Unit 3 Similar Figures and Dilations

Target 1 – Use proportions to identify lengths of corresponding parts in similar figures

Target 2 – Perform and identify dilations

Target 3 – Use ratios of lengths, perimeter, & area to determine unknown corresponding parts

- ***3.3a –Use Scale Factor & Similarity to Determine Unknown Lengths in Polygons & Circles***
- ***3.3b –Use Scale Factor & Similarity to Determine Unknown Corresponding Parts***

Target 4 – Perform compositions of figures to determine the coordinates and location of the image

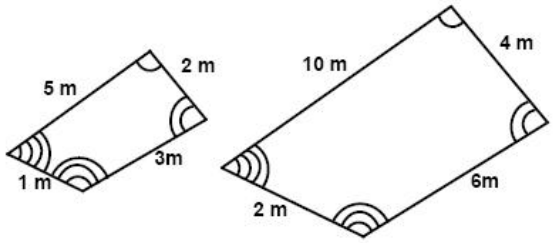
Name: _____

3.1 – Similar Figures

Target 1 – Use proportions to identify lengths of corresponding parts in similar figures

Vocabulary

Similar Polygons: Corresponding angles are _____ and corresponding sides are _____

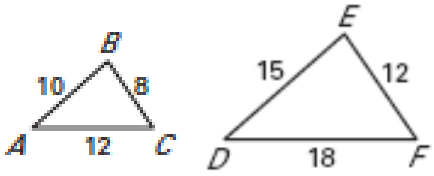


Linear Scale Factor: _____ between _____ _____

Example 1: Use similarity statements

In the diagram, $\Delta ABC \sim \Delta DEF$.

1. List all pairs of corresponding sides

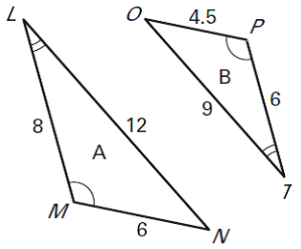


2. Check that the ratios of corresponding side lengths are equal.
   Ratio 1: **Ratio 2:** **Ratio 3:**

Linear Scale Factor of ΔABC to ΔDEF?

Example 2: Determine triangle similarity

A) Determine whether the polygons are similar.
If they are, write the similarity statement and find the scale factor of A to B.



Similar? YES or NO

Linear Scale Factor: _____

Similarity Statement: _____

B) Which of the following triangle measurements represents a similar triangle to one with measurements of 6, 8, and 10 inches?

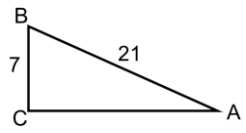
(a) 18 in, 24 in, and 30 in
(b) 1.5 in, 2 in, and 2.5 in
(c) 12 in, 16 in, and 18 in

Annotate Here

Example 3: Find linear scale factors and unknown side lengths

Proportion - A comparison of _____ _____

a) $\Delta ABC \sim \Delta DEF$.



is the scale factor of ΔABC *to* ΔDEF*?*

What is the length of ED?

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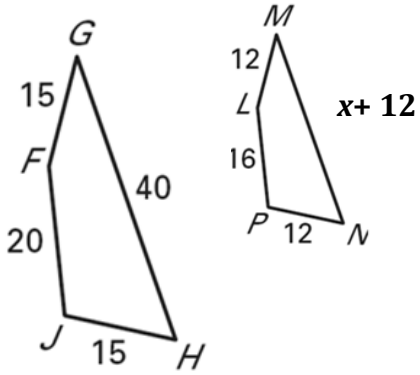
b) In the diagram, FGHJ ~LMNP.

1. What is the scale factor of *LMNP* to *FGHJ*?

2. Find the value of *x*.



Example 4: Use ratios to find an unknown side

The lengths of the sides of a triangle have the ratio 1:2:3.
If the perimeter of the triangle is 60 yards, what is the length of the smallest side?

