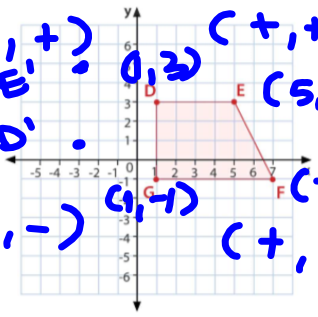
Bell Ringer

Section 9.3 - Rotations

1. Which direction is the default rotation? Circle one: Clockwise **Counter-Clockwise**

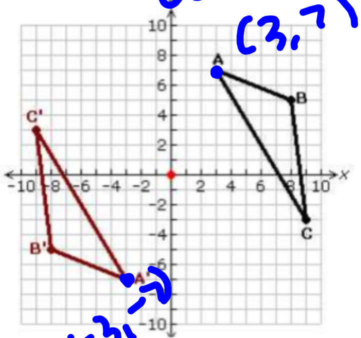
2. Graph $r_{(90°,O)}(DEFG)$

D'(,), E'(,), F'(,), G'(,)



3. Write a rule to describe the transformation below.

180° $r_{(180°,0)}(ABC)$



4. Write the equation of the line that goes through the point (-2, 3) and is parallel to the line y = -1/2x + 4

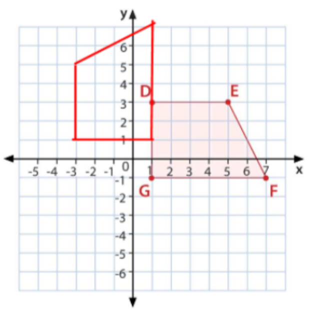
Solutions

Section 9.3 - Rotations

1. Which direction is the default rotation? Circle one: Clockwise Counter-Clockwise

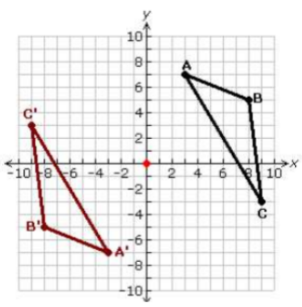
2. Graph $r_{(90°,O)}(DEFG)$

D'(-3 , 1), E'(-3, 5) , F'(1, 7), G'(1 , 1)



3. Write a rule to describe the transformation below.

$r_{(180°,O)}$



4. Write the equation of the line that goes through the point (-2, 3) and is parallel to the line y = -1/2x + 4

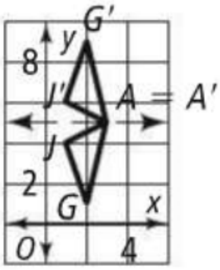
y = -1/2x + 2

9.2 #s 1-12, 15-18, 21-23

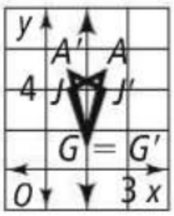
1. $(-5, -3)$

2. $(1, -1)$

3. $J'(1, 6), A'(3, 5), G'(2, 9)$



4. $J'(3, 4), A'(1, 5), G'(2, 1)$

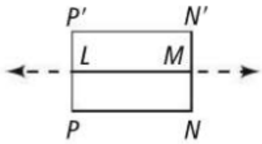


5. **a.** Figure 3 = R_j (Figure 1) because line j is the perpendicular bisector of the line segments between corresponding vertices of Figures 1 and 3.

b. Figure 2 = R_n (Figure 4) because line n is the perpendicular bisector of the line segments between corresponding vertices of Figures 2 and 4.

c. Figure 4 = R_n (Figure 2) because line n is the perpendicular bisector of the line segments between corresponding vertices of Figures 4 and 2.

