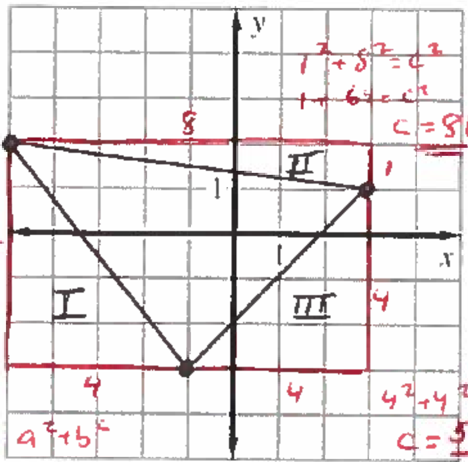
5. The vertices of a triangle are $(3,1), (-5,2)$ and $(-1,-3)$. Classify the triangle as scalene, isosceles or equilateral. Find the area and perimeter.




$1^2 + 8^2 = c^2$
$1 + 64 = c^2$
$c = 8.1$

$P = 8.1$
$5.7$
$+ 6.4$
$20.2$

$\boxed{P = 20.2 \text{ units}}$

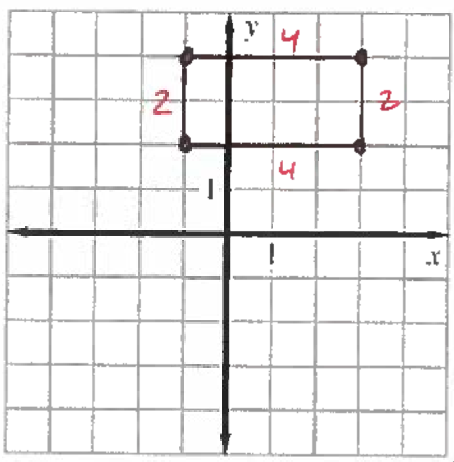
$4^2 + 4^2 = c^2$
$c = 5.7$

$c^2 = a^2 + b^2$
$4^2 + 5^2$
$16 + 25$
$c = 6.4$

$A_{TRI} = A_{SQ} - [A_{I} + A_{II} + A_{III}]$
$5 \cdot 8 - [\frac{1}{2} 4 \cdot 5 + \frac{1}{2} 8 \cdot 1 + \frac{1}{2} 4 \cdot 4]$
$40 - [10 + 4 + 8]$
$40 - 22 = 18$

$\boxed{A_{TRIANGLE} = 18}$

6. Draw a rectangle with vertices whose coordinates are $(-1,2), (-1,4), (3,4)$ and $(3,2)$




$P = 2 + 2 + 4 + 4$

$\boxed{P = 12 \text{ units}^2}$

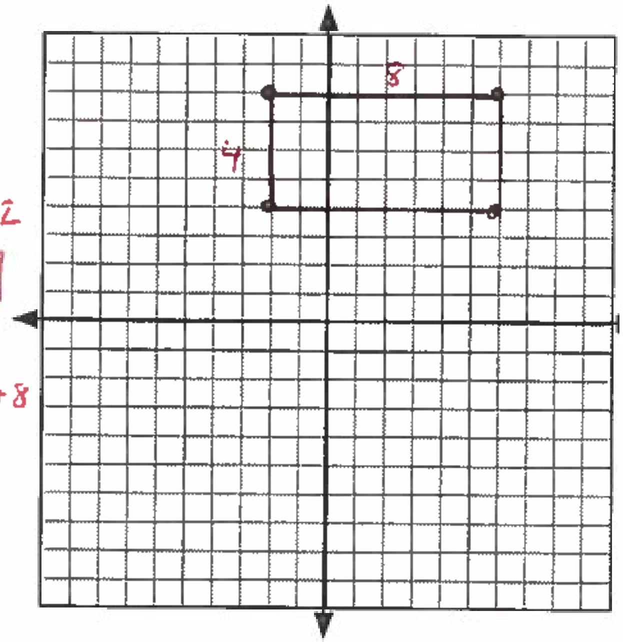
$A = l \cdot w$
$= 2 \cdot 4$

$\boxed{A = 8 \text{ units}^2}$

***Part A:*** Find the perimeter and area of the rectangle.

***Part B:*** Multiply the coordinates of the vertices of the rectangle by 2.

***Part C:*** Draw the rectangle whose vertices you found in part B. Find the area and perimeter of the new rectangle.



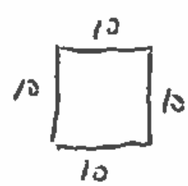

AREA
$l \cdot w = 32$
$\boxed{A = 32}$

Perimeter
$4 + 8 + 4 + 8$
$\boxed{P = 24}$

7. Danielle has 40 yd of fencing to enclose a safe space for her rabbits. She has narrowed down her choices to either a square or circular enclosure. Which one would provide more area for her rabbits, and by how many square yards?