Unit 3.1 Worksheet Answers

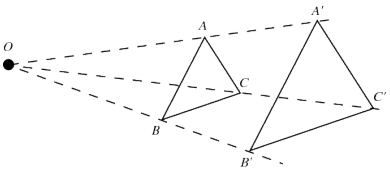
1. YES, linear scale factor = $\frac{9}{2}$, similarity statement → $TSU \sim LKM$
2. NO
3. YES, linear scale factor = $\frac{2}{1}$, similarity statement → $RSTU \sim WXYZ$
4. a) Scale factor = $\frac{5}{2}$ b) $x = 27.5, y = 12, z = 65°$
5. $x = 11$
6. $x = 9$
7. $XY = 8$
8. $YZ = 8$
9. $C \text{ and } D$
10. $A, D \text{ and } E$
11. Answers may vary
12. Answers may vary
13. $x = 4 \text{ so } DE = 88$
14. $x = 15 \text{ so } EP = 9$
15. 6

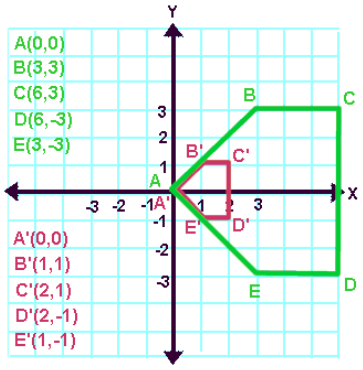
3.2 –Dilations

Target 2 – Perform and identify dilations

Vocabulary

Dilation-A transformation in which a polygon is _____ or _____ by a given **linearscale factor**using a centered_____.





Linear Scale Factor

Look at distance from _____ to _____

$$\_\_\_\_\_ = \frac{Prime\ \ Distance}{\text{PreImage}\ \ \text{Distance}}$$

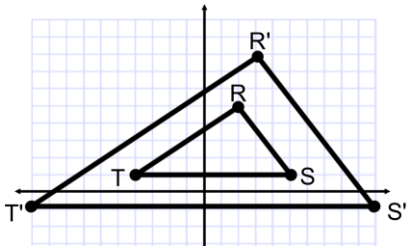
If k $< 1, then\ image\ is\ a$ _____

If k $> 1, then\ image\ is\ an$ _____

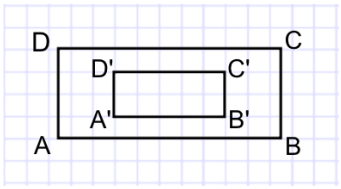
Example 1: Identify dilations

Determine whether the dilation is a *reduction (shrink)* or an *enlargement (expand)*. Find the linear scale factor of the dilation.

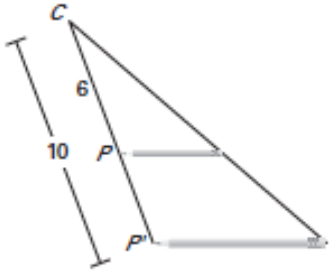
a)



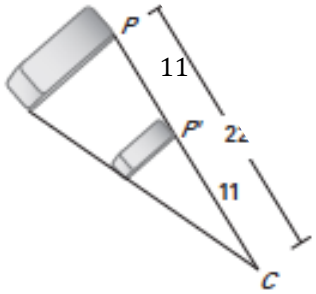
b)



c)



d)

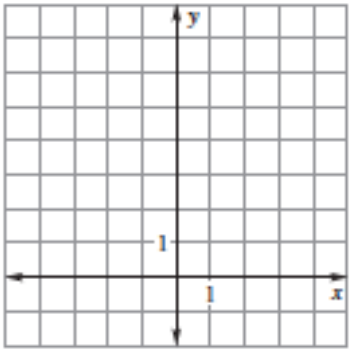


Annotate Here

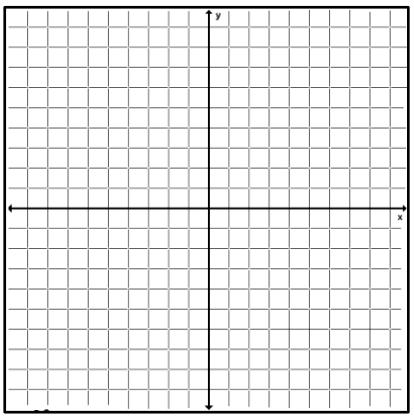
Example 2: Perform Dilations

a)The vertices of triangle *ABC* are A (-3, 0), B (0, 6), C (3, 6). Use scalar multiplication to find *A'B'C'* after a dilation with is center at the origin and a scale factor of $\frac{1}{3}$.

