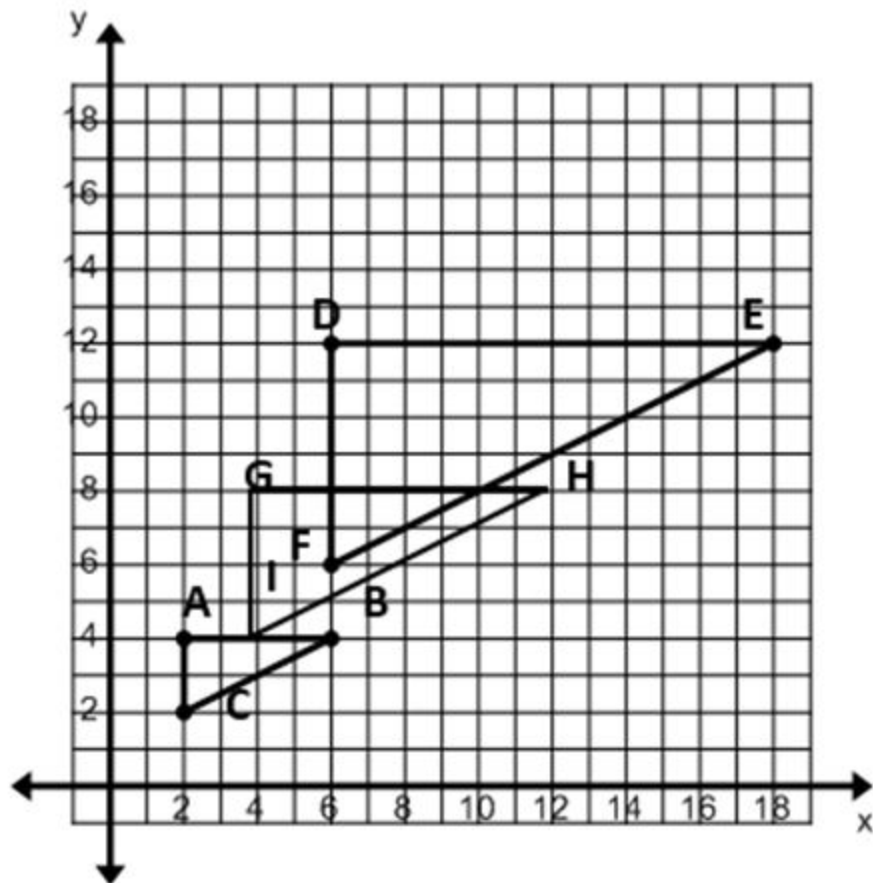


Problem #1: Dilations

Consider triangles ABC and DEF.

- a) Is triangle DEF congruent or similar to triangle ABC? Explain how you know using *specific* transformations.

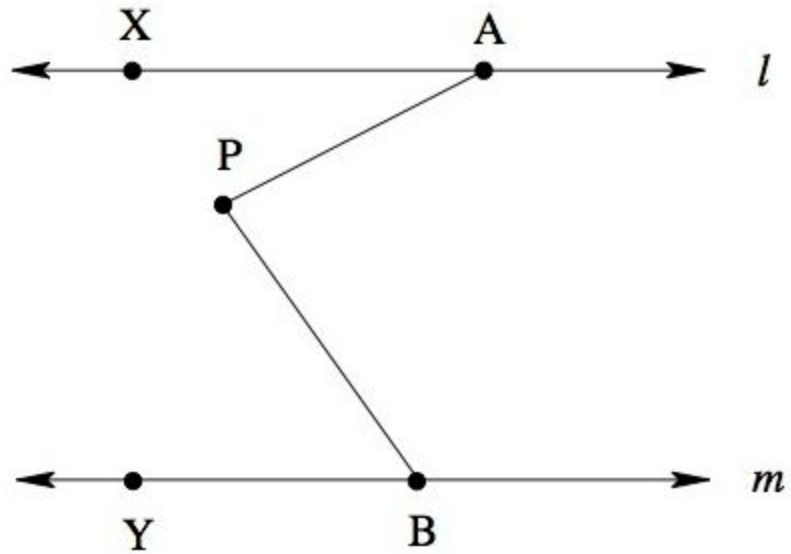


- b) Triangle GHI was formed from a dilation of triangle DEF. Determine the scale factor of the dilation.

Standards and Content Notes:

Problem #2: Angles

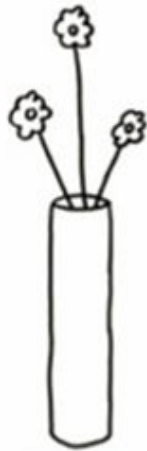
In the picture below, lines l and m are parallel. The measure of angle PAX is 31° , and the measure of angle PBY is 54° . What is the measure of angle APB ?