Square

$40 \div 4 = 10$ yd




$A = 10 \times 10$

$\boxed{A = 100 \text{ ft}^2}$

Circle

$C = 40$

$C = 2 \cdot 3.14 \cdot r$

$\frac{40}{6.28} = r = 6.4$

$A: \pi r^2$

$3.14 \cdot 6.4^2$

$\boxed{A = 128.6 \text{ yd}^2}$



Circular Pen will Maximize the Area

**G.MG.2** *I can use the concept of density in the process of modeling a situation.*

8. A county has a population density of 365 people per square mile. The county population is 23000. What is the area of this county? Round to the nearest square mile if necessary.

$$\text{Population Density} = \frac{\text{Population}}{\text{AREA}}$$

$$365 \frac{\text{People}}{mi^2} = \frac{23{,}000}{x}$$

X = 63.0 Square miles

9. An architect is designing a conference room for an office building. The room must be able to hold 20 people. The architect estimates that each person requires between 25 and 30 square feet. Which of the following room dimensions meets these requirements?

   a. 21 ft x 29 ft
   b. 19 ft x 28 ft
   c. 13 ft x 38 ft
   d. 22 ft x 22 ft

MINIMUM AREA = 20·25 = 500 ft²

MAXIMUM AREA = 20·30 = 600 ft²

a) 21×29 = 609 TOO BIG
b) 19×28 = 532 OK
c) 13×38 = 494 TOO SMALL
d) 22×22 484 TOO SMALL

IT IS BETWEEN 500 & 600 Sq. Ft

10. The area of Missouri is 69,709 mi² and its population is 5,988,927. The average state population density is 87.4 people per square mile. How does the population density of Missouri compare to the national average?

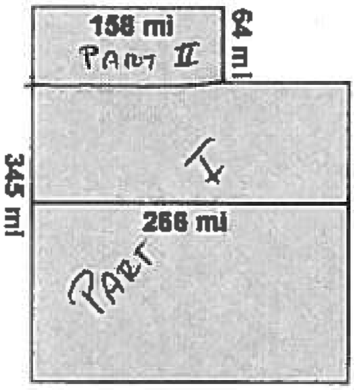
$$\text{Pop. Density} = \frac{\text{Population}}{\text{Area}} = \frac{5{,}988{,}927}{69{,}709}$$

Pop. Density of Missouri = 85.9 people per mi²

$87.4 - 85.9 = 1.5$

The Pop. Density of Missouri is 1.5 people/mi² less than the average of the other State.

11. The borders of the state of Utah have approximately the lengths shown on the map. The United States Department of the Census projects that Utah will have a population of 2, 990,094 in the year 2020. Based on this information, find the population density of Utah in 2020.




TOTAL AREA = PART 1 + PART 2

$345 - 64 = 281$

$(281)(266) + (158)(64)$

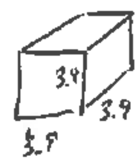
$74{,}746 + 10{,}112$

$84858\ mi^2$

$$\text{Pop. Den} = \frac{\text{POPULATION}}{\text{AREA}} = \frac{2{,}990{,}094 \text{ people}}{84859 \text{ miles}^2} = \boxed{35.2 \frac{\text{People}}{mi^2}}$$

12. Each side of a cube measures 3.9 centimeters. Its mass is 95.8 grams. Find the density of the cube. Round to the nearest hundredth if necessary.

   a. 24.56 g/cm³
   b. 0.62 g/cm³
   c. 1.61 g/cm³
   d. 373.62 g/cm³




$V = l \cdot w \cdot h$

$= (3.9)(3.9)(3.9)$

$V = 59.3\ cm^3$

$$\text{Density} = \frac{m}{V} = \frac{95.9\ g}{59.3\ cm}$$

Density = 1.62 g/cm³

Answer: C

13. Each side of a cube measures 2.6 centimeters. Its mass is 93.6 grams. Find the density of the cube. Round to the nearest hundredth if necessary.