Graph *ABC*and its image.



b) The vertices of ΔABC *is A(-3, 4), B(3.5, -5), C(2, 3). Find the vertices of the dilated image with scale factor of* 2. *The center of the dilation is the origin.*



Example 3: Understanding Notation

ΔABC*is dilated to form triangle* $\Delta A'B'C'$. *If* $\frac{AB}{A'B'} = 7$, *what is* $\frac{B'C'}{BC}$?

QUESTIONS OR REFLECTION

What concepts were important to take away from this target? Questions?

Unit 3.2 Worksheet Answers

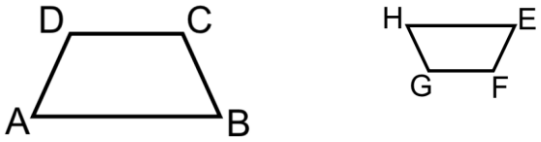
1. Answers may vary (check with classmates or teacher for verification)
2. Answers may vary (k > 1)
3. Q' (-40.5, 45)
4. LSF = $\frac{7}{3}$; Enlargement
5. LSF = $\frac{2}{5}$; Reduction
6. LSF = $\frac{3}{2}$; x = 10; Enlargement
7. $A'(-1.5, 3)$, $Y'(2, 2.5)$, $B'(3.5, -0.5)$ $D'(-4, -0.5)$ Sum = 4.5
8. 3
9. 8.5
10. $\frac{1}{9}$
11. $\frac{1}{3}$
12. $A'(0, 6)$, $B'(4, -6)$, $C'(8, 8)$ Product = -288
13. $A'(-1, 2)$, $B'(3, 1)$, $C'(2, -1)$ Sum = 2
14. $\frac{35}{6}$
15. Area = 96 in^2
16. k = 5
17. $A(-1.5, -1.5)$, $B(1, 1)$, $C(3.5, -1.5)$

3.3 Day1 –Find Unknown Lengths in Polygons&Circles

Target 3 – Use ratios of lengths, perimeter, &area to determine unknown corresponding parts

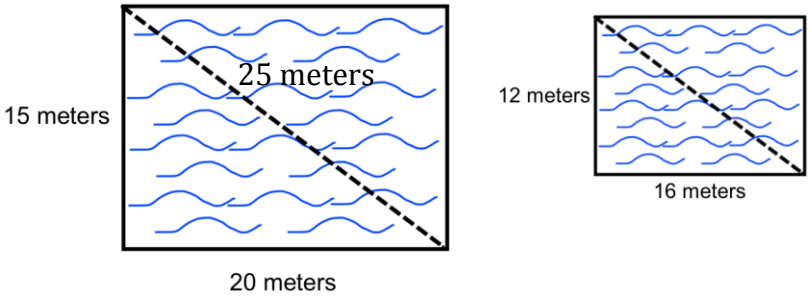
Example 1: Identify corresponding parts

Given the similar trapezoids ABCD and EHGF below, identify the side that is proportional to $\overline{BC}$.



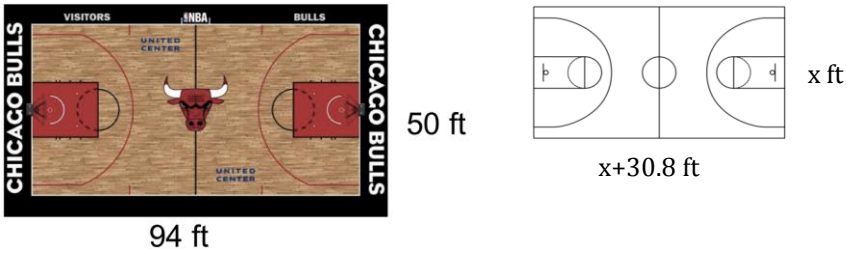
Example 2:Find lengths of unkown corresponding parts

The two rectangular swimming pools are similar.
How far is the diagonall across the smaller pool?



