Topic 7: Congruence and Similarity

Term	Meaning
Corresponding Sides	
Proportional Relationship	
Constant of Proportionality	
Transformation	
Translation	
Image	
Congruent	
Reflection	
Line of Reflection	
Rotation	

Center of Rotation	
Angle of Rotation	
Dilation	
Scale Factor	
Similar Figures	

Translations

(x, y) —>

Rotations

270° cc (x, y) —>
90° cw

180° (x, y) —>

90° cc (x, y) —>
270° cw

Reflections

Across x-axis: (x, y) —>

Across y-axis: (x, y) —>

Dilations

(x, y) —>

TRANSLATIONS ON THE COORDINATE PLANE

Guided Notes

ESSENTIAL QUESTION

What is a translation? How do I write the rule for a translation on the coordinate plane?

TRANSLATION

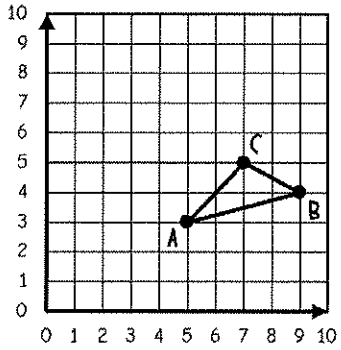
- A translation is a _____ of a figure in the up or down, and/or left or right direction. Every point of the figure moves the same _____ and _____.
- To translate a figure on the coordinate plane, _____ or _____ to the x and/or y values depending on the direction of the translation.

TRANSLATION RULE: (X ± #, Y ± #)

Right: (x + #, y) Up: (x, y + #)

Left: (x - #, y) Down: (x, y - #)

1. Translate figure ABC 4 to the left and 3 up. Record the original & new coordinates in the table and see if you notice any patterns.

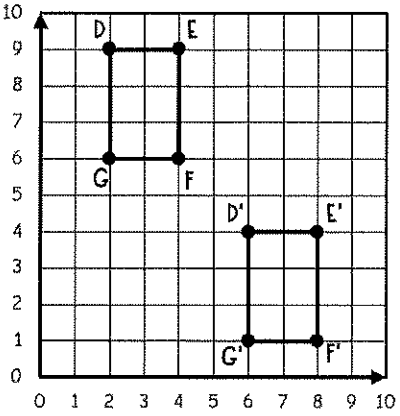


ORIGINAL IMAGE		NEW IMAGE		How were the x-coordinates effected in the translation?
A		A'		
B		B'		How were the y-coordinates effected in the translation?
C		C'		

2. Figure DEFG is translated to create Figure D'E'F'G'.

Verbal Description:

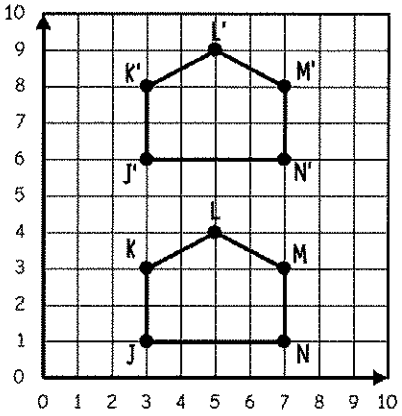
Rule:



3. Figure JKLMN is translated to create Figure J'K'L'M'N'.

Verbal Description:

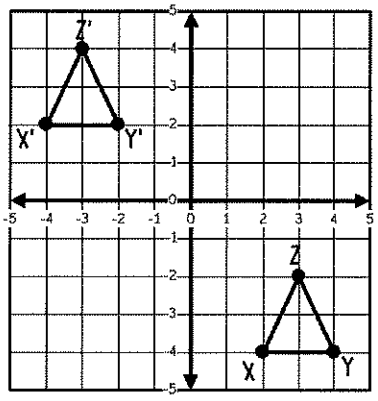
Rule:



4. Figure XYZ is translated to create Figure X'Y'Z'.

Verbal Description:

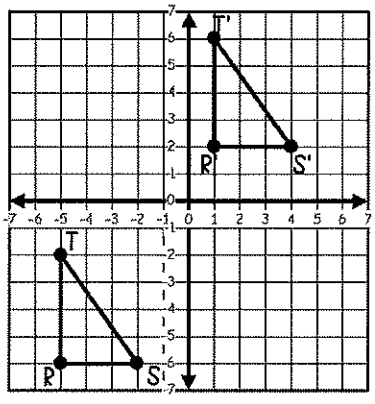
Rule:



