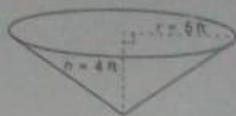
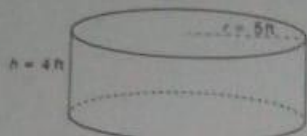


Names _____

EDUC 2551 - Elementary School Math: Geometry
Project 4

1.

The figure shows a right-circular cylinder and a right-circular cone. The cylinder and the cone have the same base and the same height.



a. What is the volume of the cone, in cubic feet?

b. What is the ratio of the cone's volume to the cylinder's volume?

$$\text{Ratio} = \frac{314.2}{104.72} = 3$$

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

$$\text{Volume of cone} = \left(\frac{1}{3} \times 3.142 \times 5^2 \right)$$

$$\text{Volume of cone} = \frac{104.72}{3}$$

$$\text{Volume of cylinder} = \pi r^2 h = 3.142 \times 5^2 \times 4 = 314.2$$

2.

Two dolphins are similar in shape. One is 4 ft long; the other is 1 ft long.

a. How many times heavier is the larger dolphin? 4 times

b. How many times more skin surface does the larger dolphin have? 4 times

3.

Find the total surface area and the volume of the triangular prism shown below.

$$\text{Area of triangle} = \frac{1}{2} \times b \times h = \frac{1}{2} \times 6 \times 8$$

$$\text{Area of triangle} = 24 \text{ units}^2$$

$$\text{Area of rectangle} = 8 \times 12 = 96$$

$$\text{Area of rectangle 2} = 12 \times 10 = 120$$

$$\text{Total Surface area} = (24 \times 2) + (96 \times 2) + 120 = 360$$

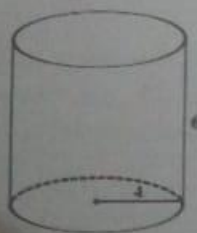


$$\text{Volume} = \frac{1}{2} \times b \times h \times L$$

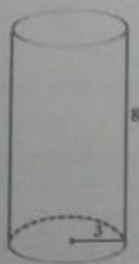
$$= \frac{1}{2} \times 6 \times 8 \times 12 = 288$$

4.

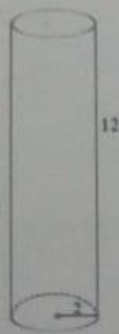
In the figures below, the radius and height of each right circular cylinder are given. If w, x, and y represent the respective volumes of the cylinders, order these volumes (w, x, and y) from least to greatest.



Volume = w



Volume = x



Volume = y

$$\text{Volume } w = \pi r^2 h = 3.142 \times 4^2 \times 6 = 301.632$$

$$\text{Volume } x = 3.142 \times 3^2 \times 8 = 226.224$$

$$\text{Volume } y = 3.142 \times 2^2 \times 12 = 150.816$$

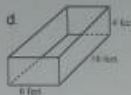
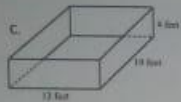
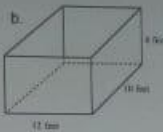
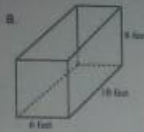
Least to Greatest

$$= y, x, w.$$

Laura made a compost bin with the dimensions shown.



She wants to double the volume of the bin. Which of the following bins will have a volume that is twice the volume of Laura's bin?



D is correct since its volume is double Laura's bin
 Laura bin $V = 6 \times 5 \times 4 = 120 \text{ ft}^3$
 Volume of D = $6 \times 10 \times 4 = 240$
 $\left(\frac{240}{120}\right) = 2$

6. The table shows the approximate measurements of the Great Pyramid of Giza in Egypt and the Pyramid of Kukulcan in Mexico.

Pyramid	Height (meters)	Area of Base (square meters)
Great Pyramid of Giza	147	52,900
Pyramid of Kukulcan	30	3,025

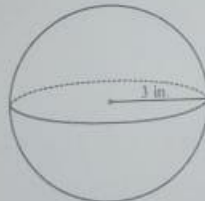
Approximately what is the difference between the volume of the Great Pyramid of Giza and the volume of the Pyramid of Kukulcan?