Example 3: Use similarity to find lengths

A high school wants to build a basketball court that is similar to an NBA basketball court, which is 94 feet long and 50 feet wide. Unforunately, the high school can only budget a room for a court that is 30.8 feet longer than it's width. How long should the court be, to the nearest foot?



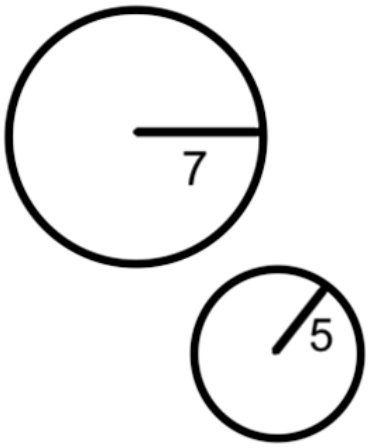
Example 4: Use similarity to find lengths

A 42.9 ft flagpole casts a 253.1 ft long shadow.
About how long is the shadow of a 6.2 ft tall woman?

Annotate Here

FUN FACT!

***All* circles are similar!*All* angles are congruent because circles have a $360°$ angle. *All* lengths are proportional because radii and circumferences are proportional!**

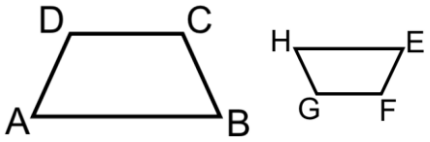


The scale factor is

2)

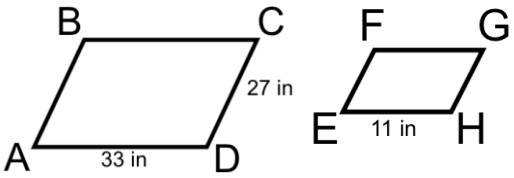
YOU TRY NOW!

a) Given the similar trapezoids ABCD and EFGH below, identify the side that is proportional to $\overline{BC}$.

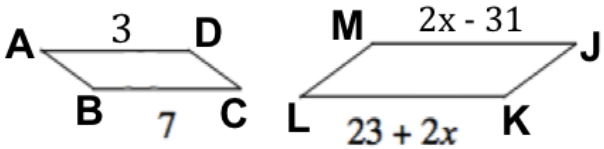


b) A 42.9 ft flagpole casts a 253.1 ft long shadow.
About how long is the shadow of a 6.2 ft tall woman?

c) *Parallelograms ABCD and EFGH are similar. What is the length of* $\overline{GH}$*?*



$ABCD \sim JKLM$



$LK =$ _____

QUESTIONS OR REFLECTION

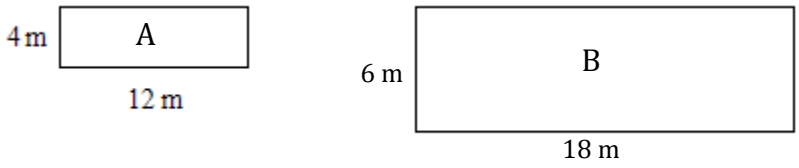
Write down at most 2 questions that you can ask the next day. BE SPECIFIC.

1)

Annotate Here

3.3 Day 3–Find Unknown Perimeters and Areas

Target 3 – Use ratios of lengths, perimeter, & area to determine unknown corresponding parts



What is the linear scale factor of Rectangle A to Rectangle B? _____

What is the perimeter of Rectangle A? _____ Rectangle B? _____

What is the ratio of the perimeters of Rectangle A to Rectangle B? _____

What is the area of Rectangle A? _____ Rectangle B? _____

What is the ratio of the areas of Rectangle A to Rectangle B? _____

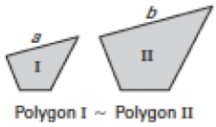
Perimeters of Similar Polygons

If two polygons are similar with the lengths of corresponding sides in the ratio a:b, then the ratio of their perimeters is _____: _____.