5. Figure RST is translated to create Figure R'S'T'.

Verbal Description:

Rule:



Lesson 1: Analyze Translations

*Goal: Use coordinates to describe the **rules of a translation***
***Translate a 2D figure** on a coordinate plane by mapping each of its vertices*

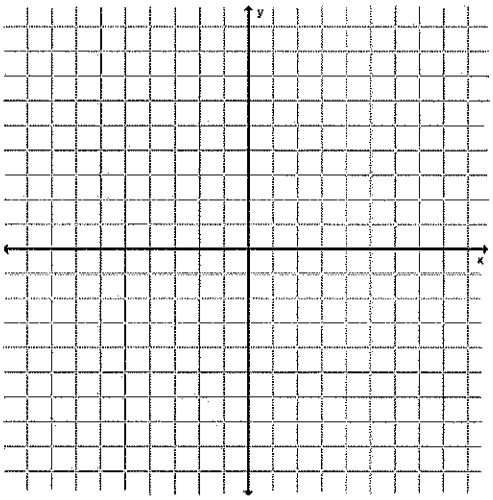
_____: an operation that changes the position, shape or size of a figure.

Translation: _____ of a figure the same _____ and _____.

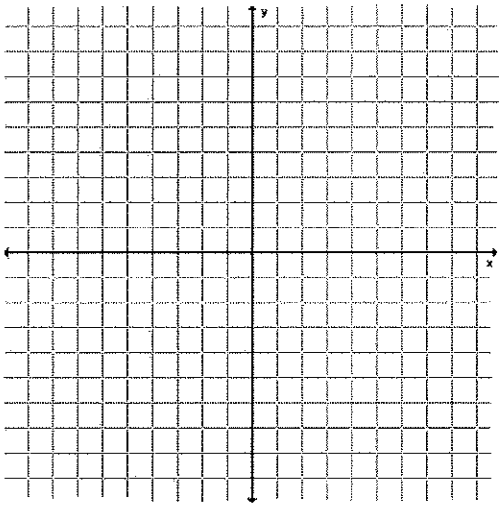
The _____ formed is _____ to the original because they have the same shape and size.

Translations are shown by (x, y) -----> (x±a, y±b)
Points are labeled: A ----> A' B----> B'

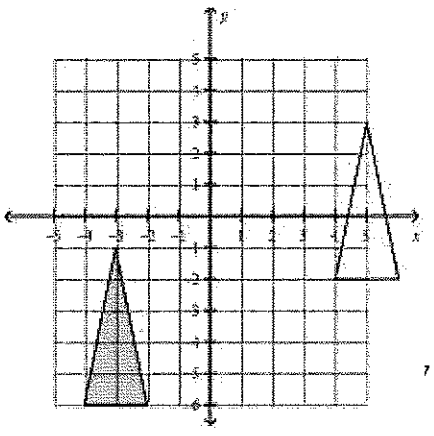
Triangle XYZ has vertices X (-1, -2) Y (6, -3) Z (2, -5) Find the vertices of the image after a translation of 2 units left and 5 units up.



Quad ABCD has vertices A (0,0) B(2,0) C (3,4) D (0,4). Find the vertices after a translation of 4 units right and 2 units down.



Describe the translation from the unshaded figure to the shaded figure.



REFLECTIONS ON THE COORDINATE PLANE

Guided Notes

ESSENTIAL QUESTION

What is a reflection? How do I write the rule for a reflection on the coordinate plane?

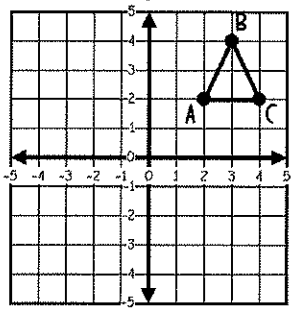
REFLECTION

- A reflection is a _____ of a figure over a line of reflection to create a mirror image. Each point is _____ distance from the line of reflection on the opposite side. This year, we will be reflecting over the x-axis and y-axis.