Difference = $(2,592,100) - 30,250 = 2,561,850$

Volume of Giza =
 $= \frac{1}{3} \times \text{Area} \times \text{Height}$
 $= \frac{1}{3} \times 52,900 \times 147 =$
 $= 2,592,100$

Volume of Kukulcan =
 $\frac{1}{3} \times A \times H = \frac{1}{3} \times 3,025 \times 30 =$
 $= 30,250$

7. a. This sphere has a 3-inch radius.



What is the volume, in cubic inches, of the sphere?

Volume = 113.112 cubic inches

What is the volume of a hemisphere with the same radius in cubic inches?

Volume of sphere
 $= \frac{4}{3} \pi r^3 = \frac{4}{3} \times 3.142 \times 3^3$
 $= 4 \times 3.142 \times 3^2$
 $= 113.112 \text{ inches}^3$

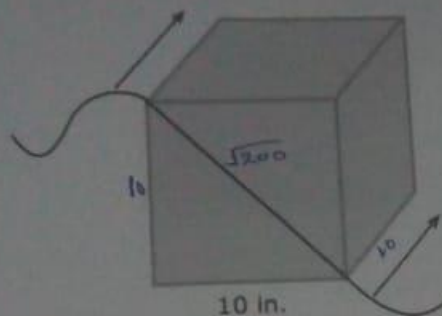
Volume of a hemisphere = $\frac{2}{3} \pi r^3$

$= \frac{1}{2} \text{ volume of sphere}$

$= \frac{1}{2} \times 113.112 = \underline{\underline{56.556 \text{ inches}^3}}$

Daniel buys a block of clay for an art project. The block is shaped like a cube with edge lengths of 10 inches.

Daniel decides to cut the block of clay into two pieces. He places a wire across the diagonal of one face of the cube, as shown in the figure. Then he pulls the wire straight back to create two congruent chunks of clay.



$$\sqrt{200} \times 10 = \text{Area of exposed Cut}$$

$$\sqrt{200} \times 10 = 141.42 \text{ in}$$

round up to whole number = 141 inch

- Daniel wants to keep one chunk of the clay for later use. To keep that chunk from drying out, he wants to place a piece of plastic sheeting on the surface he exposed when he cut through the cube. Describe this newly exposed two-dimensional cross section, and find its area. Round your answer to the nearest whole square inch. Show your work. 141 inch
- Daniel wants to reshape the other chunk of clay to make a set of clay spheres. He wants each sphere to have a diameter of 4 inches. Find the maximum number of spheres that Daniel can make from the chunk of clay. Show your work.

$$V \text{ of sphere} = \frac{4}{3} \pi r^3 = \frac{4}{3} \times 3.142 \times 2^3 = \frac{20.568}{3} = 6.856$$

$$\text{Volume of Chunk} = \left(\frac{1}{2} \times 10 \times 10 \times 10 \right) = 500$$

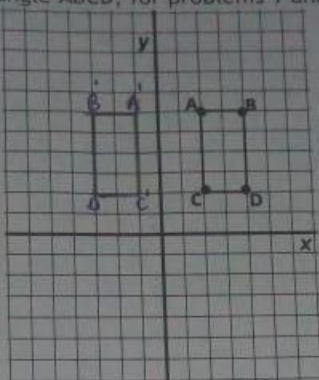
$$\text{Numbers of spheres that can fit} = \frac{500}{6.856} = 72.$$

Names _____

EDUC 2551 - Elementary School Math: Geometry

Project 2

Consider the following object, rectangle ABCD, for problems 1 and 2.

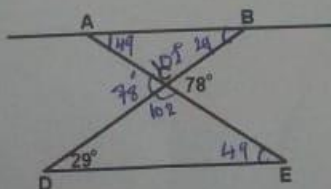


1. Complete the following
 - a. Find the image of rectangle ABCD after a reflection across the y-axis, label it A'B'C'D'.
 - b. Find the image of rectangle A'B'C'D' after a reflection across the x-axis, label it A''B''C''D''.
 - c. Suppose the original points went through a mapping change (x, y) to $(x + 5, -y)$. Find the new points and label them E, F, G, and H.
 - d. What two transformations are depicted in this mapping of rectangle ABCD onto rectangle EFGH?

