Unit 6 Notes

Transformations and Angle Relationships

Name: ______________________________

Tentative Schedule

Day	Classwork	Assignment
Mon. 1/26	Test #5	Watch Video #6.2 and Complete Notes 6.2 Reflections – page 5
Tues. 1/27 Wed. 1/28	P.S. #6.2 – Reflections	Watch Video #6.3 and Complete Notes 6.3 Dilations – page 7
Thurs. 1/29	P.S. #6.3 – Dilations	Watch Video #6.4 and Complete Notes 6.4 Translations – page 8
Fri. 1/30 Mon. 2/2	P.S. #6.4 – Translations	Watch Video #6.5 and Complete Notes 6.5 Rotations – page 9
Tues. 2/3	P.S. #6.5a – Rotations	Finish P.S. #6.5a - Rotations
Wed. 2/4 Thurs. 2/5	Symmetries P.S. #6.1 – Symmetries	P.S. #6.5b – Mixed Transformations
Fri. 2/6	**Quiz #6** P.S. #6.5c – Review	Finish P.S. #6.5c – Review
Mon. 2/9 Tues. 2/10	Begin Angle Relationships Catch-up Day	Watch Video #6.6 and Complete Notes 6.6 Angle Relationships (Part 2) – page 12
Wed. 2/11	P.S. #6.6 – Angle Relationships	Video #6.7 and Complete Notes 6.7 Similarity vs. Congruence – page 13
Thurs. 2/12 Fri. 2/13	P.S. #6.7 – Similarity vs. Congruence	Catch-up on checklist
Mon. 2/23	Identifying Transformations	P.S. #6.8 – Identifying Transformations
Tues. 2/24 Wed. 2/25	**Review for Test #6**	Review for Test #6
Thurs. 2/26	**Test #6**	Video #7.1

Notes 6.1 – Symmetries

There are four different transformations:

1.) reflections
2.) dilations
3.) translations
4.) rotations

Line Symmetry:

When two halves of a figure mirror each other

Letters that have line symmetry:

A, B, C, D, E, H, etc.

Point Symmetry: Point symmetry exists when a figure is built around a single point called the center of the figure. For every point in the figure, there is another point found at the same distance from the center directly opposite it.

How can you tell if a figure has point symmetry?

It looks the same if you flip it upside down

Letters that have point symmetry:

H, Z, N

has point symmetry because it looks the same upside down

Transformation Rules Sheet

Line Reflections:

$$r_{x-axis}(x,y)=(x,-y)$$
$$r_{y-axis}(x,y)=(-x,y)$$
$$r_{y=x}(x,y)=(y,x)$$
$$r_{y=-x}(x,y)=(-y,-x)$$

Pre-image and image are **congruent** and **similar.**

- Congruent sides
- Congruent angles

Point Reflection:

$$R_{180^\circ}(x,y)=(-x,-y)$$

Pre-image and image are **congruent** and **similar.**

- Congruent sides
- Congruent angles

Rotations:

$$R_{90^\circ}(x,y)=(-y,x)$$
$$R_{180^\circ}(x,y)=(-x,-y)$$
$$R_{270^\circ}(x,y)=(y,-x)$$
$$R_{-90^\circ}(x,y)=(y,-x)$$

Pre-image and image are **congruent** and **similar.**

- Congruent sides
- Congruent angles

Translation:

$$T_{a,b}(x,y)=(x+a,y+b)$$

Pre-image and image are **congruent** and **similar.**

- Congruent sides
- Congruent angles

Dilation:

$$D_k(x,y)=(kx,ky)$$

Pre-image and image are **ONLY similar.**

- **Proportional** sides
- **Congruent** angles

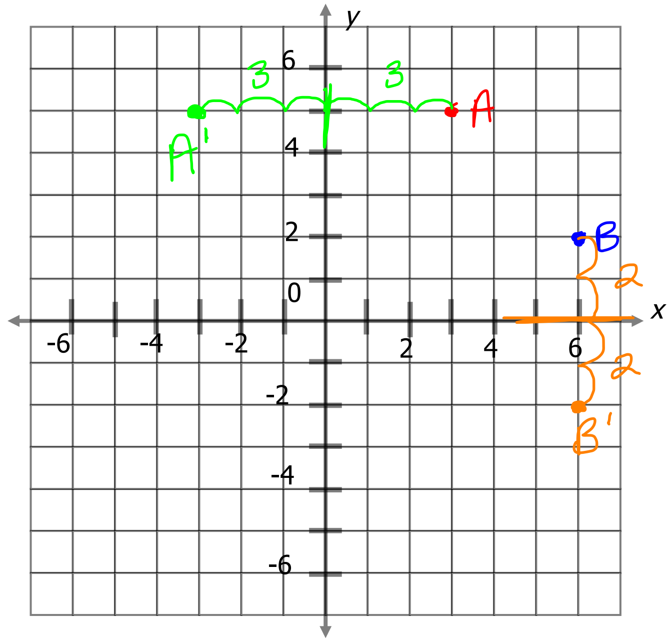
Notes 6.2 - Reflections

Reflection: mirror image

1.) Graph point A(3,5) on the set of axes to the right.

2.) Graph the image of A after a reflection in the y-axis. State the coordinates of the image.

A'(-3,5)



3.) Graph point B(6,2) on the set of axes to the right.

4.) Graph the image of B after a reflection in the x-axis. State the coordinates of the image.

B'(6,-2)

What do you notice?

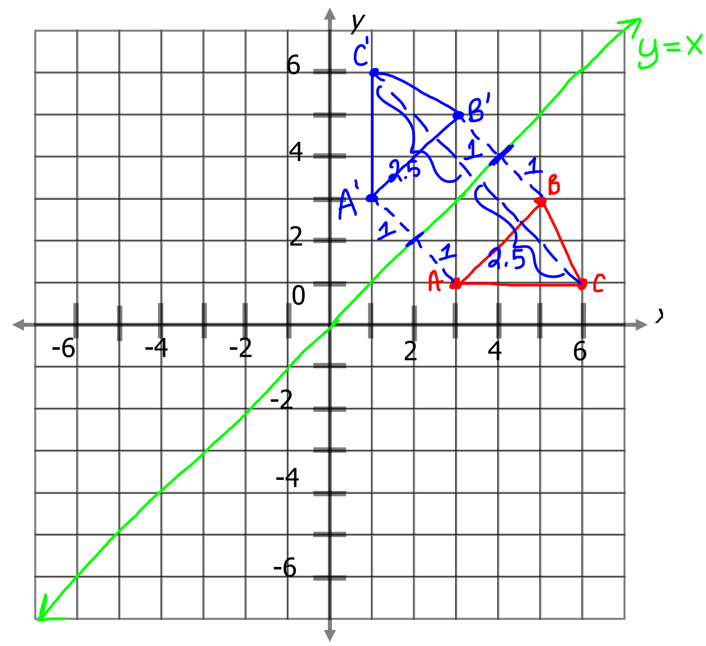
<table>
<tr><td rowspan="3">Before Reflection

(x,y)</td><td rowspan="3">→</td><td>After Reflection in the x-axis:
(x,-y)</td></tr>
<tr><td>After Reflection in the y-axis:
(-x,y)</td></tr>
<tr><td>After Reflection in the line y = x
(y,x)</td></tr>
</table>

5.) Given triangle ABC with coordinates $A(3,1)$, $B(5,3)$, $C(6,1)$. Reflect triangle ABC over the line $y = x$. State the new coordinates.

A'(1,3)
B'(3,5)
C'(1,6)

(Notice: x and y swap)



Properties of Reflections

a.) Shape – preserved

b.) Size – preserved

c.) Orientation – not preserved

Notes 6.3 - Dilations

What is a dilation?

a shrinking or enlargement

How do you do a dilation?