REFLECT OVER X-AXIS RULE: (X, -Y)

REFLECT OVER Y-AXIS RULE: (-X, Y)

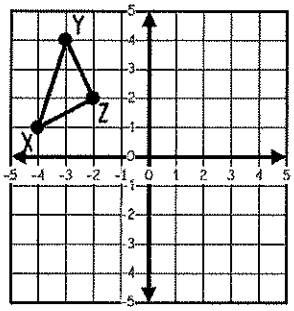
1. Reflect Figure ABC over the **x-axis** & fill out the table.



ORIGINAL IMAGE		NEW IMAGE	
A		A'	
B		B'	
C		C'	

What patterns do you notice between the original & new coordinates? What is the rule for a reflection over the **x-axis**?

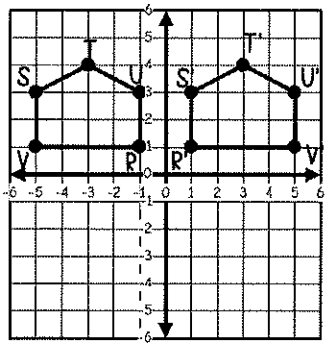
2. Reflect Figure ABC over the **y-axis** & fill out the table.



ORIGINAL IMAGE		NEW IMAGE	
X		X'	
Y		Y'	
Z		Z'	

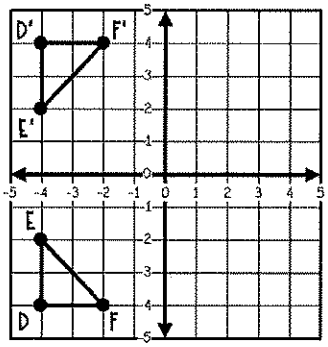
What patterns do you notice between the original & new coordinates? What is the rule for a reflection over the **y-axis**?

3. Does the transformation below show a reflection over the x-axis or the y-axis?



Rule:

4. Does the transformation below show a reflection over the x-axis or the y-axis?



Rule:

5. James thinks the rule for a reflection over the x-axis is (-x, y). Ramsey thinks the rule for a reflection over the x-axis is (x, -y). Who is correct and why?

6. Brooke thinks the reflection of point A (-8, 10) over the y-axis would transform to point A' (-8, 10) since the rule is (-x, y). Is she correct? Why or why not?

Lesson 2: Analyze Reflections

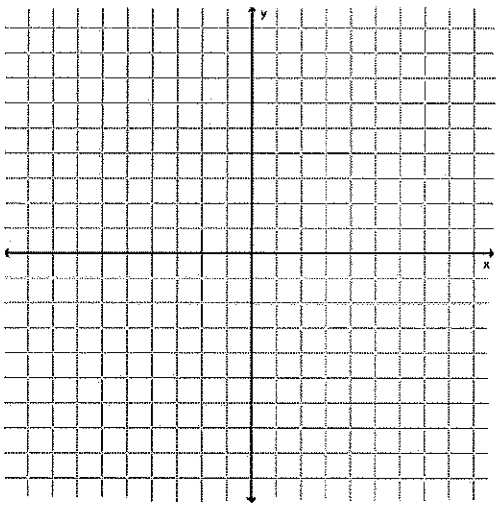
Goal: ***Understand reflections*** *as a type of transformation*
Use coordinates to ***describe the image created by a reflection***
Reflect a 2D figure *on a coordinate plane by* ***mapping*** *each of its vertices*

A reflection is a _____ of the original figure. It is the result of a transformation of a figure over a line called _____. (Generally the x- or y-axis)

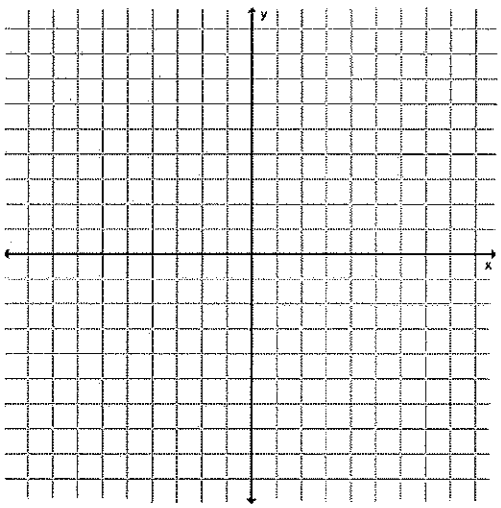
To reflect across the x axis: (x,y) ---->

