Math 247 Computer Lab, on Similarity and Area measurements

Computer Prep.
Get sample files: scale fish, and scale flower from the web site and open them

Open the file "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.

A "change factor" or a "scale factor" is something you multiply by to change something. So when a picture is scaled up, the length is multiplied by the length scale factor and the area is multiplied by the area change factor. Finish this table

Reference area	Area ratio	Area change factor	New area
8	**2:1 (new: ref.)**	2	**2× 8=16**
4			16
	3:1		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 horizontal scale factor to the area change factor*)

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?

c. Set both the vertical and horizontal scale factors to 2. What is the area scale factor now?

d. 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)?

e. 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 file "scale flower"

Before you begin:

- Identify the Vertical scale factor on the screen
- Identify the Area scale factors on the screen (click Show Area)

3. Experiment with the drag button. **Notice that the two flowers are always similar.**
a. Why is there only a length scale factor listed, and not both horizontal and vertical scale factors?

b. Fill in this table relating length and area scale 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)?

c. 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)

d. 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.

a. How are the length and perimeter scale factors related?

b. Why is this different from what happens with area?