2. This time you are going to consider dilations.
 - a. Dilate rectangle ABCD emanating from the point C and having a scale factor of 2. What are the vertices (give ordered pairs) for the new image?
 - b. Draw the new rectangle.
 - c. Find the ratio of the perimeter of the new rectangle to the old
 - d. Find the ratio of the area of the new rectangle to the old

3. Create a tessellation pattern by starting with an equilateral triangle. Then take out a piece from one side and rotate it and add it to another side of the triangle. With your newly created tile, use it to tessellate a plane. Show your tessellation pattern and the steps needed to make the pattern.

4. Suppose line AB is parallel to line DE. Find all the missing angle measures. (Note: figure is not drawn to scale.)

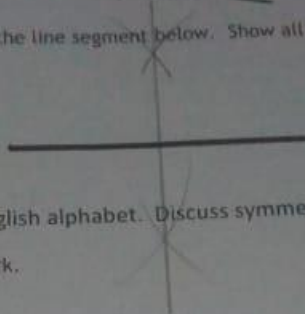


5. Construct a copy of the following using a compass. Show all marks for the construction.



6. Construct the angle bisector for the following angle. Show all marks for the construction.

7. Construct the perpendicular bisector of the line segment below. Show all marks for the construction.



8. Consider the capital letters in the English alphabet. Discuss symmetry for these letters.

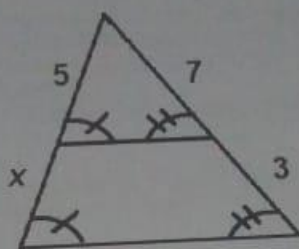
9. Find x for the following. Show your work.

$$(7+3) = (5+x)$$

$$10 = 5 + x$$

$$10 - 5 = x$$

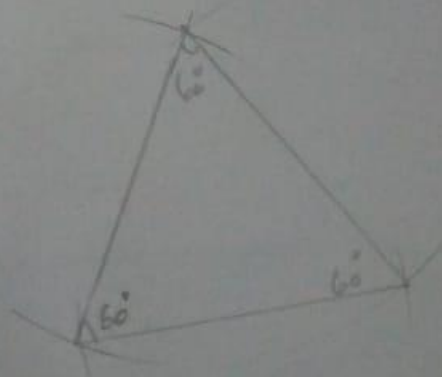
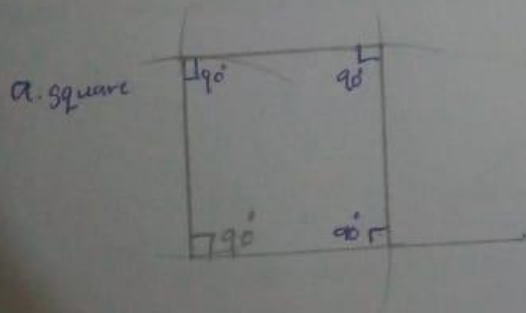
$$x = 5$$



10. Extra Credit - Starting with a sheet of cardboard that has a right angle corner, construct the following in the least number of steps, using only a straightedge and a compass. Make sure to describe all your steps.

a. a square

b. an equilateral triangle



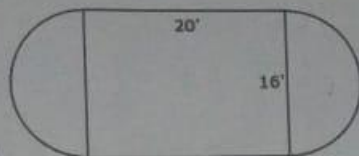
1. A swimming pool is pictured below. Each end is a semicircle and middle section is a rectangle.
- If you were to take a walk around the edge of the pool, how far would it be?
 - What is the area of the pool?