To reflect across the y axis: (x,y) ---->

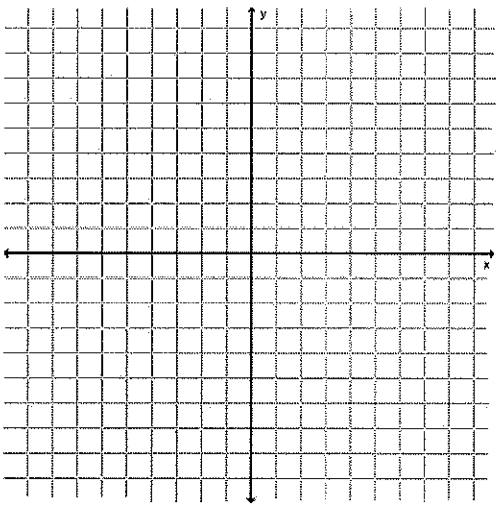
Reflect Triangle ABC across the x-axis
A(5,2) B(1,3) C (-1,1)



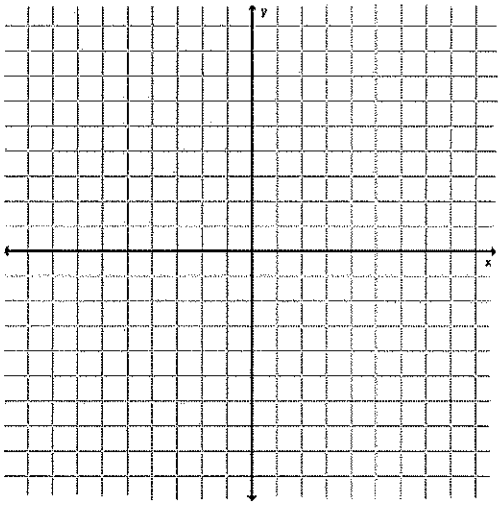
Reflect Quad DEFG across the y-axis. D(7,1) E (6,4) F(3,2) G(4,0)



Reflect XYZ over the x-axis and then over the y-axis
X (1,5) Y (3,7) Z (4,-1)



Reflect JKLM over the y-axis and then over the x axis
J (2,3) K (5,1) L (4,-2) M (1,-1)



ROTATIONS ON THE COORDINATE PLANE

Guided Notes

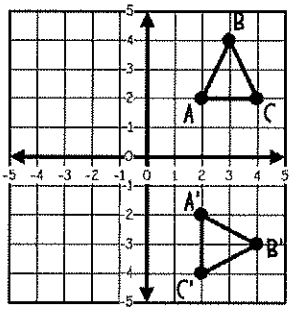
ESSENTIAL QUESTION

What is a rotation? How do I write the rule for a rotation on the coordinate plane?

ROTATION

- A rotation is a _____ of a figure about a fixed point. This year, we will always rotate about the _____.
- Rotations can be _____ (turn to the right) or _____ (turn to the left).

90° CLOCKWISE / 270° COUNTERCLOCKWISE

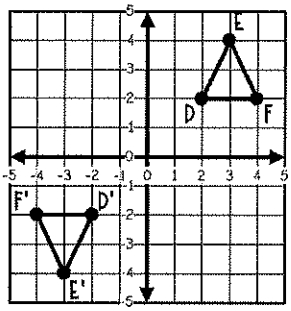


ORIGINAL IMAGE		NEW IMAGE	
A		A'	
B		B'	
C		C'	

Patterns observed:

90° CW/270° CCW Rule:

180° CLOCKWISE / 180° COUNTERCLOCKWISE

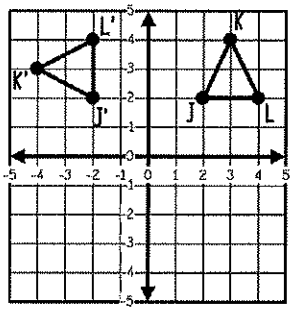


ORIGINAL IMAGE		NEW IMAGE	
D		D'	
E		E'	
F		F'	

Patterns observed:

180° CW/180° CCW Rule:

270° CLOCKWISE / 90° COUNTERCLOCKWISE

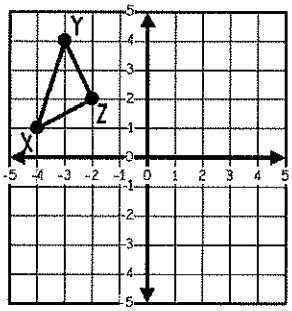


ORIGINAL IMAGE		NEW IMAGE	
J		J'	
K		K'	
L		L'	