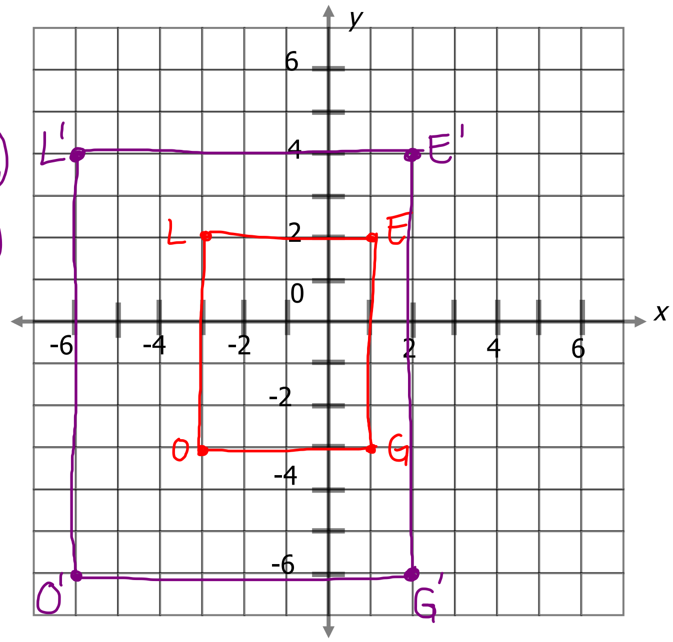
multiply by a Scale factor, K

(If $K>0 \rightarrow$ enlargement)
(If $0<K<1 \rightarrow$ reduction)

1.) Graph rectangle *OLEG* *O*(-3,-3), *L*(-3,2), *E*(1,2), *G*(1,-3). Graph *O'L'E'G'* after a dilation with scale factor 2.

Multiply each value by 2

$O(-3,-3)\cdot 2 \rightarrow O'(-6,-6)$
$L(-3,2)\cdot 2 \rightarrow L'(-6,4)$
$E(1,2)\cdot 2 \rightarrow E'(2,6)$
$G(1,-3)\cdot 2 \rightarrow G'(2,-6)$



Properties of Dilations

a.) Shape- preserved
b.) Size-not preserved
c.) orientation- preserved

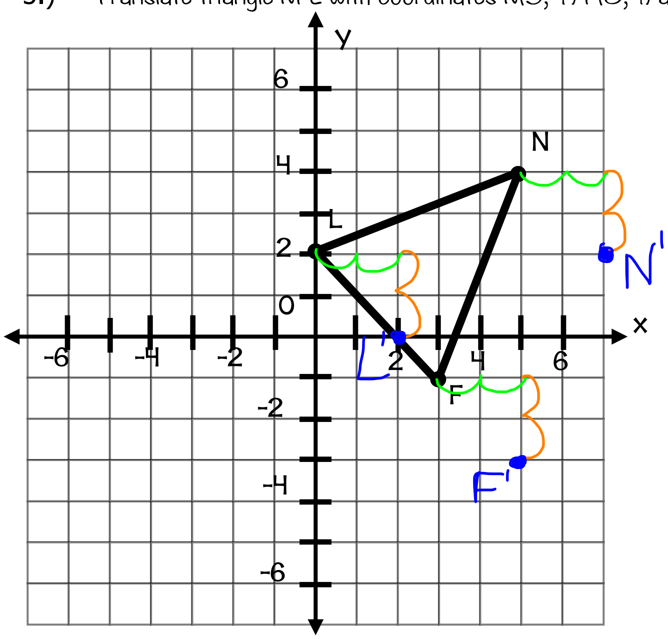
Notes 6.4 - Translations

1.) **Translation:** A translation slide the same figure in the same direction.

2.) How would the following translation affect a coordinate?

Translation	X-Coordinate	Y-Coordinate
Move to 8 units to the right	+8	—
Move 3 units to the left	+3	—
Move 9 units up	—	+9
Move 7 units down	—	−7

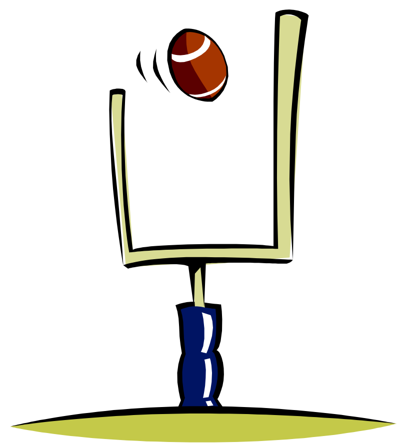
3.) Translate triangle NFL with coordinates N(5,4) F(3,-1) and L(0,2) 2 units to the right and 2 units down.



N' (7,2)

F' (5,-3)

L' (2,0)



4.) Two notations for left five, up six: $(x,y) \to (x-5, y+6)$ $T_{-5,6}$

5.) Two notations for right two, down eleven: $(x,y) \to (x+2, y-11)$ $T_{2,-11}$

6.) General form for a translation: $(x,y) \to (x+h, y+k)$ $T_{h,k}$
h units horizontally, K units vertically

Properties of Translations

a.) shape - preserved

b.) Size - preserved

c.) orientation - preserved

Notes 6.5 - Rotations

Rotation:

Which way is clockwise?

