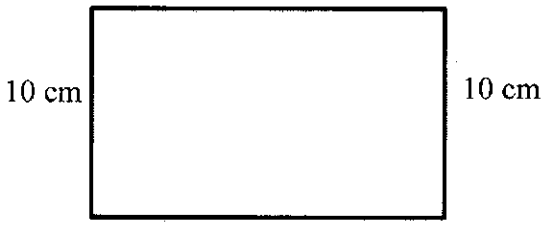
Math 213 Exam 3A Spring 2019 Name Answers

Please copy and sign: I pledge on my honor that I have not given or received any unauthorized assistance on this exam. [signed]

1. Joy likes to design jewelry boxes. She draws a 2 dimensional layout to represent one rectangular face of a jewelry box she is designing. The length of two opposite sides of the 2D drawing is 10 cm, and the total area of the 2D drawing is 200 cm^2.



(a) What is the length of the other two opposite sides? Show your work.

$A = l \cdot w$

$200 = l \cdot 10 \Rightarrow l = 20$ cm

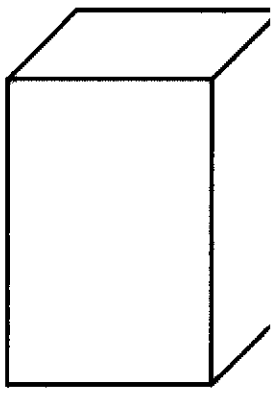
(b) What is the perimeter of the 2D drawing? Show your work. Include appropriate units on your answer.

$2 \cdot 10 + 2 \cdot 20 = 60$ cm

(c) What is the area of the 2D drawing in square millimeters? Show your work using dimensional analysis.

$$200 \text{ cm}^2 \times \frac{10^2 \text{ mm}^2}{1 \text{ cm}^2} = 20000 \text{ mm}^2$$

(d) After building a 3D model of the box, Joy finds that the jewelry box is a rectangular prism. What is the volume of the 3D model, in cubic cm, given that the rectangle above is the base of the prism and the height of the prism is 80 cm.



$V = A \cdot h$.

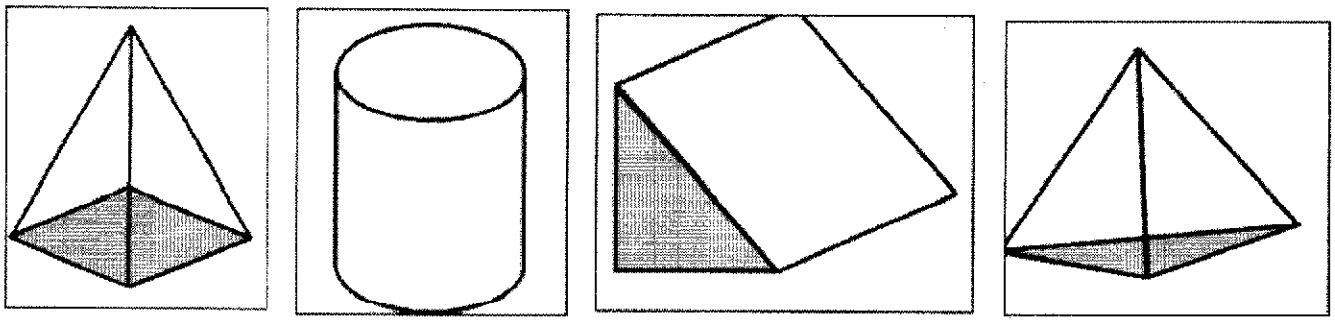
$V = 200 \cdot 80 = 16000 \text{ cm}^3$

(e) Fill in the following about the 3D model:

There are 6 # of faces, 12 # of edges, and 8 # of vertices.