Patterns observed:

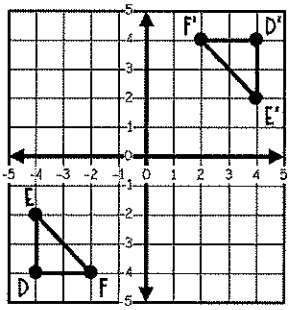
270° CW/90° CCW Rule:

1. Rotate figure XYZ 90° clockwise.



Rule:

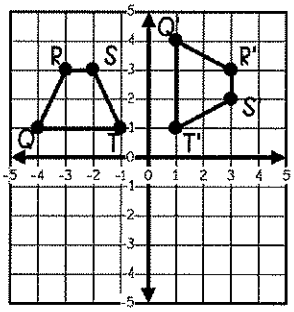
2. Figure DEF was transformed to create figure D'E'F'.



Which rule describes this transformation?

A. (y, -x) B. (-x, -y)
C. (-y, x) D. (-y, -x)

3. Figure QRST was transformed to create figure Q'R'S'T'.



Which rule describes this transformation?

A. (y, -x) B. (-x, -y)
C. (-y, x) D. (-y, -x)

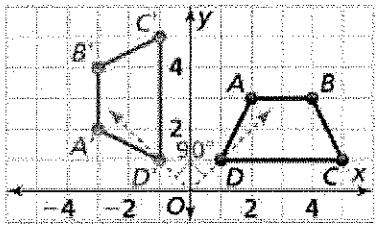
Lesson 3: Analyze Rotations

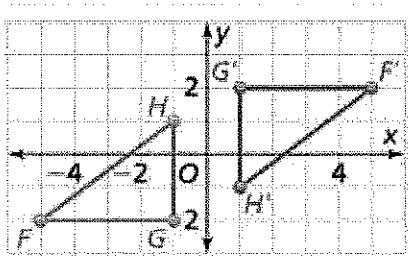
*Goal: Determine how a rotation **affects** a 2D figure*
*Use coordinates to **describe the image created by a rotation***
***Rotate a 2D figure** on a coordinate plane by **mapping** each of its vertices*

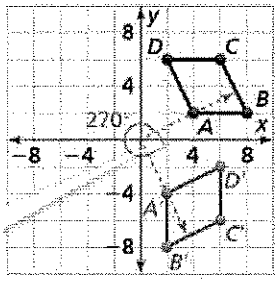
Rotation: a transformation in which a figure is rotated or _____ about a fixed point _____(generally the origin)
The shape and size of the figure stay the same, but the direction it faces will look different.

The rotations shown here are counterclockwise around the origin

90° 180° 270°

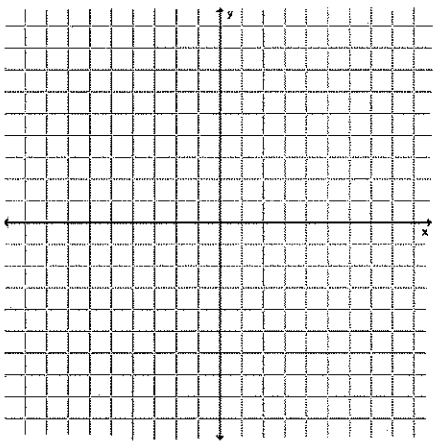




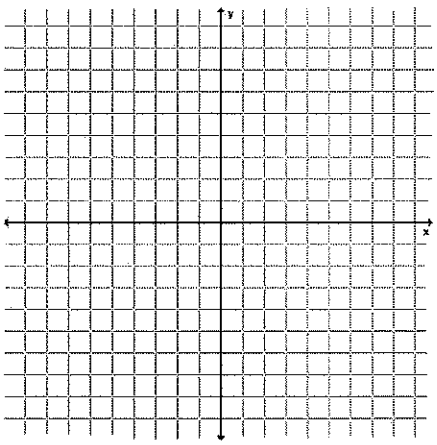


90° (x, y) —> **180° (x, y) —>** **270° (x, y) —>**

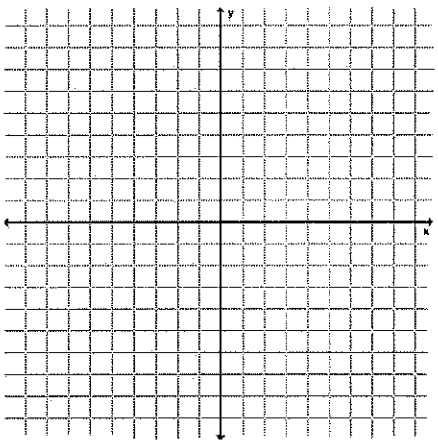
Rotate PQR 90°
P(-4,1) Q(-1,4) R(-2,1)