$V_{cube} = 2.6^3 = 17.576$

$$\text{Density} = \frac{m}{V} \quad \frac{93.6}{17.576}$$

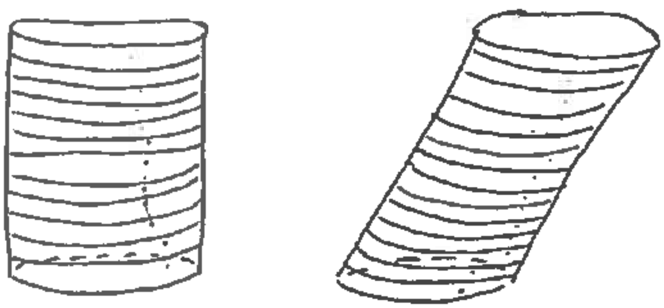
   a. 36 g/cm³
   b. 0.19 g/cm³
   c. 5.32 g/cm³
   d. 243.36 g/cm³

$\boxed{5.33\ g/cm^3}$

**G-GMD.1-** ***I can explain the formulas for volume of a cylinder, pyramid, and cone by using dissection, Cavalieri's, informal limit argument.***

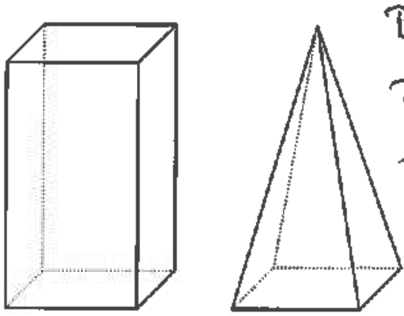
14. How could you use a stack of round drink coasters to demonstrate Cavalieri's Principle? Draw sketches to illustrate your answer.

Coaster:



15. Evan has a popcorn container in the shape of a square prism that can hold 360 cubic inches. He also has some square-pyramid-shaped containers with the same height and base side lengths as the square prism. How many pyramid-shaped containers can he can fill from the prism-shaped container? Explain your answer.

HE CAN FILL THE PYRAMID 3 TIMES



Square prism Square pyramid

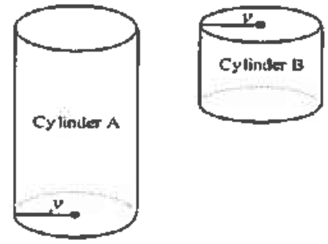
BECAUSE THE PRISM HAS 3 TIMES MORE VOLUME THAN THE SQUARE PYRAMID.

$B \cdot h \rightarrow \frac{1}{3}Bh$

Same formula but pyramid is just a 1/3 of the prism.

16. The height of Cylinder A is 26 feet. The height of Cylinder B is 14 feet. What is the ratio of the volume of Cylinder A to the volume of Cylinder B?

26′ 14′




$\frac{(\pi r^2 h)\ \text{Cyl. A}}{\pi r^2 h\ \text{Cyl. B}}$

a. $\boxed{\frac{13}{7}}$

b. $\frac{13}{7}\pi$

c. $\frac{7}{13}$

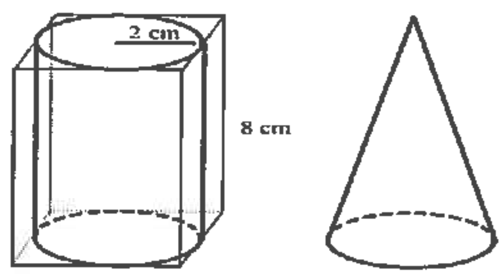
d. $\frac{7}{13}\pi$

$\frac{\pi \cdot y^2 \cdot 26}{\pi\ y^2 \cdot 14}$

Cancle $\pi \cdot y^2$

$\frac{26}{14} = \boxed{\frac{13}{7}}$

17. A square prism has a cylinder fitted inside it so that the square just touches the circle, as shown. The radius of the cylinder is 2 cm and its height is 8 cm.




Which has a greater volume: the part of the prism that is outside the cylinder, or a cone with the same radius and height as the cylinder? Justify your answer.

