Similarity and Area measurements

Open the web page "scale fish"

Before you begin:

- Identify the Horizontal scale factor on the screen
- Identify the Vertical scale factor on the screen
- Identify the Area change factor on the screen
- Verify that you know how the Area of the scaled fish would be calculated using only the original area and the area change factor.

Fill in the following table to show that you understand what a change factor is (you should not be using the sketch to fill in this table):

Original area	Area change factor	Scaled area
8	2	
4		16
	3	12

1. When you change the length and height of the fish, you also change its area. Experiment with the two drag points. One changes the scale factor on the fish in the horizontal direction, and one in the vertical direction.

a. Set the scale factor in the vertical direction to 1, and experiment with what happens when you change just the horizontal scale factor. What happens to the Area change factor when you change just the Horizontal scale factor? (*Compare the scale factors*)

b. Set the scale factor in the horizontal direction to 1, and experiment with what happens when you change just the vertical scale factor. What happens to the Area change factor? (*Compare the scale factors*)

c. Fill in the table by recording the area scale factor (ratio) after setting the horizontal and vertical scale factors (round to nearest tenth):

horizontal scale factor	vertical scale factor	area change factor
2	2	
2	3	
1.5	2	
4	3	
.5	2	

Rule #1: What is the general rule for what happens to the area change factor when you change both the horizontal and vertical scale factors (how are these factors related)?

d. Find three ways to make the area change factor double:

horizontal scale factor	vertical scale factor	area change factor
		2
		2
		2

2. In order for two shapes to be similar they must have the same shape. For the small and the large fish to be similar, the corresponding angles must be the same.

a. Set the horizontal scale factor to 2, and experiment with the vertical scale factor until the measured angles are equal. What vertical scale factor makes the two fish similar?

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b. What is a general rule for horizontal and vertical scale factors to make the two fish similar? Test your rule for a scale factor of 3.

Now open the web page "scale flower"

Before you begin:

- Identify the Vertical scale factor on the screen
- Identify the Area scale factors on the screen
- Verify that you know how the Areas and lengths of the scaled flower would be using only the original area/length and the appropriate scale factor.

Fill in the following table to show that you understand the concept of scale factor (you should not be using the sketch to fill in this table):

Original area	Area change factor	Scaled area
8	2	
4		16
	3	12

Original length	Vertical scale factor	Scaled Length
4	3	
3		6
	4	8

3. Experiment with the drag button. Notice that the two flowers are always similar.

a. The figures are shown, and the vertical scale factor is shown. If the vertical scale factor is 3, what is the horizontal scale factor (use your conclusion from #2)?

b. Notice the area calculations for the flower and for the leaf. Compare the area change factors for the flower and for the leaf. What do you notice?

c. F ill in this table relating length and area change factors

length (vertical) scale factor	area change factor
2	
3	
.5	

Predict what factor the area would change by, if the length scale factor were 5?

What if the length scale factor were 10?

Rule #2: What is the general rule for what happens to the area change factor of <u>similar</u> figures when you change the linear (horizontal or vertical) scale factor (how are the factors are related)?

d. What (vertical) length scale factor will make the area of the large flower double the area of the small one? (Hint: area is double if area change factor = 2). (give your best approximation)

e. What (vertical) scale factor will make the area triple?

4. Apply your rules (#1 and #2) by filling in the tables (you should not be using the sketches for this section):

Figures that are not similar:

Horizontal scale factor	Vertical scale factor	Area change factor	Original area	Scaled area
3	5		6	
4	1.5		6	

Figures that are similar:

Length scale factor	Area change factor	Original area	Scaled area
2		6	
3		6	
1.5		6	

5. Click the "show perimeter measurements" button. The perimeter of an object is the length around its boundary. When you change the vertical scale factor, what happens to the perimeter scale factor? (compare the length and perimeter scale factors)