Rotate JKLM 180°
J(-7,4) K(-7,1) L(-2, 1) M(-2,4)



Rotate DEF 270°
D(-4,4) E(-1,2) F(-3,1)

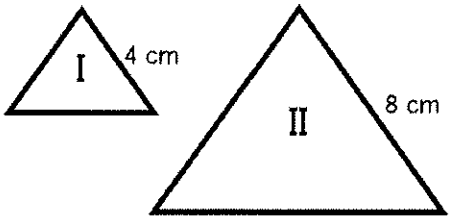


DILATIONS & SCALE FACTOR
Guided Notes

ESSENTIAL QUESTION
What is a dilation & scale factor? How do I find a scale factor?

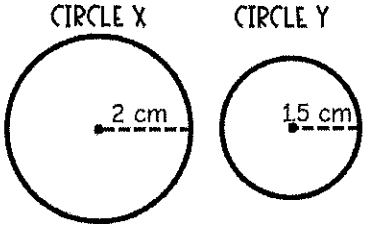
SCALE FACTOR	• A scale factor is a _____ between the corresponding parts of similar figures. • The ratio can be found by _____ a corresponding new & original side length. Scale Factor = $\frac{\text{new}}{\text{original}}$ **A new figure is often denoted with a prime (') symbol*
DILATION	• A _____ is a transformation that produces a similar figure by _____ by the scale factor. The new image will have the same shape & congruent angles, but will be _____ or _____. The new & original figures will have _____ side lengths between the corresponding sides.
REDUCTION	• A dilation where the scale factor is _____ than one. The new figure will be _____ than the original.
ENLARGEMENT	• A dilation where the scale factor is _____ than one. The new figure will be _____ than the original.

1. Find the scale factor that was used to dilate Figure I to create Figure II.



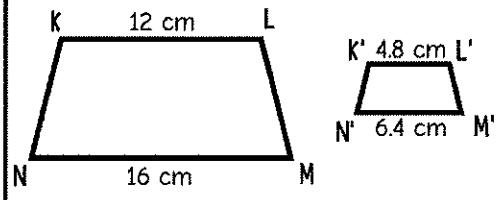
Scale Factor: _____ Circle one: Enlargement or Reduction

2. Find the scale factor that was used to dilate circle X to create circle Y.



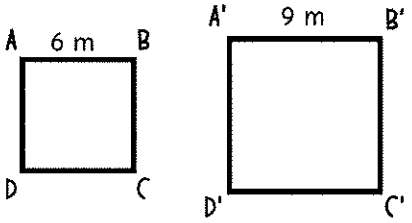
Scale Factor: _____ Circle one: Enlargement or Reduction

3. Find the scale factor that was used in the dilation below.



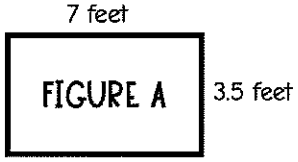
Scale Factor: _____ Circle one: Enlargement or Reduction

4. Find the scale factor that was used to dilate square ABCD to create square A'B'C'D'



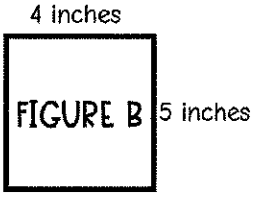
Scale Factor: _____ Circle one: Enlargement or Reduction

5. Figure A is dilated by a scale factor of 3. What are the dimensions of the new figure?



New Dimensions: _____
Enlargement or Reduction: _____

6. Figure B is dilated by a scale factor of ½. What are the dimensions of the new figure?



New Dimensions: _____
Enlargement or Reduction: _____

Lesson 4: Describe Dilations

*Goal: Verify the properties of a **dilation***
***Graph the image of a dilation** given a fixed center and scale factor*

A dilation moves each point along a ray through the point and starting from a

_____(generally the origin.)

The distances from the points to the center are _____ by a common scale factor.

