1.

than 1000 in total volume.   4 fish × $\frac{160 in^3}{fish}$ = 640 in³ needed for 4 fish

Aquarium shape... How 'bout a prism or box?
Needs at least 640 volume but less than 1000 in³.

8 in
12 in   8 in
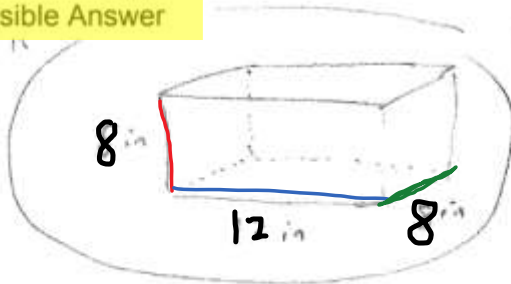
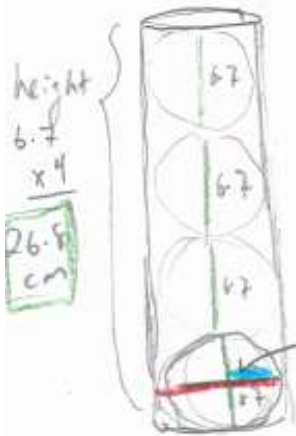TIP: use trial and error until you find dimensions that work!

V = 12 × 8 × 8 = 768 in³

fits between 640 and 1000!
yay!

2.   Tennis balls are sold in cylindrical cans with the balls stacked on atop the other. A tennis ball has a diameter of 6.7cm. Find the approximate minimum volume, in cubic centimeters, of a can that can hold 4 such tennis balls.

height
6.7
× 4
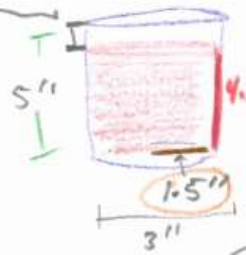26.8 cm

$V = \pi r^2 \cdot h$
$= \pi (3.35)^2 \cdot 26.8$

$V = 300.763\pi$

$V \approx 944.87 \ cm^3$

Diameter:
6.7cm → r = 3.35cm

3. Drinks are being sold. Five hemispherical punch bowls with diameters 10" contain the delicious beverage. The cups being used to distribute the drinks are cylinders 3" wide and 5" tall but are only partially filled, with 1/2" left empty to keep from spilling. $22 have already been spent on cups and supplies, and each drink is being sold for $0.75. If all the punch is sold, approximately how much profit will the seller make?

$-5'' = r$

$\times 5$

$V = \dfrac{\frac{4}{3}\pi r^3}{2} = \dfrac{\frac{4}{3}\pi \cdot (5^3)}{2} = \dfrac{523.6 \text{ in}^3}{2}$

1 bowl ~ 261.8 cm³

5 bowls ~ 1309 cm³ $) \times 5$

Amount of drink

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

$V = \pi (1.5)^2 \cdot 4.5$

$V = 31.81 \text{ in}^3$

Volume of 1 cup

How many cups to sell?

$\dfrac{1309 \text{ cm}^3}{31.81 \text{ cm}^3/\text{cup}} = 41 \text{ cups}$

$\times 0.75 \text{ \$/cup}$

$\$ 30.75$ revenue
-22.00 costs
$\$ 8.75$ profit

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4. A spherical rock with diameter 2.02cm is brought to your lab for identification. Its mass is measured on a scale to be 12.6g. Based on the table below, find the most likely category for the rock.
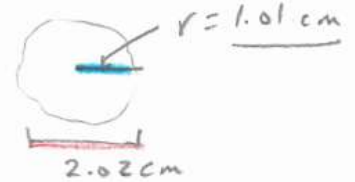
MASS

Type	Density (g/cm³)
Shale	0.34
Graphite	2.23
Talc	2.92
Pyrite	5.02

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

$V = \dfrac{4}{3}\pi (1.01)^3$

$V \approx 4.32 \text{ cm}^3$

VOLUME

$r = 1.01 \text{ cm}$

2.02 cm

$D = \dfrac{M}{V}$

$D = \dfrac{12.6 \text{ g}}{4.32 \text{ cm}^3} \Rightarrow 2.92 \text{ g/cm}^3 -$ Talc

5.

