

Area and Volume Problems

1.



Volume of entire cylinder

$$\begin{aligned}V &= \pi r^2 h \\ &= \pi (3)^2 (4.8) \\ &= 135.72 \text{ in}^3\end{aligned}$$

Volume of empty cylinder

$$\begin{aligned}V &= \pi r^2 h \\ &= \pi (0.8)^2 (4.8) \\ &= 9.65 \text{ in}^3\end{aligned}$$

$$\text{Volume of Toilet Paper} = 135.72 - 9.65 = \boxed{126.07 \text{ in}^3}$$

Thickness of 1 sheet =

$$\begin{aligned}\text{Volume of 1 sheet} &= 126.07 / 1000 \\ &= 0.126 \text{ in}^3\end{aligned}$$

One sheet is
0.012" thick

$$\begin{aligned}V &= l \cdot w \cdot h \\ 0.126 &= 4.8 \cdot 2.2 \cdot h \\ 0.126 &= 10.56h \\ \frac{0.126}{10.56} &= \frac{10.56h}{10.56} \\ 0.012 \text{ in} &= h\end{aligned}$$

2.

$$\begin{aligned}V &= Bh \\ V &= 9 \cdot 12\end{aligned}$$

$$\text{Area of base} = 3 \cdot 3 = 9$$

$$V = \boxed{108 \text{ ft}^3}$$

3.

$$\begin{aligned}\text{a. Carpeted Area} &= l \cdot w \\ &= 10 \cdot 12 \\ &= 120 \text{ ft}^2\end{aligned}$$

$$\boxed{120 \text{ ft}^2 \text{ of carpet}}$$

b. walls:

$$\begin{aligned}\text{Surface Area of walls} &= 2l_1w + 2l_2w \\ &= 2(10)(8) + 2(12)(8) \\ &= 160 + 192 \\ &= 352 \text{ sq ft.}\end{aligned}$$

One bucket of paint covers 8 ft²

$$\begin{aligned}\# \text{ of buckets} &= \frac{\text{Total Area}}{8 \text{ ft}^2/\text{bucket}} = \frac{352 \text{ ft}^2}{8 \text{ ft}^2/\text{bucket}}\end{aligned}$$

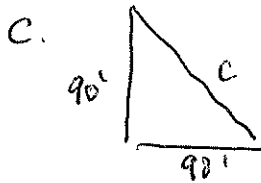
$$= \boxed{44 \text{ buckets of paint}}$$

4. a. $P = 2l + 2w$
 $= 2(90) + 2(90)$
 $= 360 \text{ ft}$

Perimeter of base paths is 360 ft

b. $A = l \cdot w$
 $= 90 \cdot 90$
 $= 8100 \text{ ft}^2$

Area of infield = 8100 ft²



$a^2 + b^2 = c^2$
 $90^2 + 90^2 = c^2$
 $\sqrt{16,200} = c$
 $127.28 = c$

The distance from home to second base is 127.28 ft

d. $A = \frac{1}{2}bh$
 $= \frac{1}{2}(90)(90)$
 $= 4050 \text{ ft}^2$

Area of 1 triangle is 4050 ft²

5. $V = \pi r^2 h$
 $V = \pi (9)^2 (3)$
 $V = 763.41 \text{ ft}^3$

How many gallons?

Gallons = $\frac{V}{0.134 \text{ ft}^3/\text{gallon}}$
 $= \frac{763.41}{0.134}$
 $= 5697.1 \text{ gallons}$

It will take 5697.1 gallons to fill the pool up to 3 feet deep.

6. My yard: $A = l \cdot w$
 $= 12 \cdot 12$
 $= 144 \text{ ft}^2$

Friend's yard: $A = s^2$
 $\sqrt{144} = \sqrt{s^2}$
 $12 = s$

The sides of my friend's yard are 12 ft

7. $P = 2l + 2w$
 $340 = 2(50) + 2w$
 $340 = 100 + 2w$
 $-100 \quad -100$

 $\frac{240}{2} = \frac{2w}{2}$
 $120 = w$

$A = l \cdot w$
 $= (50)(120)$
 $= 6000$

Area = 6000 ft²

8. a. Total Area = Area of Room - Area for stairwell $A = l \cdot w$
to be floored

$$\begin{aligned} A &= 20 \cdot 24 - 4 \cdot 12 \\ &= 480 - 48 \\ &= 432 \text{ ft}^2 \end{aligned}$$