Volume Prism = $l \cdot w \cdot h$

$4 \cdot 4 \cdot 8$

$16 \cdot 8$

$V_{Prism} = 128$

Volume of Cyl. $\pi r^2 h$

$3.14 \cdot 2^2 \cdot 8$

$V_{CYL} = 100.48$

Volume of Cone $= \frac{1}{3}\pi r^2 h$

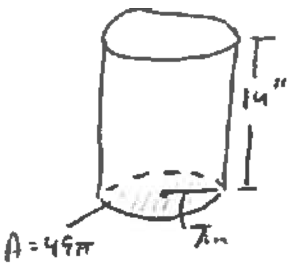
$\frac{1}{3} 3.14 \cdot 2^2 \cdot 8$

$V_{CONE} = 33.5$

VOLUME OF PRISM OUTSIDE THE CYLINDER $128 - 100.48$ $27.52\ cm^3$

THE VOLUME OF THE CONE IS GREATER THAN THE VOLUME OF THE PRISM OUTSIDE THE CYLINDER

18. Find the volume of a cylinder with a base area of 49π inches squared and a height equal to twice the radius. If necessary, round to the nearest tenth.




$V = \pi r^2 h$

$= \pi 7^2 \cdot h$

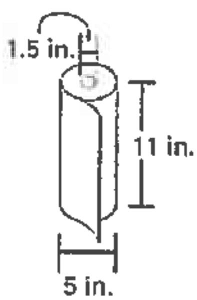
$49 \cdot 3.14 \cdot 14$

$V = 2154.04$

$\boxed{V = 2154.0 \text{ in}^3}$

19. A roll of paper towels is wrapped around a cardboard cylinder with a diameter of 1.5 in. The diameter of the whole roll of paper towels is 5 in. What is the volume of the paper on the role to the nearest cubic inch?

$d = 1.5 \quad r = .75$




$d = 5 \quad r: 2.5$

$V_{cylinder} - V_{tube} = V_{paper}$

$\pi r^2 h - \pi r^2 h$

$3.14(2.5)^2 11 - 3.14(.75)^2 11$

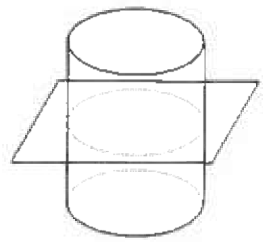
$215.875 - 19.428$

$196.447 \text{ in}^3$

$\boxed{196 \text{ in}^3}$

**G-GMD.4:** *I can identify shapes of 2-dimensional cross-section of 3-dimensional objects. I can identify 3-dimensional objects generated by rotations of 2-dimensional objects.*

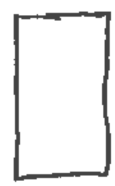
20. Given the diagram below:



**Part A:** Describe the cross section.

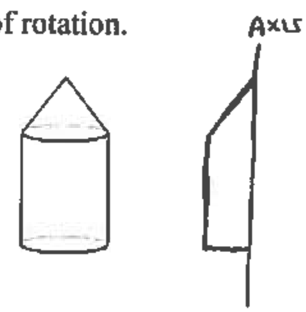
A Circle

**Part B:** Sketch and describe the cross section if the plane was drawn perpendicular to the base of the cylinder.



IT WOULD BE A RECTANGLE

21. Draw the 2D shape that would produce the solid below if rotated 360°. Make sure to label the axis of rotation.



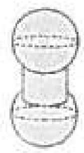
22. Draw the solid of revolution formed by the shape rotated around the axis given.

THIS WILL MAKE A 3D FIGURE.

a.

2D

b.

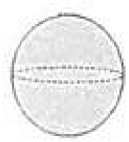


3D

c

2D

*d.*



3D

**G-GMD.3-** *I can use volume formulas for cylinders, pyramids, cones and spheres to solve problems.*

23. A cone is inscribed in a cylinder with radius 1.5 units and height 10 units, as shown.


***Part A:*** Find the volume of the cylinder.

$V = \pi r^2 h$

$3.14(1.5^2)(10)$

$\boxed{V = 70.65 \text{ units}^3}$

***Part B:*** Find the volume of the cone.

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

$\frac{1}{3}\, 3.14 \cdot (1.5)^2\,(10)$

$\boxed{V = 23.55 \text{ unit.}^3}$

***Part C:*** Find the ratio of the volume of the cone to the volume of the cylinder.

$\frac{V_{cone}}{V_{cylinder}} \quad \frac{23.55}{70.65} = \boxed{0.33}$