3. Find the missing data values in the table. Round each to the nearest whole number.

Country	Total Population	Area (km²)	Density (people/km²)
Peru	29,555,000	1,285,000	23
Morocco	34,000,000	450,000	76
Laos	6,800,000	251,851	27

$D = \dfrac{stuff}{Space}$ {in this problem} → $\dfrac{people}{area}$

Perú:

$D = \dfrac{m}{V}$

$23 = \dfrac{m}{1,285,000}$

$(23)(1,285,000) = m$

$29,555,000$ people

Morocco

$D = \dfrac{m}{V}$

$D = \dfrac{34,000,000}{450,000}$

$D \approx 76 \ p/km^2$

Laos

$D = \dfrac{m}{V}$

$27 = \dfrac{6,800,000}{V}$

$27 \cdot V = 6,800,000$

$\hookrightarrow V = \dfrac{6,800,000}{27} \approx 251,852 \ km^2$

6. Find the exact surface area of the object in #7.
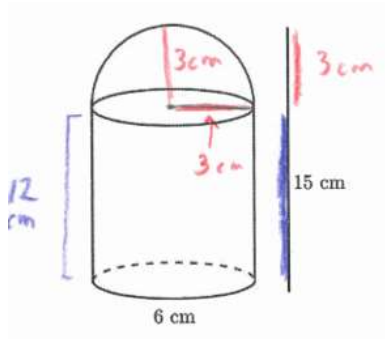
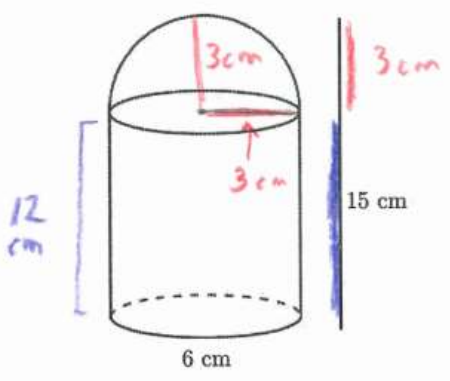$SA_{HS} = \dfrac{1}{2} \cdot 4\pi r^2 \longrightarrow 2\pi(3)^2 \longrightarrow 18\pi$

$SA_{CYL} = \cancel{2}\pi r^2 + 2\pi r h = \pi(3)^2 + 2\pi(3)(15)$

only 1 Circle Visible (bottom)

$= 9\pi + 90\pi = 99\pi$

Sum:

$117 \ \pi \ cm^2$

7.

Find the volume of the object below, which consists of a cylinder capped by a hemisphere.

$V_{CYL} = \pi r^2 \cdot h$

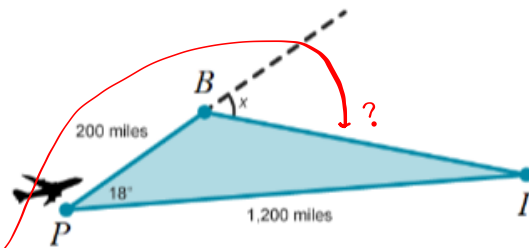$V_{CYL} = \pi \cdot 3^2 \cdot 12$

$V_{CYL} = 108\pi \ cm^3$

$V_{sphere} = \dfrac{4}{3}\pi r^3 \longrightarrow V_{\frac{1}{2} sphere} \ \dfrac{\frac{4}{3}\pi r^3}{2}$