$$C = \frac{1}{2} \pi d = \text{Circumference of a circle}$$

$$= \frac{1}{2} \times 3.142 \times 16 = 25.136$$

Perimeter of the pool

$$= (25.136 \times 2) + (20 \times 2) \\ = 50.272 + 40 = 90.272$$



Area of the pool

= Area of two Semi-circles + Area of rectangle

= Area of semi-circles

$$= \frac{1}{2} \pi r^2 = \frac{1}{2} \times 3.142 \times 8^2$$

$$= 100.544 \times 2 = 201.088$$

$$\text{Area of rectangle} = 20 \times 16 = 320$$

$$\text{Total Area} = 201.088 + 320 = 521.088$$

2. The following questions pertain to the figure below.

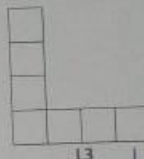
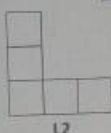
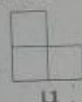
- If each side has a length of 1 unit, find the areas and perimeters of L1, L2, and L3.
- Draw L4 and find its area and perimeter.
- What is the formula for the perimeter of Ln?
- What is the formula for the area of Ln?
- Find the area and perimeter of L10.

$$\text{Area of L1} = (2 \times 1) + (1 \times 1)$$

$$A \text{ of L1} = 3$$

$$\text{Area of L2} = (3 \times 1) + (2 \times 1) \\ = 5$$

$$\text{Area of L3} = (4 \times 1) + (3 \times 1) \\ = 7$$



$$P \text{ of L4} = (5+5+4+1)$$

$$P \text{ of L5} = 19$$

$$P \text{ of L1} = (2+2+1+1+1) \\ \text{Perimeter of L1} = 6$$

$$P \text{ of L2} = (3+3+2+2+1) \\ = 11$$

$$P \text{ of L3} = (4+4+3+3+1) = 15$$

$$P \text{ of Ln} = ((n+1)2 + 2n + 1)$$

$$P \text{ of Ln} = 2n + 2 + 2n + 1$$

$$P \text{ of Ln} = 4n + 3$$

- Find the area of the triangle.
- Find the perimeter of the triangle.

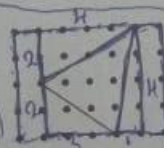
Area of triangle = A of Rectangle - Area of other parts forming Rectangle.

$$A \text{ of triangle} = (6 \times 4) - (4 \times 1) - (\frac{1}{2} \times 2 \times 4) - (\frac{1}{2} \times 2 \times 3)$$

$$= (6 \times 4) - (4 \times 1) - (4 \times 1)$$

$$= 24 - (4 + 4 + 3 + 2 + 4)$$

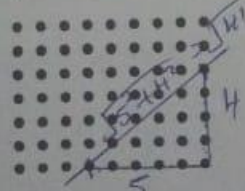
$$= 24 - 17 = 7 \text{ units}^2$$



$$\text{Perimeter of Triangle} = \sqrt{2^2 + 4^2} + \sqrt{2^2 + 3^2} + \sqrt{4^2 + 4^2}$$

$$= 12.198 \text{ units}$$

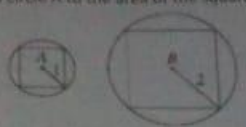
- Draw a line segment that is length of exactly $\sqrt{41}$ units on the square dot grid below.



$$\sqrt{41} = \sqrt{5^2 + 4^2}$$

- A square is inscribed in each of the circles below. The radius of circle A is 1 and the radius of the circle B is 2. What is the

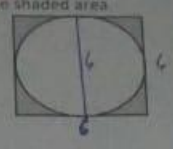
Ratio of Areas
 $A_1 = \pi r^2 = 3.142 \times 1 \times 1$
 $A_2 = \pi r^2 = 3.142 \times 2 \times 2$



$$\text{Ratio} = \frac{3.142 \times 2 \times 2}{3.142 \times 1 \times 1} = 4$$

b. The circle shown has a diameter of 6. Find the shaded area

Area of square
 $= 6 \times 6 = 36$
 Area of circle
 $= \pi r^2 = 3.142 \times 3 \times 3$
 $= 28.278$

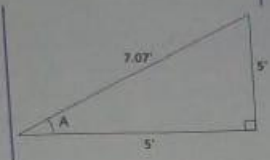


Difference $= 36 - 28.278$
 Area of shaded part
 is equal to
 $36 - 28.278 = 7.722$