6. **a.**

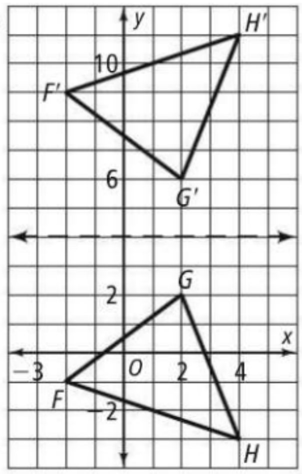


b. square; Since $R_{\overline{LM}}(M) = M$, $R_{\overline{LM}}(N) = N'$, and reflections preserve distance, $R_{\overline{LM}}(\overline{MN}) = \overline{MN'}$. So, $MN = MN'$ and $NN' = 2MN$. Since $LM = 2MN$ and $NN' = 2MN$, by substitution $LM = NN'$. Therefore, in the new figure $PNN'P'$ the length equals the width, so the figure is a square.

7. $(-4, -3)$

8. $(4, 2)$

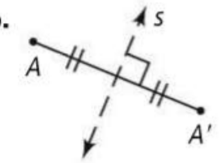
9.



10. The line of reflection is the ⊥ bis. of any seg. whose endpts. are corresp. pts. of the preimage and image.

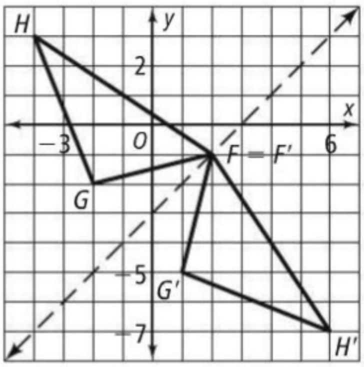
11. a. $\overline{AA'}$ should be ⊥ to r.

b.



12. $R_{y\text{-axis}}(x, y) = (-x, y)$; $R_{x\text{-axis}}(x, y) = (x, -y)$

15.

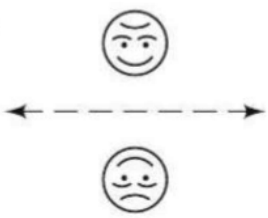


16. a. (3, 5), (1.5, 3.5)

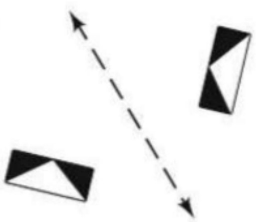
b. $y = x + 2$

c. $R_{y=x+2}(ABCDE) = A'B'C'D'E'$

17.



18.



21. (0, −6)

22. (4, 0)

23. (0, 0)

due tomorrow 9.3 #s 1-4, 7-9, 11-14, 20, 27-32

Bring Volume 1 tomorrow :)

pg 510

9-4 Compositions of Isometries

G.CO.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure . . . Specify a sequence of transformations that will carry a given figure onto another. Also G.CO.2

p510

Isometries

The term *isometry* means "same distance." An **isometry** is a transformation that preserves distance, or length. So, translations, reflections, and rotations are isometries.

pg 510

take note

Key Concept Composition of Isometries

The composition of two or more isometries is an isometry.

There are only four kinds of isometries.

You will learn about *glide reflections* later in the lesson.

p510

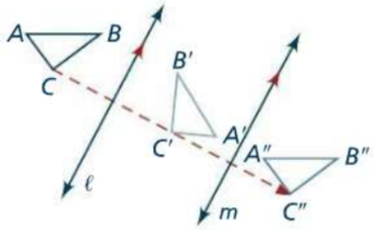
take note

Key Concept Reflections Across Parallel Lines

A composition of reflections across two parallel lines is a translation.

You can write this composition as
$(R_m \circ R_\ell)(\triangle ABC) = \triangle A''B''C''$
or $R_m(R_\ell(\triangle ABC)) = \triangle A''B''C''$.

