17 \text{ gallons}}$

12



D=8 so height = 8

CYLINDER:

$V = \pi r^2 h$

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

$V = 128\pi$

SPHERE:

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

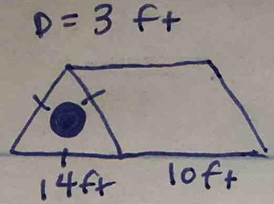
$V = \frac{4\pi \cdot 4^3}{3}$

$V = \frac{256\pi}{3}$

WASTED SPACE:

$128\pi - \frac{256\pi}{3}$

$\boxed{\frac{128\pi}{3} ft^3}$



(13)

Formulas

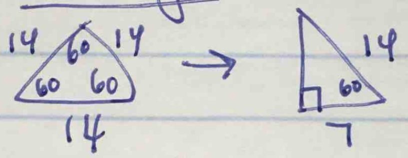
Triangular prism (with holes)

AND a cylinder inside (just lateral area)

$SA = 2\cdot\frac{1}{2}\cdot b\cdot h - 2\cdot\pi r^2 +$ Perimeter of Base $\cdot$ Height $+ 2\pi r h$

$SA = 2\cdot\frac{1}{2}\cdot 14\cdot h - 2\cdot\pi\cdot(3/2)^2 + (14\cdot3)(10) + 2\pi(3/2)(10)$

need to find height of triangle:



$h = 7\sqrt{3}$

$SA = 14\cdot7\sqrt{3} - 2\pi\cdot 9/4 + 420 + 30\pi$

$SA = 98\sqrt{3} - \frac{9\pi}{2} + 420 + 30\pi$

$$\boxed{SA = 420 + 98\sqrt{3} + \frac{51\pi}{2}\ ft^2}$$

Shape-by-Shape

3 rectangles, 2 triangles with holes, interior cylinder

- 3 rectangles: $3\cdot14\cdot10$
  $420\ ft^2$
- 2 triangles w/ holes:
  $2\cdot\frac{1}{2}\cdot b\cdot h - 2\pi r^2$
  $2\cdot\frac{1}{2}\cdot14\cdot7\sqrt{3} - 2\pi(3/2)^2$
  $98\sqrt{3} - \frac{9\pi}{2}$
- Interior cylinder (only lateral area)
  $2\pi r h$
  $2\pi(3/2)(10)$
  30π

★now add them all up

(14)

$SA = 100\pi$

$100\pi = 4\pi r^2$

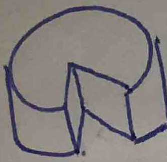
$25 = r^2$

$5 = r$

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

$V = \frac{4\pi\cdot5^3}{3}$

$$\boxed{V = \frac{500\pi}{3}\ in^3}$$

(15)  6in

D=10 in

$45°$ slice $\rightarrow \frac{45}{360} = \frac{1}{8}$

So there is 7/8 of the cake still left!

* we are ADDING two rectangles to the SA!

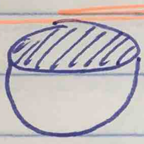
~~$SA = 2\pi rh + 2\pi r^2$~~

$SA = 7/8 \cdot 2\pi rh + 7/8 \cdot 2\pi r^2$ + two rectangles

$SA = 7/8 \cdot 2 \cdot \pi \cdot 5 \cdot 6 + 7/8 \cdot 2 \cdot \pi \cdot 5^2 + 2 \cdot 5 \cdot 6$

$SA = \frac{105\pi}{2} + \frac{175\pi}{4} + 60$

$$\boxed{SA = \frac{385\pi}{4} + 60 \text{ in}^2}$$

(16)  $d = 5in$

~~$SA = 4\pi r^2$~~ * we only have 1/2 a grapefruit!

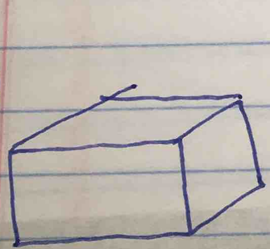
$SA = \frac{1}{2} \cdot 4\pi r^2 + \pi r^2 \leftarrow$ must add the top!

$SA = \frac{1}{2} \cdot 4 \cdot \pi \cdot (5/2)^2 + \pi (5/2)^2$

$SA = 2 \cdot \pi \cdot \frac{25}{4} + \pi \cdot \frac{25}{4}$

$SA = \frac{25\pi}{2} + \frac{25\pi}{4}$

$$\boxed{SA = \frac{75\pi}{4} \text{ in}^3}$$

(17) 

$V = 162 \text{ in}^3$

$l = 1.5(2x) \rightarrow l = 3x$

$w = 2x$

$h = x$

$x \cdot 2x \cdot 3x = 162$

$6x^3 = 162$

$x^3 = 27 \rightarrow x = 3$

Dimensions are $9 \times 6 \times 3$