5. Find the $\sin A$, $\cos A$, and $\tan A$.

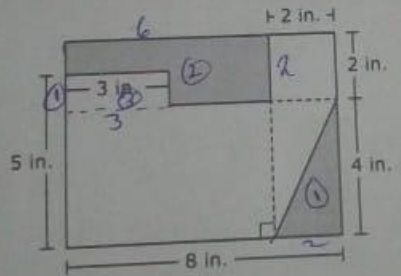
$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{5}{7.07} = 0.707$$

$$\cos A = \frac{\text{Adjacent}}{\text{hypotenuse}} = \frac{5}{7.07} = 0.707$$



$$\tan A = \frac{\text{opposite}}{\text{Adjacent}} = \frac{5}{5} = 1$$

6. This figure shows two shaded regions and a non-shaded region. Angles in the figure that appear to be right angles.



Area of big rectangle
 $= 6 \times 8 = 48$
 Area of Rectangle 2 $= 6 \times 2 = 12$
 Area of Rectangle 3 $= 3 \times 1 = 3$
 A of 2 - A of 3 $= 12 - 3 = 9$
 The difference of (A of 2 - A of 3) + A of 1

a. What is the area, in square inches, of the triangular-shaped region that is shaded in this figure?

b. What is the area, in square inches, of the non-shaded region in this figure?

Area of Triangular Shaded Region
 $= \left(\frac{1}{2} \times 2 \times 4\right) = 4$

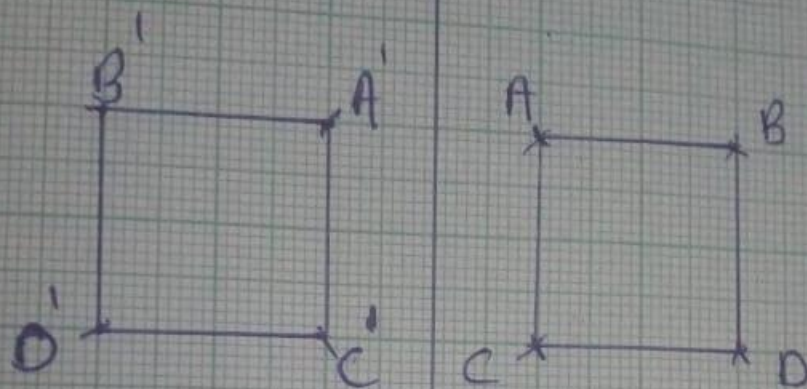
Area of non-shaded region
 $= \text{Area of rectangle} - \text{Area of Shaded region}$