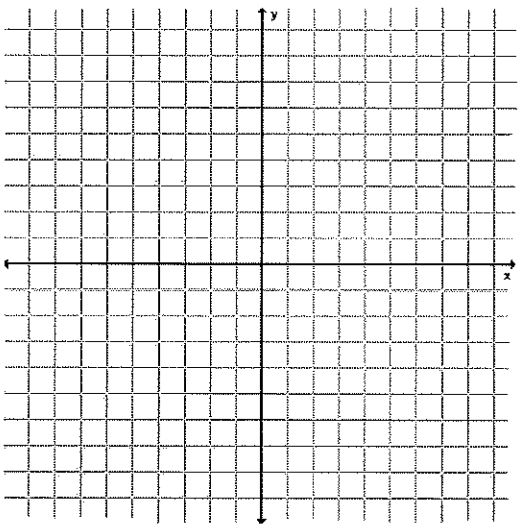
The original and the image will have the same shape but the _____ will depend on

the _____.

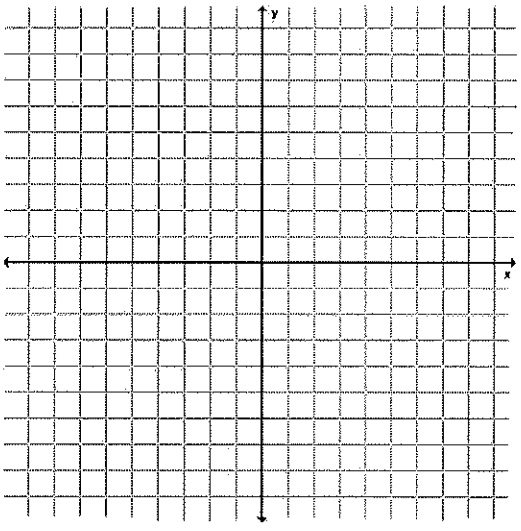
A figure VWX has coordinates V(0,0) W (8,0) X(3,-2). Find the coordinates after a dilation with a scale factor of 4.

Figure ABCD has coordinates A(-2,4) B(1,4) C(-3,-1) D(3,-1). Find the coordinates after a dilation with a scale factor of 2.

Dilate with a scale factor of 3
Q(-1,1)R(1,1)S(2,-1)T(-1,-1)



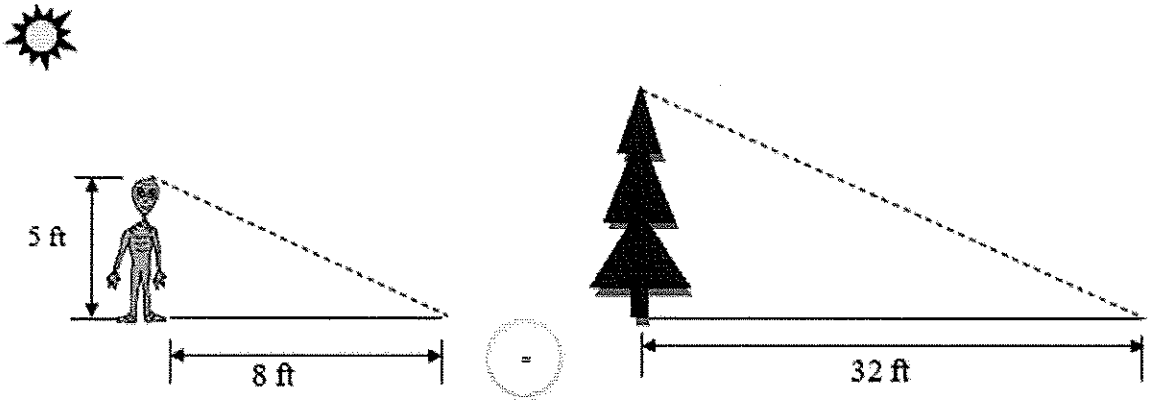
Dilate with a scale factor of ½
A(4,8) B(8,6) C(6,5)