Linear Scale Factor:

$$\frac{Side\ Length\ of\ Polygon\ 1}{Side\ Length\ of\ Polygon\ 2} =$$

Ratio of Perimeters:



Polygon I ~ Polygon II

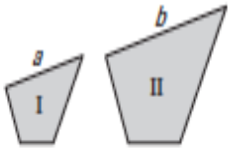
Linear Scale Factor/Ratio of the Perimeters

AREAS OF SIMILAR POLYGONS

If two polygons are similar with the lengths of corresponding sides in the ratio of $a:b$, then the ratio of their areas is ___:___.

$$\frac{\text{Side length of Polygon I}}{\text{Side length of Polygon II}} = \_\_\_$$

$$\frac{\text{Area of Polygon I}}{\text{Area of Polygon II}} = \_\_\_$$



Polygon I ~ Polygon II

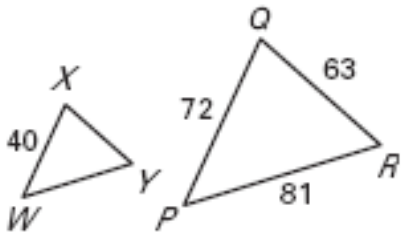
Ratio of the Areas

Example 1: Find an unknown ratio

Linear Scale Factor	Perimeter Ratio	Area Ratio
$\frac{2}{3}$		
	$\frac{5}{6}$	
		$\frac{8}{32}$

Example 2: Find the perimeter of similar figures

a) $\Delta WXY \sim \Delta PQR$. Find the perimeter of ΔWXY.



Linear Scale Factor	Ratio of the Areas

Perimeter of ΔWXY: _____

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b) The ratio of the areas of two squares is 8:50.
If the perimeter of the smaller square is 25 m, what is the perimeter of the larger square?

Linear Scale Factor	Ratio of the Areas

Perimeter of Larger Square: _____

Example 3: Find the areas of similar figures

a) The ratio of the area of two circles is 9:16.
If the area of the larger circle is 68 ft^2, what is the area of the smaller circle?

Linear Scale Factor	Ratio of the Areas

Area of ΔXYZ: _____

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b)$\Delta ABC \sim \Delta DEF$. AB = 3 inches, DE = 6 inches, and the area of ΔABC is 72 square inches. What is the area of ΔDEF?

Linear Scale Factor	Ratio of the Areas

Area of ΔDEF: _____

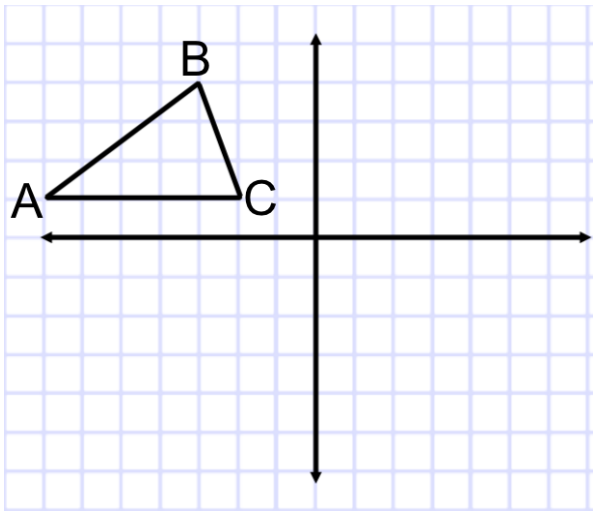
3.4 –Compositions with Dilations

Target 4 – Perform compositions of figures to determine the coordinates and location of the image

Example 1: Perform the composition

a) Transformation #1: Reflect over the line $x = -1$

Transformation #2: Dilate by a factor of $\frac{1}{2}$ centered at the origin



Coordinates after each transformation

ΔABC	$\Delta A'B'C'$	$\Delta A''B''C''$
A(-7 ,1)	**A'(,)**	**A''(,)**
B(-3 , 4)	**B'(,)**	**B''(,)**
C(-2 ,1)	**C'(,)**	**C''(,)**