Standards and Content Notes:

Problem #3: Complex Shapes

My sister's birthday is in a few weeks and I would like to buy her a new vase to keep fresh flowers in her house. She often forgets to water her flowers and needs a vase that holds a lot of water. In a catalog there are three vases available and I want to purchase the one that holds the most water. The first vase is a cylinder with diameter 10 cm and height 40 cm. The second vase is a cone with base diameter 16 cm and height 45 cm. The third vase is a sphere with diameter 18 cm.



Cylinder Vase
Show off your flowers in
this beautiful vase.
10cm X 40cm
\$9.95
4KE09



Cone Vase
This vase holds your flowers
in place!
16cm X 45cm
\$9.95
4KE08



Sphere Vase
Doesn't get any more
symmetric than this!
18cm X 18cm
\$9.95
4KE07

a. Which vase should I purchase?

b. How much more water does the largest vase hold than the smallest vase?

More on the back!

- c. Suppose the diameter of each vase decreases by 2 cm. Which vase would hold the most water?

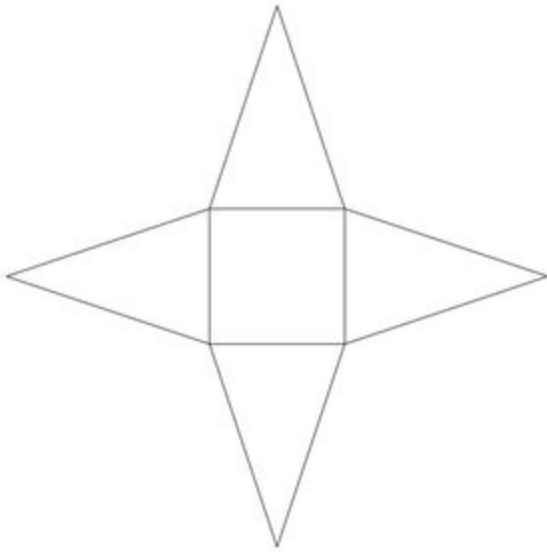
Standards and Content Notes:

Problem #4: Nets

a. Below is a net for a three dimensional shape:

The inner quadrilateral is a square and the four triangles all have the same size and shape.

i. What three dimensional shape does this net make? Explain.



ii. If the side length of the square is 2 units and the height of the triangles is 3 units, what is the surface area of this shape?

b. Draw a net for a rectangular prism whose base is a one inch by one inch square and whose faces are 3 inches by 1 inch.

i. Is there more than one possible net for this shape? Explain.

ii. What is the surface area of the prism?

Standards and Content Notes:

Problem 1: 8.G.A.3

Problem 2: 7.G.5 and 8.G.5

Problem 3: [8.G.C.9](#) -

a. You should purchase the **cylinder vase**. If r is the radius and h is the height, then, using the fact that the radius is half the diameter, we get:

$$\begin{aligned}\text{Cylinder Volume} &= \pi r^2 h \\ &= \pi(5)^2(40) \text{ cm}^3 \\ &= 1000\pi \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\text{Cone Volume} &= \frac{1}{3}\pi r^2 h \\ &= \frac{1}{3}\pi(8)^2(45) \text{ cm}^3 \\ &= 960\pi \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\text{Sphere Volume} &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3}\pi(9)^3 \text{ cm}^3 \\ &= 972\pi \text{ cm}^3\end{aligned}$$

b. Cylinder Volume – Cone Volume =

$$1000\pi \text{ cm}^3 - 960\pi \text{ cm}^3 = \underline{\underline{40\pi \text{ cm}^3}}$$

c. If the diameter decreases by 2 cm, then the radius decreases by 1 cm. Now the cone holds more water:

$$\text{Cylinder Volume} = \pi r^2 h = \pi(4)^2(40) \text{ cm}^3 = 640\pi \text{ cm}^3.$$

$$\text{Cone Volume} = 1/3\pi r^2 h = 1/3\pi(7)^2(45) \text{ cm}^3 = 735\pi \text{ cm}^3$$

$$\text{Sphere volume} = 4/3\pi r^3 = 4/3\pi(8)^3 \text{ cm}^3 = 68223\pi \text{ cm}^3$$

Problem 4: 6.G.A.4 -

This pattern will make a square pyramid that is a pyramid with a square base. The four triangular sides all meet at the apex of the pyramid.

The area of the square base will be 4 square units. The four faces of the pyramid all have the same area. Since each base is 2 units and each height is 3 units the area of one triangle is square units. So all four triangular faces have an area of 12 square units, and the total surface area of the pyramid is $4 + 12 = 16$ square units.

a. An example of a net is pictured here:

There are many different nets for this rectangular prism. We could, for example, leave the four rectangles one on top of the other as in the picture above and move the two square bases: the only restraint is that they need to share a side with one of the four rectangles and they cannot both be on the left or both be on the right. There are other possible nets as well, such as the one pictured below:

Each square is one inch by one inch and each rectangle is 3 inches by 1 inch.

To calculate the surface area of this rectangular prism we add the areas of the square bases (1 square inch each) to the areas of the rectangular faces (3 square inches each). There are two square bases and 4 rectangular faces so the total area is $2 \cdot 1 + 4 \cdot 3 = 14$ square inches.