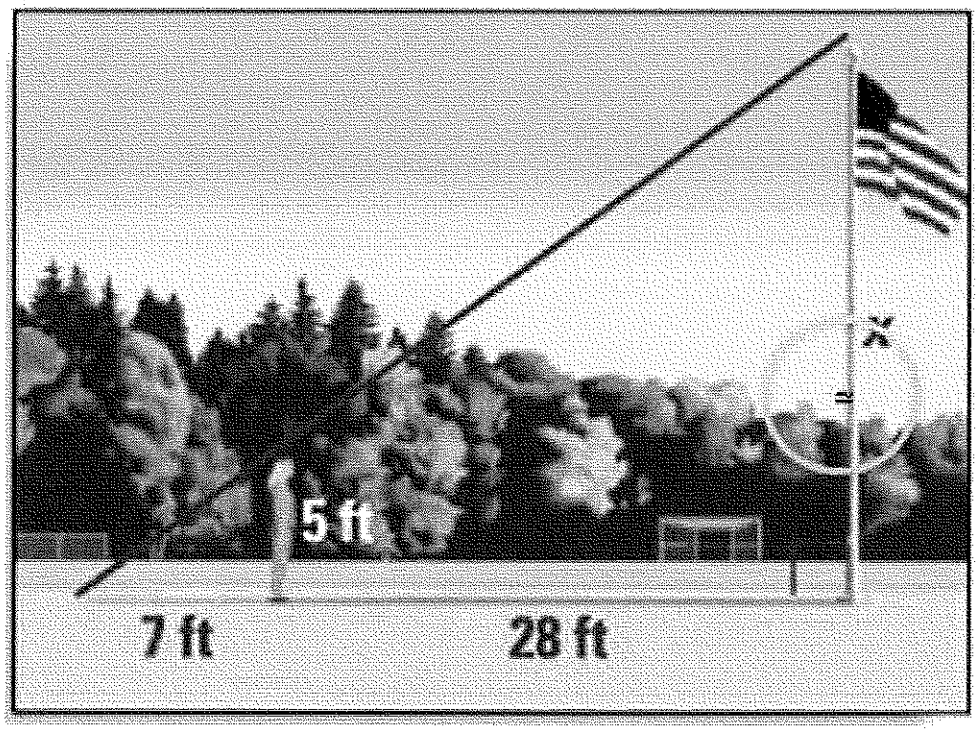
Lesson 5: Solve Problems Involving Similar Triangles

*Goal: Identify **similar triangles***
***Find missing side lengths** of similar triangles*

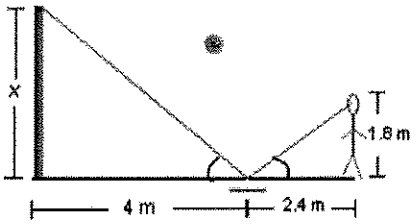
9) Lance the alien is 5 feet tall. His shadow is 8 feet long.



At the same time of day, a tree's shadow is 32 feet long. What is the height of the tree?



11) A statue, honoring Ray Hnatyshyn (1934–2002), can be found on Spadina Crescent East, near the University Bridge in Saskatoon. Use the information below to determine the unknown height of the statue.



Extra Problems for Practice

If two polygons are similar: ~

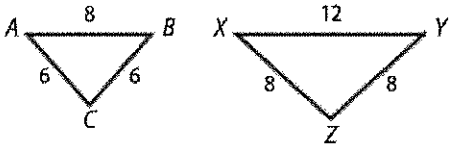
1. _____

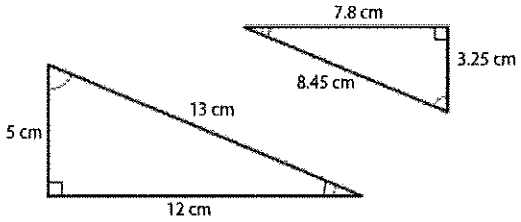
2. _____

Match the congruent corresponding parts when naming the similar figures.

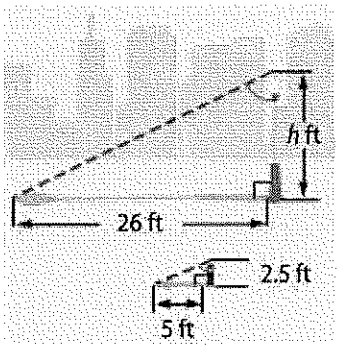
You can write a _____ to determine if two triangles are similar.

Determine if the triangles are similar





A fire hydrant that is 2.5 ft high casts a shadow that is 5 ft long. How high is the lamp that casts a 26 ft shadow?



The triangles are similar. Find the distance across the lake.