2. Consider the objects below. Indicate the appropriate letters for the questions below.

A B C D



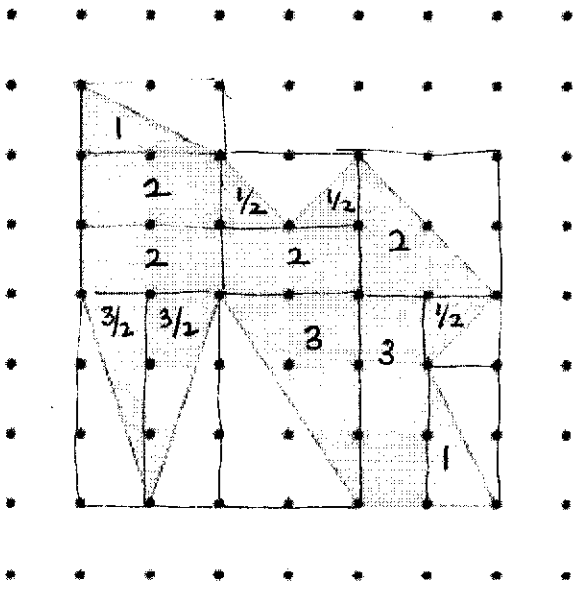
(a) Which are prisms? C

(b) Which are convex? A B C D

(c) Which are pyramids? A D

(d) Which are polyhedra? A C D

3. Find the exact area of the shape below. Annotate the diagram so your thinking is clear.

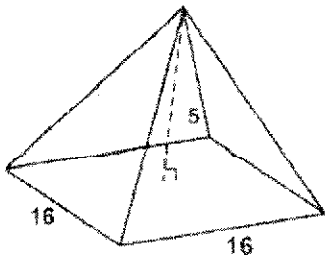


20 1/2 square units

4. Consider the square pyramid below. The base has side length 16 feet, and the vertical height, h, (measured from the center of the square to the apex) is 5 feet. Recall the perpendicular distance from the base to the apex is the "height" of the pyramid (h). On each triangular face connecting the base and the apex the triangle has a "height," which is called the "slant height."

(a) Find the surface area. Include all faces. Include appropriate units on your answer. Round to two decimal places if necessary. Show all work.

Find slant height: x, 5, 8 $\quad x \approx 9.4$



4 triangles @ $\frac{1}{2}(16)(9.4) = 300.8$

Square Base $= 256$

$556.8\ ft^2$

(b) Find the volume of the pyramid. Include appropriate units on your answer. Round to two decimal places if necessary. Show all work. (Recall $V = \frac{1}{3}Bh$)

$V = \frac{1}{3}(16^2)(5) \approx 426.67\ ft^3$

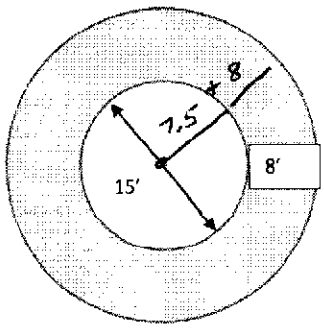
(c) Convert the volume of the pyramid to cubic yards. Show work. Round to two decimal places if necessary.

$1\ yd^3 = 3^3\ ft^3 = 27\ ft^3$

$\frac{426.67}{27} \approx 15.80\ yd^3$

5. A garden path surrounds a circular garden as shown in the diagram. (The shaded region is the path). The garden path is 8 feet wide and the diameter of the circular garden is 15 feet.

(a) What is the area of the garden path? Show work. Include appropriate units on your answer. Round to two decimal places if necessary.



Large circle's area − Small circle's area

$\pi(15.5)^2 - \pi(7.5)^2$

$\approx 577.76 \text{ ft}^2$

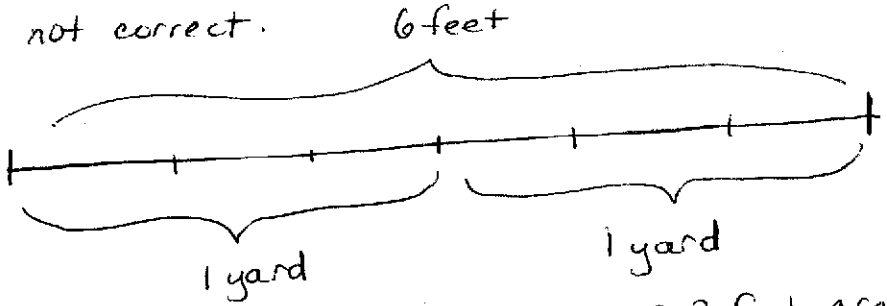
(b) How many plants, spaced every 4 inches, are needed to surround the garden path (the outer circumference)? Show all work. Round to the nearest whole number.

Circumference $= 2\pi r = 2\pi(15.5) = 97.34 \text{ ft} \approx 1168 \text{ in}$

$\frac{1168}{4} = 292$ plants

6. (a) Trey wants to change 6 feet to yards. He believes that he should multiply 6 by 3 since yards are bigger than feet. Is he correct? Use a diagram and the meaning of multiplication or division to help explain.

No, not correct.



Each yard is 3 feet. How many groups of 3 feet are in 6 feet?

$6 \div 3 = 2$ yards

(b) Suppose Trey wanted to change 6 feet to meters instead. Use dimensional analysis and the equality 1 inch = 2.54 cm to find the equivalent number of meters. Show all work.

$6 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{100 \text{ cm}} = 1.8288 \text{ meters}$