

Notes

3.1.2 - Similarity

3-11. Find the side lengths of $\triangle ABC$ and $\triangle A'B'C'$, write the coordinates to the side of the graph.

Use Pythag to calculate AB and $A'B'$

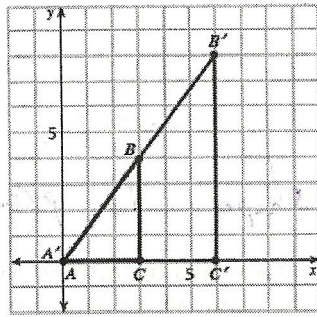
$$6^2 + 8^2 = c^2$$

$$36 + 64 = c^2$$

$$100 = c^2$$

$$\sqrt{100} = c$$

$$\overline{A'B'} = 10$$



$$3^2 + 4^2 = c^2$$

$$9 + 16 = c^2$$

$$25 = c^2$$

$$\sqrt{25} = c$$

$$\overline{AB} = 5$$

- a. In problem 3-5, you dilated (stretched) $\triangle ABC$ to create $\triangle A'B'C'$. Which side of $\triangle A'B'C'$ corresponds to \overline{CB} ? Which side corresponds to \overline{AB} ?

$$\overline{CB} \rightarrow \overline{C'B'}$$

$$\overline{AB} \rightarrow \overline{A'B'}$$

$$\overline{AC} \rightarrow \overline{A'C'}$$

- b. What is the relationship of the corresponding sides? Write down all of your observations. How could you get the lengths of $\triangle A'B'C'$ from the lengths of $\triangle ABC$?

$$\overline{BC} \parallel \overline{B'C'}$$

$$3 \times 2 = 6$$

$$\overline{AB} \parallel \overline{A'B'}$$

Double them,

$$4 \times 2 = 8$$

$$\overline{CB} \parallel \overline{C'B'}$$

$$5 \times 2 = 10$$

- c. Why does $\overline{A'B'}$ lie directly on \overline{AB} and $\overline{A'C'}$ lie directly on \overline{AC} , but $\overline{B'C'}$ does not lie directly on \overline{BC} ?

Because \overline{AB} lies on the point of dilation, the origin.

- d. Could you get the side lengths of $\triangle A'B'C'$ by adding the same amount to each side of $\triangle ABC$? Try this and explain what happened.

$$3+3 = 6 \quad \checkmark$$

No!

$4+3 \neq 8$, so I could not add the same amount to each

- e. Monica dilated $\triangle ABC$ to get a different triangle. She knows that $\overline{A''B''}$ is 20 units long. How many times larger than $\triangle ABC$ is $\triangle A''B''C''$? (That is, how many "rubber bands" did she use?)

And how long is $\overline{B''C''}$? Show how you know.

$$\frac{\overline{A''B''}}{\overline{AB}} = \frac{20}{5} = \boxed{4 \text{ for the scale factor}}$$

$$\overline{BC} \times 4 = \overline{B''C''}$$

$$5 \times 4 = \boxed{16}$$

3-12. SIMILARITY

An important aspect of dilation is that the shape of a figure does not change even though its size may change. This is because dilations do not affect angles while they change lengths proportionally.

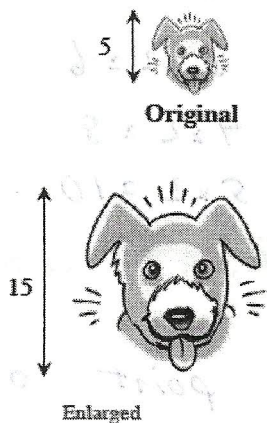
- a. If Monica rotated $\triangle A''B''C''$ about a point, would it still remain the same shape as $\triangle ABC$? Why or why not? What if she translated it or reflected it?

Yes, shape is preserved

- b. When two figures are related by a series of transformations (including dilation), they are called **similar**. Similar figures have the same shape but not necessarily the same size. Similar figures can be created by multiplying each side length by the same number. This number is called the **zoom factor** (scale factor)

You may have used a zoom factor before when using a copy machine. For example, if you set the zoom factor on a copier to 50%, the machine shrinks the image in half (that is, multiplies it by 0.5) but keeps the shape the same. In this course, the zoom factor will be used to describe the ratio of the new figure to the original figure.

