4.1 – Enlargements and Reductions

Enlargement: an _____ in the dimensions (length, width, height, etc) of an object by a _____factor. Can be 2-D or 3-D.

- An enlargement results in an *image* that is the _____shape but proportionally _____than the *original.*

Reduction: a _____ in the dimensions (length, width, height, etc) of an object by a _____factor. Can be 2-D or 3-D

- A reduction results in an *image* that is the _____shape but proportionally _____than the *original.*

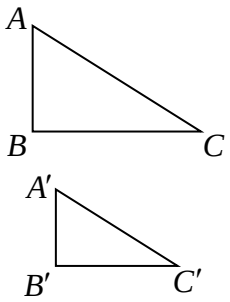
Scale Factor: the constant amount by which all dimensions of an object are _____ to draw an enlargement or reduction.

- A scale factor _____than one indicates an enlargement.
- A scale factor _____ than one indicates a reduction.

$$Scale\ \ Factor = \frac{image\ length}{object\ length}$$

Corresponding angles/sides: have the same relative position in a geometric figure.

- $\angle A$ corresponds to _____
- $\angle B$ corresponds to _____
- $\angle C$ corresponds to _____
- Side AB corresponds to _____
- Side AC corresponds to _____
- Side BC corresponds to _____



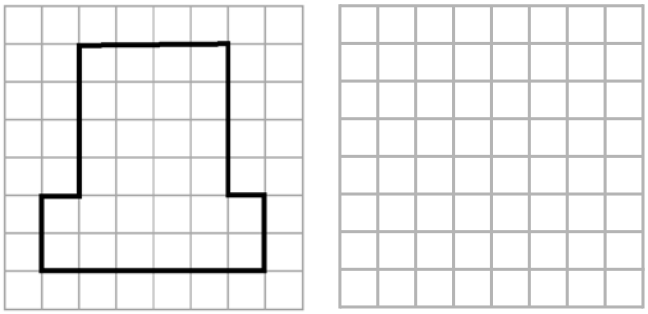
Similar Figures: have the _____ shape but _____ size.

- Similar figures have _____ corresponding angles
- Similar figures have _____ corresponding sides

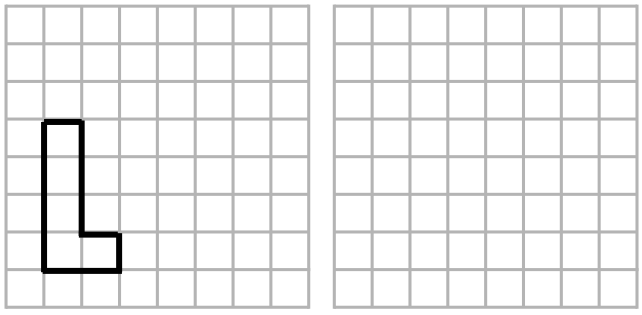
4 Ways of drawing scale diagrams:

- **1) Using grid paper & counting.**

a) Draw a reduction using a scale factor of $\frac{1}{2}$



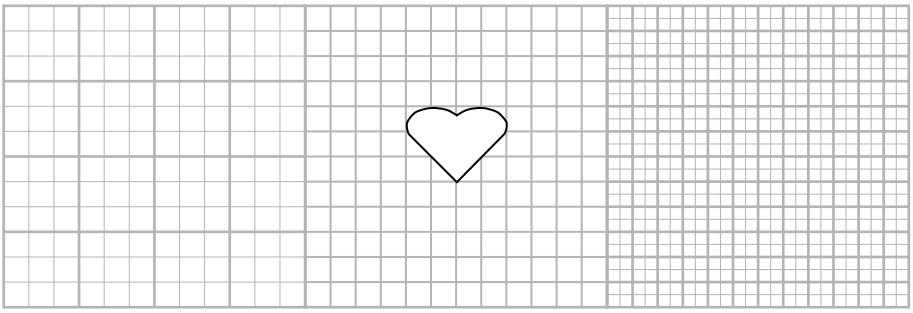
b) Draw an expansion using a scale factor of 2



- **2) Using different sized grid paper.**

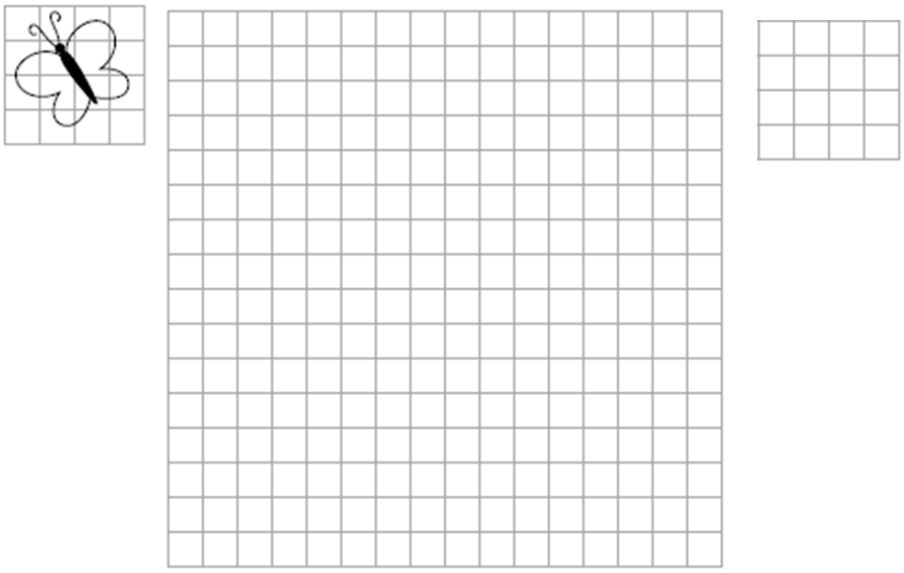
a) Use larger grid paper to enlarge the object by a scale factor of 3?

b) Use smaller grid paper to reduce the object by a scale factor of $\frac{1}{2}$



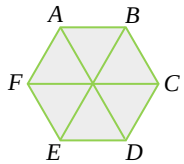
c) Draw an enlargement of the butterfly using a scale factor of 4.

d) Draw a reduction of the butterfly using a scale factor of 0.5.