$\dfrac{\frac{4}{3}\pi(3^3)}{2} = \dfrac{36\pi}{2}$

18π

108π

18π

$108\pi = 108\pi + 18\pi = 126\pi \ cm^3$
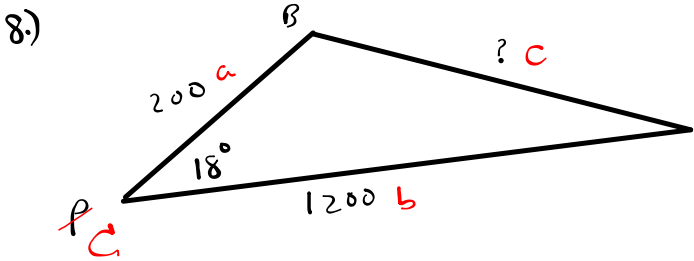
$\approx 395.8 \ cm^3$

SRT-C8b

On a flight to Istanbul, a pilot hits severe weather and needs to make flight adjustments. The originally planned travel route was 1200 miles; however, the plane has veered off course by 18 degrees for 20 minutes while flying at a speed of 600 miles per hour as shown in the diagram below.

8. To the nearest mile, find the distance that the plane now has to travel to reach Istanbul.

9. Find the angle, x, that the plane must turn through to reach Istanbul.

8.)

Can I use law of Sines??

no..don't have opposite side/angle pair

So I must use Law of Cosines

$$c^2 = b^2 + a^2 - 2ab \cdot \cos C$$

$$C' = 1200^2 + 200^2 - 2(200)(1200) \cdot \cos(18)$$

directly as-is into calc, 1 line

$$c^2 = 1,023,492.872$$
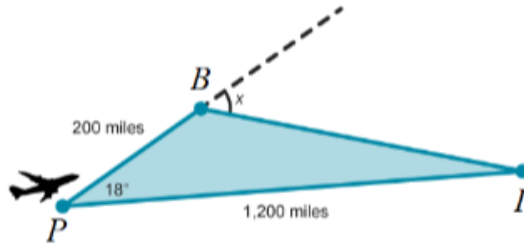
$$c = 1011.678 \rightarrow \boxed{1012 \text{ miles}}$$

Law of Cosines to find a Side

1. Rename desired side c, opposite angle C

2. Call other two angles A and B, with opposite sides a and b

3. Plug into formula; everything on one side should be known

SRT-C8b
On a flight to Istanbul, a pilot hits severe weather and needs to make flight adjustments. The originally planned travel route was 1200 miles; however, the plane has veered off course by 18 degrees for 20 minutes while flying at a speed of 600 miles per hour as shown in the diagram below.

8. To the nearest mile, find the distance that the plane now has to travel to reach Istanbul.

9. Find the angle, x, that the plane must turn through to reach Istanbul.

9.

1012 [from #8]
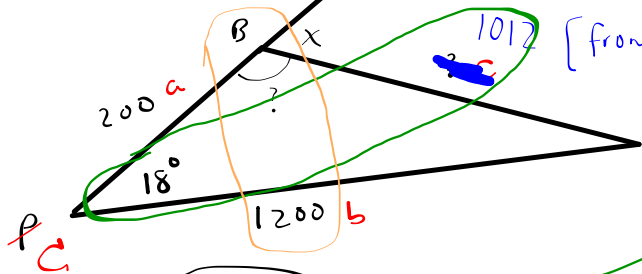
Plan: find angle B, then subtract from 180°

Can I use law of Sines??
Yes!! Now that I have 1012, I still have the opposite angle (18°).

$$\frac{\sin B}{1200} = \frac{\sin 18°}{1012}$$

$$1012 \cdot \sin B = 1200 \cdot \sin 18°$$

$$\frac{1012 \cdot \sin B}{1012} = \frac{370.820}{1012}$$

$$\sin B = 0.366$$

INVERT!

$$\sin^{-1}(0.366) = B$$

$$21.5° = B$$

∠B is obtuse, so

$$180 - 21.5°$$

$$B = 158.5°$$

$$\boxed{x = 21.5°}$$