What zoom factor was used to enlarge the puppy shown below?



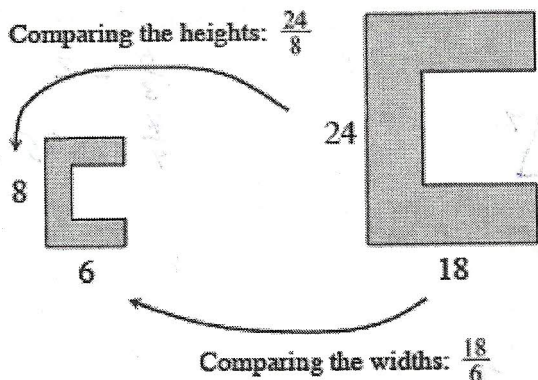
x3 zoom, 300%

Notes: When the zoom factor is 1 the shapes are congruent.

3-15. EQUAL RATIOS OF SIMILARITY

Casey wants to learn more about her enlarged "C"s. Return to your work from problem 3-13.

- a. Since the zoom factor multiplies each part of the original shape, then the ratio of the widths must equal the ratio of the lengths. Casey decided to show these ratios in the diagram below. Verify that her ratios are equal.



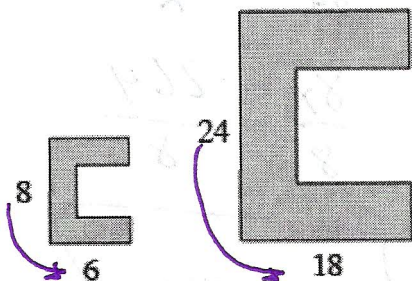
$$\frac{24}{8} = 3$$

$$3 = 3$$

$$\frac{18}{6} = 3$$

Ratios are equal

- b. When looking at Casey's work, her brother wrote the equation $\frac{8}{6} = \frac{24}{18}$. Are his ratios, in fact, equal? And how could he show his work on his diagram? Copy his diagram below and add arrows to show what sides Casey's brother compared.

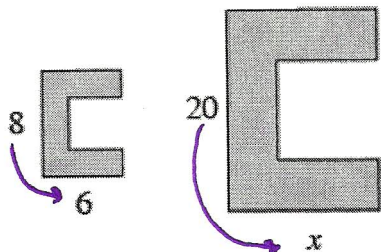


$$\frac{8}{6} = \frac{24}{18}$$

$$1.\bar{3} = 1.\bar{3}$$

Ratios are =

- c. She has decided to create an enlarged "C" for the door of her bedroom. To fit, it needs to be 20 units tall. If x is the width of this "C", write and solve an equation to find out how wide the "C" on Casey's door must be. To solve this problem you need to set up a proportion.



$$\frac{8}{6} = \frac{20}{x}$$

$$\frac{120}{8} = \frac{8x}{8}$$

$$15 = x$$

3-16. Use your observations about ratios between similar figures to answer the following questions. For each part you need to have a proportion.

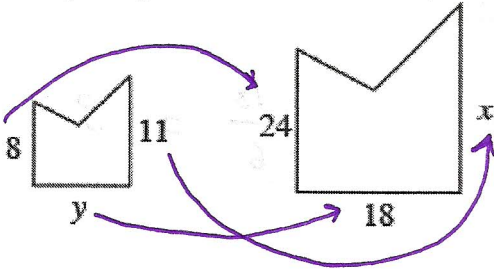
- a. Assume one triangle has side lengths 6, 7, and 10 units while another has side lengths 3, 4, and 5 units. Are these triangles similar? How do you know?



$$\frac{6}{3} = 2 \quad \frac{10}{5} = 2$$

$$\frac{7}{4} = 1.75 \leftarrow \text{Doesn't match}$$

- b. If the pentagons below are similar, what are the values of x and y ?



Not Similar

$$\frac{8}{24} = \frac{y}{18}$$

$$144 = 24y$$

$$\boxed{6 = y}$$

$$\frac{8}{24} = \frac{11}{x}$$

$$\frac{8x}{8} = \frac{264}{8}$$

$$\boxed{x = 33}$$