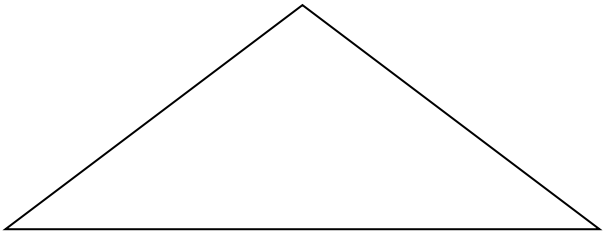


- **3) Using a center point and a ruler (The Ray Method)**

a) Use a ruler to draw an enlargement with a scale factor of 2. (Hint choose a center point)



b) Use a ruler to draw a reduction with a scale factor of $\frac{1}{4}$. (Hint choose a center point)



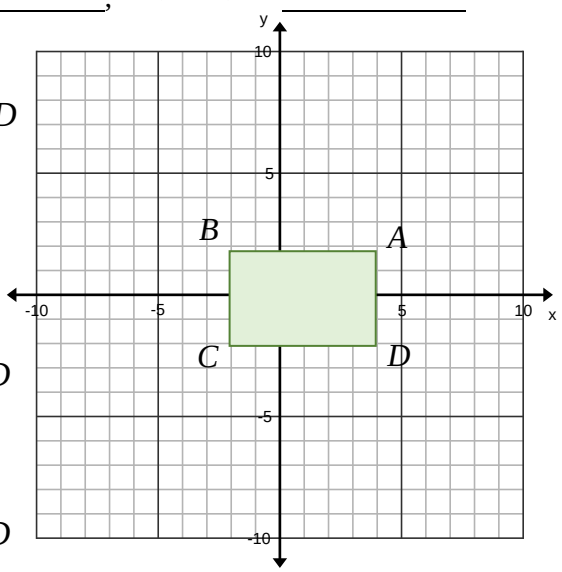
- **4) Using the Cartesian Coordinate system with (0,0) as the center point and multiplying the coordinates by the scale factor**

Example 1:

a) The rectangle $ABCD$ has coordinates $A(4,2)$, $B(-2,2)$, $C(-2,-2)$, and $D(4,-2)$.

b) We wish to enlarge the rectangle by a scale factor of two. Multiply the coordinates of each vertex by 2:
$A(4,2) \rightarrow A'(8,4)$, $B(-2,2) \rightarrow$ _____, $C(-2,-2) \rightarrow$ _____, $D(4,-2) \rightarrow$ _____

c) Plot the enlarged image of the rectangle.



Inquire:

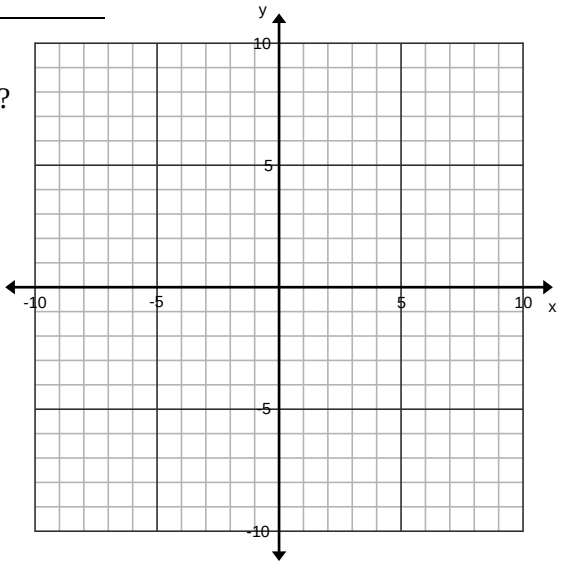
1. The side lengths of $A'B'C'D'$ are _____ $ABCD$
2. How do the angles of the two rectangles compare?

   _____
3. What can we conclude about the rectangles from your findings in questions 2 and 3? _____
4. The perimeter of $A'B'C'D'$ is_____ $ABCD$
5. The area of rectangle $A'B'C'D'$ is _____ $ABCD$

Example 3: Triangle ABC has the following coordinates: $A(1,5)$ $B(4,1)$ $C(4,5)$

State the coordinates of the image points if the triangle is enlarged by a scale factor of a 1.5 then draw the image.

$A(1,5) \rightarrow$ _____, $B(4,1) \rightarrow$ _____, $C(4,5) \rightarrow$ _____



Inquire:

1. The side lengths of $\Delta A'B'C'$ are_____ ΔABC?
2. How do the angles of the two triangles compare?_____
3. What can we conclude about the triangles from your findings in questions 2 and 3? _____
4. The perimeters $\Delta A'B'C'$ are_____ ΔABC?
5. The areas $\Delta A'B'C'$ are_____ ΔABC?

Example 5: Complete the tables for each enlargement or reduction.

	Object Length	Image Length	Scale Factor
a)	**1.5 cm**	**3 cm**	
b)	**5 cm**	**2.5 cm**	
c)	**4**		**3**
d)	**8**		**0.25**

	Object Length	Image Length	Scale Factor
e)	**0.1**	**10**	
f)	**100**	**1**	
g)	**4**		**50%**
h)		**12**	**4**