Which way is counterclockwise?

Steps to graphing rotations (multiples of 90°):

1.) Draw the original figure.

2.) Turn the paper.

Do NOT graph the coordinates when the paper is turned!!!*

3.) Determine what the new coordinates are while the paper is turned.

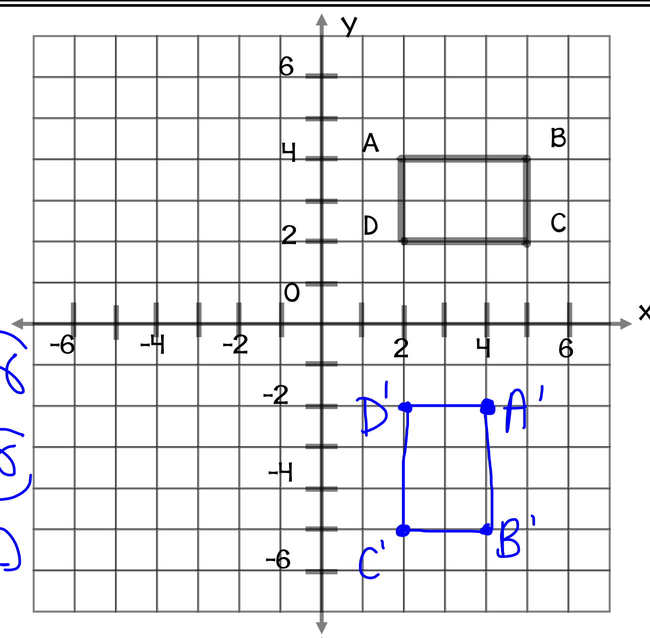
**** Do NOT graph the coordinates when the paper is turned!!!****

4.) Turnthe paper back.

5.) Graph the new coordinates.

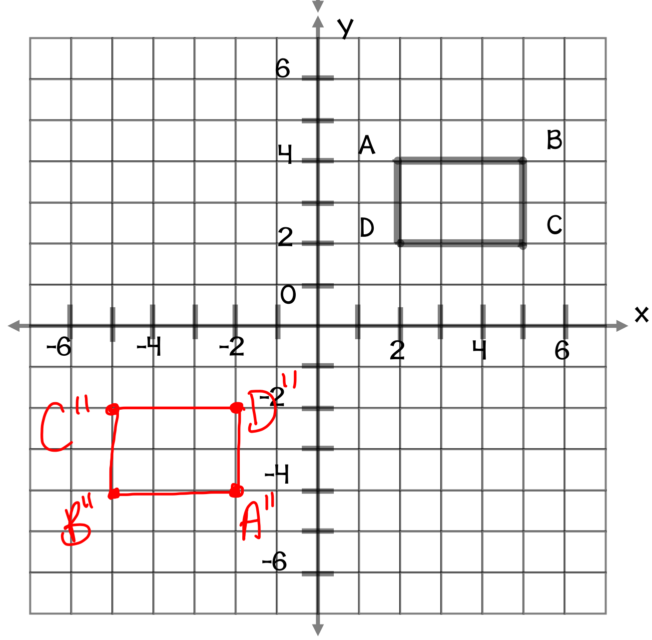
1.) Given rectangle ABCD, with coordinates A (2,4), B(5,4), C(5,2), and D(2,2), find the new rectangle A'B'C'D' after a 90° clockwise rotation.

A'(4,-2)
B'(4,-5)
C'(2,-5)
D'(2,-2)