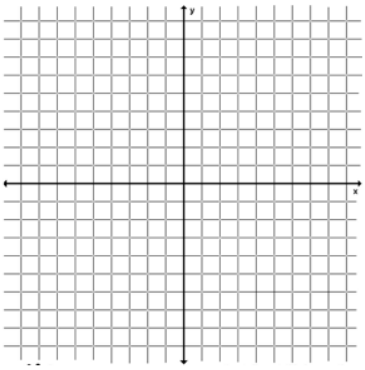
b) The endpoints of $\overline{CD}$ are C (-2, 3) and D (0, -2). Graph the image of $\overline{CD}$ after the composition.

Dilate by a scale factor of 3 centered at the origin

Rotation: 90° clockwise about the origin

C' D'

C'' D''



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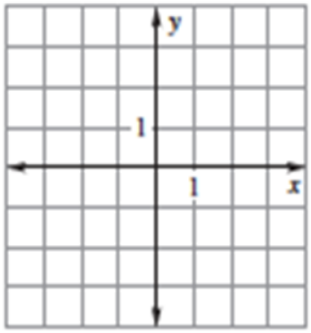
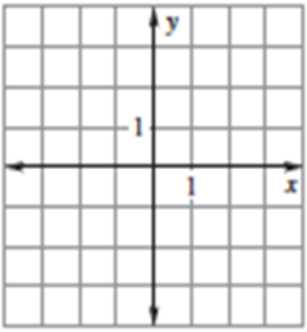
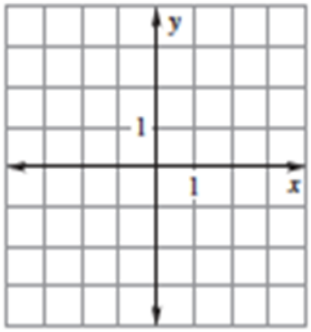
Graph y = 2



Graph x = -1



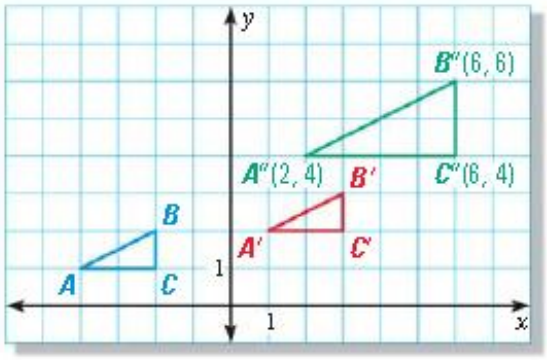
Rotate K in a counter-clockwise direction



CCW	K (3, 2)
90°	
180°	
270°	

Example 2:Describe the composition

Describe the composition of transformations.
Give the exact translation, reflection or rotation using proper notation.



Transformation 1:
Transformation 2:

SUMMARY

In your own words, describe what a composition is.

3.4 Worksheet Answers

18.
   a. $P'(-9,6), P''(-3,2)$
   b. $P'(8,16), P''(-8,16)$
   c. $P'(1,2), P''(\frac{1}{2}, 1)$
   d. $P'(2,-1), P''(-2,1)$

19. $C'(3,0)D'(2,-6), C''(1,0)D''(\frac{2}{3},-2)$
20. $C'(6,-12)D'(4,0), C''(8,-12)D''(6,0)$
21. $P'(3,6)Q'(9,0)R'(6,-3), P''(-6,3)Q''(0,9)R''(3,6)$
22. $P'(2,6)Q'(6,2)R'(4,0), P''(1,3)Q''(3,1)R''(2,0)$
23. Transformation 1: Dilate by a factor of 2 centered at the origin
    Transformation 2: Reflect over line x = 1
24. Transformation 1: Rotate 90° CW about the origin
    Transformation 2: Dilate by a factor of $\frac{1}{3}$ centered at the origin
25. $A'(-3.4,3.4), A''(-3.4,0.6)$, Sum = -2.8
26. $A'(2,8), A''(-1,6)$, Sum = 5
27. SUM = -3
28. SUM = 1
29. SUM = -14
30. SUM = 3