$$= (6 \times 8) - (9 + 4)$$

$$= 48 - 13 = 35$$

$$= 48 - 13 = 35 \text{ in}^2$$

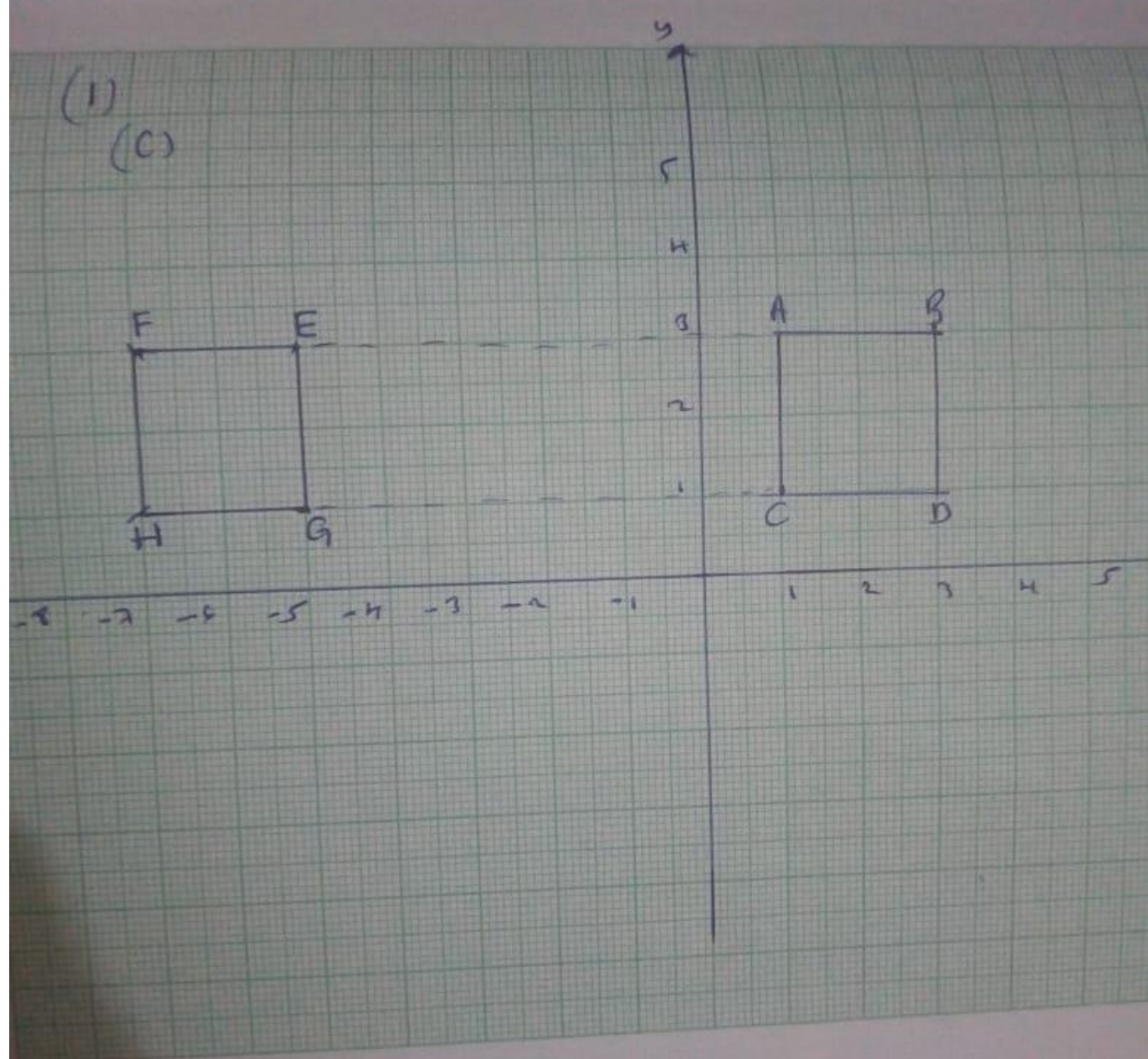
①(a)



1) (b)

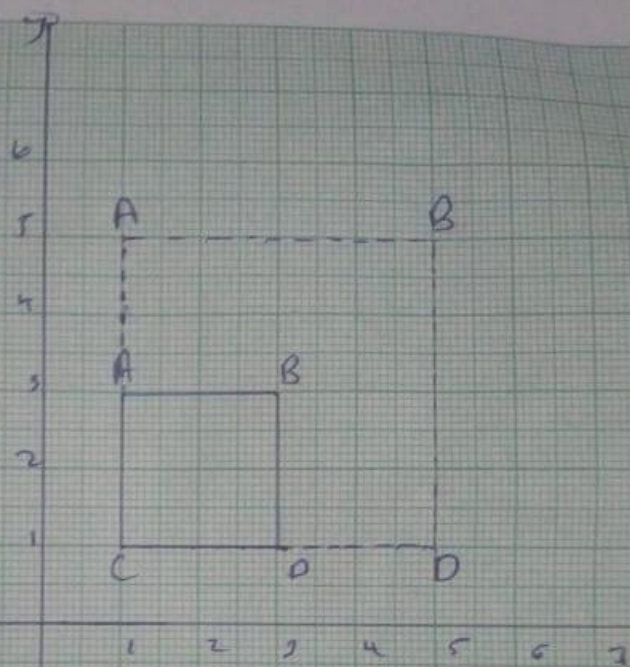


marks for the construction.



6. Construct the angle bisector for the following angle. Show all marks for the construction.

(2) (b)



Construct the angle bisector for the following angle.