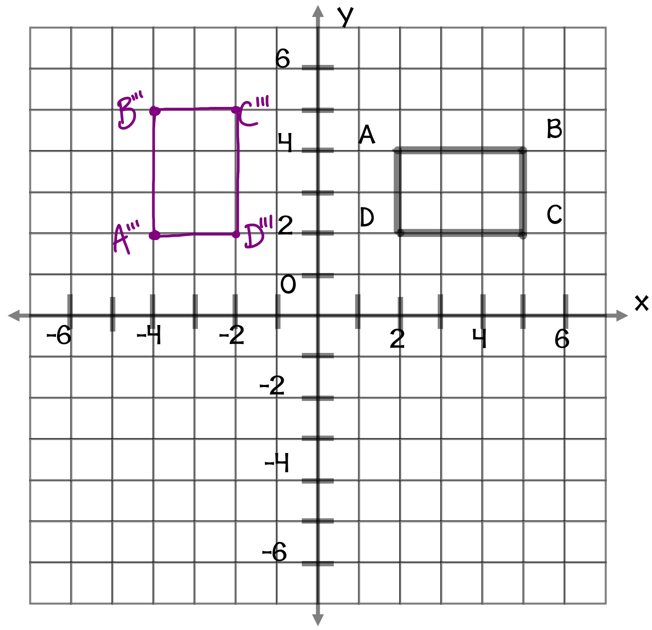
2.) Given rectangle ABCD, with coordinates A (2,4), B(5,4), C(5,2), and D(2,2), find the new rectangle A'B'C'D' after a 180° clockwise rotation.

D''(-2,-2)
C''(-5,-2)
B''(-5,-4)
A''(-2,-4)



3.) Given rectangle ABCD, with coordinates A (2,4), B(5,4), C(5,2), and D(2,2), find the new rectangle A'B'C'D' after a 270° clockwise rotation.

D'''(-2,2)
C'''(-2,5)
B'''(-4,5)
A'''(-4,2)



Summary

Rotation	(x,y)→
90°	(y, -x)
180°	(-x, -y)
270°	(-y, x)

Properties of rotations:

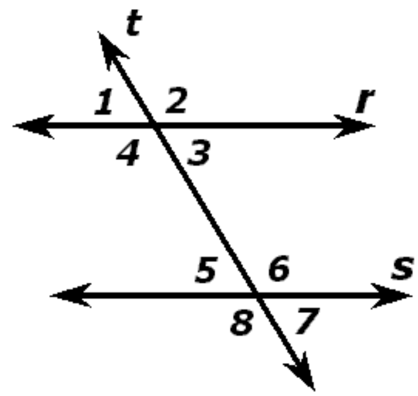
a. Shape-preserved

b. Size-preserved

c. ☆orientation- preserved ☆

doesn't change!

Notes 6.6 - Angle Relationships

Word	Definition	Example
Parallel Lines	Lines that never intersect. Notation: r $\parallel$ s t is called the transversal	
Exterior Angles	Angles on the outside of the parallel lines	$\angle 1, \angle 2, \angle 7, \angle 8$
Interior Angles	Angles on the inside of the parallel lines	$\angle 3, \angle 4, \angle 5, \angle 6$
*Alternate Exterior Angles**	Angles on the outside of the parallel lines and on opposite sides of the transversal	$\angle 1 \cong \angle 7$ $\angle 2 \cong \angle 8$
*Alternate Interior Angles**	Angles on the inside of the parallel lines and on opposite sides of the transversal	$\angle 4 \cong \angle 6$ $\angle 3 \cong \angle 5$
*Corresponding Angles**	Angles that are in the same spot when the parallel lines are placed on top of each other.	$\angle 1 \cong \angle 5$, $\angle 3 \cong \angle 7$, $\angle 2 \cong \angle 6$, $\angle 4 \cong \angle 8$
*Vertical Angles**	Angles that are across or diagonal from each other	$\angle 1 \cong \angle 3$, $\angle 2 \cong \angle 4$, $\angle 5 \cong \angle 7$, $\angle 6 \cong \angle 8$

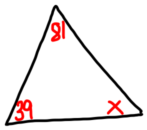
*Angles that are **congruent** to each other.

Angles on parallel lines that are **not congruent are **supplementary** (add up to 180°).

1.) What do the angles in a triangle add up to?

180°

2.) If a triangle has two angles with measures of 39° and 81°, what is the measure of the third angle?



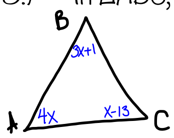
$39+81+x=180$

$120+x=180$

$-120 \qquad -120$

$\boxed{x=60^\circ}$

3.) In ΔABC, $m\angle A=4x$, $m\angle B=3x+1$, and $m\angle C=x-13$. Find the value of x and the measure of each angle.