Area to be floored equals 432 ft²

b. # of boxes needed = $\frac{\text{Area to be floored}}{22.5 \text{ ft}^2/\text{box}}$

$$\begin{aligned} &= \frac{432}{22.5} \\ &= 19.2 \text{ boxes} \end{aligned}$$

19.2 boxes will be needed

c. Cost = # of boxes \cdot 70.95/box
 $= 19.2 \cdot 70.95$
 $= \$1,362.24$

Total cost is \$1,362.24

* If you can only buy full boxes:

$$\begin{aligned} \text{Cost} &= \# \text{ of boxes} \cdot 70.95/\text{box} \\ &= 20 \cdot 70.95 \\ &= \$1419 \end{aligned}$$

Total Cost for FULL boxes \$1419

9. Area of Patio = $l \cdot w$
 $= (12)(18)$
 $= 216 \text{ ft}^2$

Area of fountain = πr^2
 $= \pi(4)^2$
 $= 50.27 \text{ ft}^2$

Area to be paved = $216 - 50.27 = 165.73 \text{ ft}^2$

Area of a brick = $l \cdot w$
 $= (4)(8)$
 $= 32 \text{ in}^2$

More helpful \rightarrow $A = l \cdot w$
 $= (\frac{1}{3})(\frac{2}{3})$
 $= \frac{2}{9} = 0.22 \text{ ft}^2$

of bricks needed = $\frac{\text{Area to be paved}}{0.22 \text{ ft}^2/\text{brick}} = \frac{165.73}{0.22} = 753.3$

754 bricks

$$\begin{aligned}
 10. \text{ a. } V &= l \cdot w \cdot h \\
 &= (37.75)(11.5)(17.125) \\
 &= 7434.4 \text{ in}^3
 \end{aligned}$$

Volume of the tank = 7434.4 in^3

$$\begin{aligned}
 \text{b. } \# \text{ of total gallons} &= \frac{\text{Volume}}{231 \text{ in}^3/\text{gallon}} \\
 &= \frac{7434.4}{231} \\
 &= 32.2 \text{ gallons}
 \end{aligned}$$

The tank can hold 32.2 gallons of water.

$$\text{c. } 10 \text{ gal} \cdot 231 \text{ in}^3/\text{gal} = 2310 \text{ in}^3 \leftarrow \text{Volume of 10 gallons}$$

$$\begin{aligned}
 V &= l \cdot w \cdot h \\
 2310 &= (37.75)(11.5)h \\
 \frac{2310}{434.125} &= \frac{434.125h}{434.125} \\
 5.32 &= h
 \end{aligned}$$

For 10 gallons, the depth will be 5.32 in

11. Large Box

$$\begin{aligned}
 SA &= 2(8 \cdot 11) + 2(3 \cdot 11) + 2(3 \cdot 8) \\
 &= 2(88) + 2(33) + 2(24) \\
 &= 290 \text{ m}^2
 \end{aligned}$$

$$\begin{aligned}
 V &= l \cdot w \cdot h \\
 &= (8)(11)(3) \\
 &= 264 \text{ in}^3
 \end{aligned}$$

$$\begin{aligned}
 \text{Cardboard needed difference} &= SA \text{ Large Box} - SA \text{ Small Box} \\
 &= 290 - 200 \\
 &= 90 \text{ m}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{Volume Difference} &= V \text{ large box} - V \text{ small box} \\
 &= 264 - 150 \\
 &= 114 \text{ m}^3
 \end{aligned}$$

Small Box

$$\begin{aligned}
 SA &= 2(6 \cdot 10) + 2(2.5 \cdot 10) + 2(2.5 \cdot 6) \\
 &= 2(60) + 2(25) + 2(15) \\
 &= 200 \text{ m}^2
 \end{aligned}$$

$$\begin{aligned}
 V &= l \cdot w \cdot h \\
 &= (6)(10)(2.5) \\
 &= 150 \text{ in}^3
 \end{aligned}$$

You need 90 in² more cardboard to make the large box.

The large box holds 114 in³ more cereal than the small box