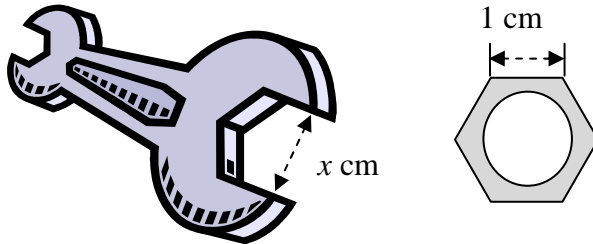


SOML MEET 2
EVENT 1
APPLICATIONS OF GEOMETRY

NAME: _____
TEAM: _____
SCHOOL: _____

1. [2 Points] If the wrench just fits the hexagonal nut, what is the width labeled x in the picture below? Be precise.



ANS: _____ **cm**

2. [3 Points] Ann took two 8-inch-by-10-inch rectangular pieces of sheet metal, and rolled each piece into a tube, one with a circumference of 8 inches, the other with a circumference of 10 inches. She put a circular bottom on each tube to create cylindrical cans that could be filled with sand. What was the volume of the taller can? Express your answer in simplest form (in terms of π).

ANS: _____ **cubic inches**

3. [5 Points] The length and width of a right, rectangular prism were each decreased by 20%. By what percent must the height be increased for the volume to remain unchanged? Be precise.

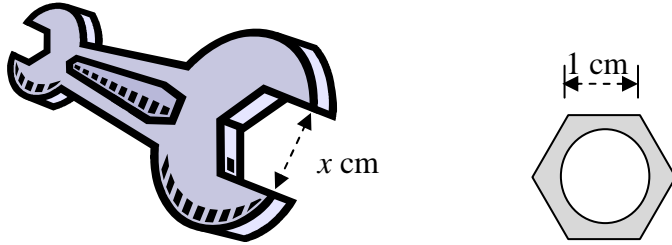
ANS: _____ **%**

SOML MEET 2
EVENT 1
APPLICATIONS OF GEOMETRY

NAME: Key
TEAM: _____
SCHOOL: _____

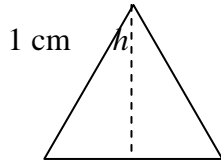
1. [2 Points]

If the wrench just fits the hexagonal nut, what is the width labeled x in the picture below? Be precise.



Solution:

Connect the center of the nut to each vertex to form six equilateral triangles. One such triangle looks like this:



By the Pythagorean Theorem, $(1/2)^2 + h^2 = 1^2$, which implies that

$$h = \frac{\sqrt{3}}{2}$$

Then $x = \text{height of the nut} = 2h = \sqrt{3}$ cm.

ANS: $\sqrt{3}$ cm

2. [3 Points]

Ann took two 8"-by-10" rectangular pieces of sheet metal, and rolled each piece into a tube, one with a circumference of 8 inches, the other with a circumference of 10 inches. She put a circular bottom on each tube to create cylindrical cans that could be filled with sand. What was the volume of the taller can? Express your answer in simplest form (in terms of pi).

Solution:

The taller can will have a circumference of 8 inches, and its height will be 10 inches. (The shorter can will have a height of only 8 inches.)

Since circumference = $2\pi \cdot (\text{the radius})$, the radius = $\frac{\text{circumference}}{2\pi}$. Therefore, the radius of the taller

cylinder is $\frac{8}{2\pi} = \frac{4}{\pi}$ inches. Volume of the taller cylinder is $\pi r^2 h = \pi \left(\frac{4}{\pi}\right) \left(\frac{4}{\pi}\right) \cdot 10$,

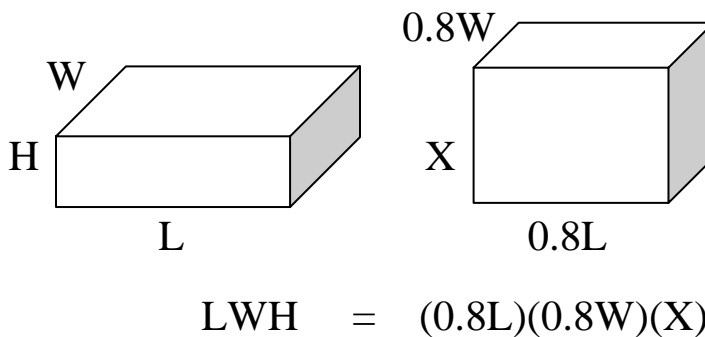
which simplifies to $\frac{160}{\pi}$ cubic inches.

ANS: $\frac{160}{\pi}$ cubic inches

3. [5 Points]

The length and width of a right, rectangular prism were each decreased by 20%. By what percent must the height be increased for the volume to remain unchanged? Be precise.

Solution:



Let L , W , and H be the original dimensions. Let X represent the unknown height of the new solid. If L and W are reduced by 20%, then 80% of each remains. Thus, the new volume is $(.8L)(.8W)X$, which should equal the original volume, LWH . This implies that $LWH = .64LWX$. Solving for X , we find that $X = H/.64 = H \div (64/100) = H \cdot (100/64) = H \cdot 1.5625$. Thus, H is increased by 56.25%.

ANS: H is increased by 56.25%.