$4x+3x+1+x-13=180$

$8x-12=180$

$+12 \quad +12$

$8x=192$

$x=24$

$m\angle A=4x=4(24)=96^\circ$

$m\angle B=3x+1=3(24)+1=72+1=73^\circ$

$m\angle C=x-13=24-13=11^\circ$

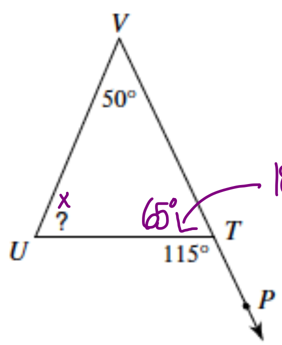
$\boxed{96^\circ, 73^\circ, 11^\circ}$

Check:

96
73
+11
180 ✓ ☺

4.) In each triangle below, find the missing angle.

(The sum of two remote interior angles is equal to the measure of the exterior angle)



$180-115=65$

$50+65+x=180$

$115+x=180$

$-115 \qquad -115$

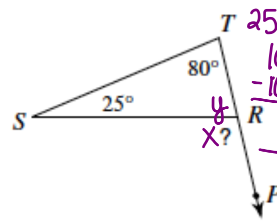
$\boxed{x=65}$

OR

$x+50=115$

$-50 \quad -50$

$\boxed{x=65^\circ}$



$25+80+y=180$

$105+y=180$

$-105 \quad -105$

$y=75^\circ$

$x+y=180$

$x+75=180$

$-75 \quad -75$

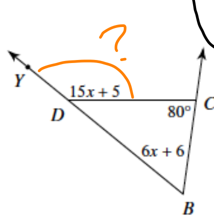
$\boxed{x=105^\circ}$

OR

$25+80=x$

$\boxed{105^\circ=x}$

5.) 18) Find $m\angle YDC$.



$6x+6+80=15x+5$

$6x+86=15x+5$

$-6x \qquad -6x$

$86=9x+5$

$-5 \qquad -5$

$81=9x$

$\frac{81}{9}=\frac{9x}{9}$

$9=x$

$m\angle YDC=15x+5$

$=15(9)+5$

$=135+5$

$\boxed{m\angle YDC=140^\circ}$

Notes 6.7 - Similarity vs. Congruence

1.) What is the difference between congruency and similarity?

Two figures are congruent when their sides are congruent and their angles are congruent.

Two figures are similar when their sides are proportional and their angles are congruent.

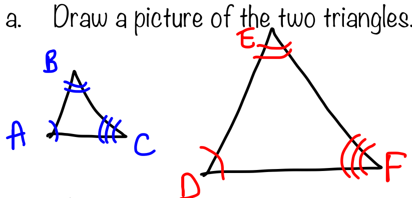
2.) What requirements are there for shapes to be similar?

① proportional sides

② congruent angles

3.) $\Delta ABC \sim \Delta DEF$. Answer the following questions.

a. Draw a picture of the two triangles.



b. Which angle corresponds to $\angle A$? $\angle D$

c. Which angle corresponds to $\angle B$? $\angle E$

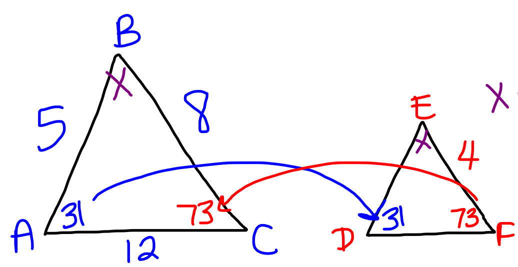
d. Which angle corresponds to $\angle C$? $\angle F$

e. Which side corresponds to AB? $\overline{DE}$

f. Which side corresponds to BC? $\overline{EF}$

g. Which side corresponds to AC? $\overline{DF}$

h. Fill in the missing information in the chart below.



$x + 31 + 73 = 180$

$x + 104 = 180$

$-104 \quad -104$

$x = 76°$

$AB = 5$	$m\angle A = 31$	$DE =$ 2.5 (5÷2)	$m\angle D =$ 31°
$BC = 8$	$m\angle B =$ 76°	$EF = 4$	$m\angle E =$ 76°
$AC = 12$	$m\angle C =$ 73°	$DF =$ 6 (12÷2)	$m\angle F = 73$

i. What is the scale factor? $\frac{1}{2}$ $\left(\frac{4}{8} = \frac{1}{2}\right)$

4.) Which transformation will result in a figure that is similar, but not congruent, to the original figure? Explain your reasoning.

DILATION-

Same shape, different size

congruent angles

proportional sides