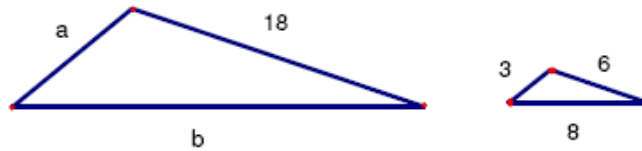
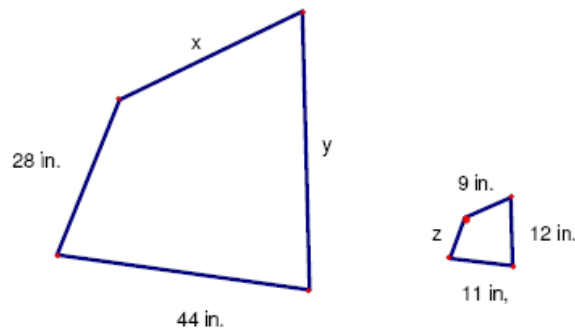


1. The two triangles shown below are **similar**. This means that all the angles are equal and the sides are **proportional**.



- a. How many times bigger is the big triangle in comparison to the little triangle?
- b. Use this information to find the length of the missing sides. Make sure you can do this without cross-multiplying.

2. The two quadrilaterals shown below are similar.



- a. Determine the missing side lengths  $x$ ,  $y$ , and  $z$ . Make sure you can do this without cross-multiplying.
- b. Finding side  $z$  was different from the other sides in a significant way that might cause confusion for some elementary students. Describe this difference.

3. According to Kepler's third law the period squared to the radius cubed is the same ratio for all planets in the following way:

$$\left(\frac{T_1}{T_2}\right)^2 = \left(\frac{R_1}{R_2}\right)^3$$

- a. Determine the ratios for (i) Uranus and Earth, (ii) Earth and Venus, and (iii) Neptune and Mars.
- b. If planet A is five times as far from the Sun as planet C, then the period of its orbit will be \_\_\_\_\_ times as long.
- c. If planet A is 10 times as far from the Sun as planet C, then the period of its orbit will be \_\_\_\_\_ times as long.
- d. If planet A's orbit is three times as long as planet B's, then planet A is \_\_\_\_\_ times further away from the Sun than planet B.
- e. If planet A's orbit is 8 times as long as planet B's, then planet A is \_\_\_\_\_ times further away from the Sun than planet B.
- f. What kind of difficulties could students have with these problems?
  
- g. How could you help students overcome any difficulties you described?
  
- h. How can you calculate the eccentricity of an ellipse?
  
- i. True or false: The higher the eccentricity, the lower the spread of the ellipse.

Planet	Diameter (miles)	Radius (miles)	Surface Area (square miles)
Mercury	$3.032 \cdot 10^3$		
Venus	$7.521 \cdot 10^3$		
Earth	$7.926 \cdot 10^3$		
Mars	$4.222 \cdot 10^3$		
Jupiter	$8.8846 \cdot 10^4$		
Saturn	$7.4897 \cdot 10^4$		
Uranus	$3.1763 \cdot 10^4$		
Neptune	$3.0775 \cdot 10^4$		

4. Comparing numbers written in scientific notation:

- a. Complete the missing values in the table above.
- b. Discuss the following student comments and evaluate their reasoning.
  - i. Tom: "I know that Jupiter has the largest diameter followed by Earth. In third position is Venus followed closely by Saturn."
  - ii. Susan: "To get the radius one has to divide the diameter in two. Thus, Neptune's radius would be  $3.0775 \cdot 10^2$ ."
  - iii. Nick: "To get the surface area one has to multiply the diameter with pie, I think..."
- c. What would you do to help these students with their thinking?

**5. Adding Fractions (Using manipulatives)**

**a. Solve the problem  $\frac{1}{3} + \frac{1}{6}$  using the P-Blocks.**

*What manipulative is representing the whole?*

*Given the whole you chose above, what manipulative represents a third?*

*Given the whole you chose above, what manipulative represents a sixth?*

*Show  $\frac{1}{3}$*

*Show  $\frac{1}{6}$*

*Remembering that adding is joining, what is the answer to  $\frac{1}{3} + \frac{1}{6}$ ?*

**b. Solve the problem  $\frac{7}{6} + \frac{5}{4}$  using the P-Blocks.**

*What manipulative or group of manipulatives is representing the whole?*

*Given the whole you chose above, what manipulative represents a sixth?*

*Given the whole you chose above, what manipulative represents a fourth?*

*Show  $\frac{7}{6}$*

*Show  $\frac{5}{4}$*

*Remembering that adding is joining, what is the answer to  $\frac{7}{6} + \frac{5}{4}$ ?*

**6. Adding Fractions (Using manipulatives)**

**a. Solve the problem  $\frac{3}{5} + \frac{1}{2}$  using the C-Rods.**

*What manipulative is representing the whole?*

*Given the whole you chose above, what manipulative represents a fifth?*

*Given the whole you chose above, what manipulative represents a half?*

Show  $\frac{3}{5}$

Show  $\frac{1}{2}$

*Remembering that adding is joining, what is the answer to  $\frac{3}{5} + \frac{1}{2}$ ?*

**b. Solve the problem  $\frac{7}{10} + \frac{5}{4}$  using the C-Rods**

*What manipulative or group of manipulatives is representing the whole?*

*Given the whole you chose above, what manipulative represents a tenth?*

*Given the whole you chose above, what manipulative represents a fourth?*

Show  $\frac{7}{10}$

Show  $\frac{5}{4}$

*Remembering that adding is joining, what is the answer to  $\frac{7}{10} + \frac{5}{4}$ ?*

7. Discuss the following student answers and determine the problems in their thinking when manipulating fractions:

a. Barbara: " $\frac{1}{3} + \frac{3}{2} = \frac{4}{5}$ ."

b. Lin: " $\frac{1}{3} > \frac{1}{2}$ , because 3 is larger than 2."

c. Sam: " $2\frac{1}{3} = \frac{3}{3}$ ."

d. How could you help the students?

8. Create a distance versus time graph and the story it tells.

9. Create a speed versus time graph and the story it tells.