$\overline{AA''}$, $\overline{BB''}$, and $\overline{CC''}$ are all perpendicular to lines ℓ and m.



pg 511 $(f \circ g)(3)$

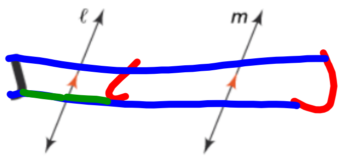
p511

Reflections across PARALLEL lines

not in book

Problem 1 Composing Reflections Across Parallel Lines

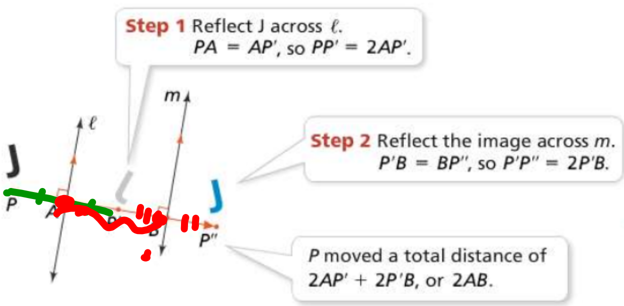
What is $(R_m \circ R_\ell)(J)$? What is the distance of the resulting translation?



Problem 1 Composing Reflections Across Parallel Lines

What is $(R_m \circ R_\ell)(J)$? What is the distance of the resulting translation?

As you do the two reflections, keep track of the distance moved by a point P of the preimage.



The red arrow shows the translation. The total distance P moved is $2 \cdot AB$. Because $\overleftrightarrow{AB} \perp \ell$, AB is the distance between ℓ and m. The distance of the translation is twice the distance between ℓ and m.

Got it pg 511

Got It? **a.** Draw parallel lines ℓ and m as in Problem 1. Draw J between ℓ and m. What is the image of $(R_m \circ R_\ell)(J)$? What is the distance of the resulting translation?

2 times distance between ℓ & m

b. Reasoning Use the results of part (a) and Problem 1. Make a conjecture about the distance of any translation that is the result of a composition of reflections across two parallel lines.

p511

pg 512

Reflections across INTERSECTING lines

take note

Key Concept Reflections Across Intersecting Lines

A composition of reflections across two intersecting lines is a rotation.

You can write this composition as $(R_m \circ R_\ell)(\triangle ABC) = \triangle A''B''C''$ or $R_m(R_\ell(\triangle ABC)) = \triangle A''B''C''$.

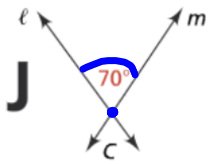
The figure is rotated about the point where the two lines intersect, in this case, point Q.

p512

not in book

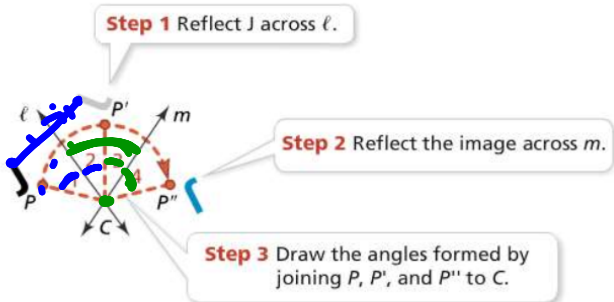
Problem 2 Composing Reflections Across Intersecting Lines

Lines ℓ and m intersect at point C and form a $70°$ angle. What is $(R_m \circ R_\ell)(J)$? What are the center of rotation and the angle of rotation for the resulting rotation?



Problem 2 Composing Reflections Across Intersecting Lines

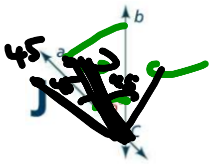
Lines ℓ and m intersect at point C and form a 70° angle. What is $(R_m \circ R_\ell)(J)$? What are the center of rotation and the angle of rotation for the resulting rotation?



J is rotated clockwise about the intersection point of the lines. The center of rotation is C. You know that $m\angle 2 + m\angle 3 = 70$. You can use the definition of reflection to show that $m\angle 1 = m\angle 2$ and $m\angle 3 = m\angle 4$. So, $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 = 140$. The angle of rotation is 140° clockwise.

Got it pg 513

Got It? **a.** Use the diagram below. What is $(R_b \circ R_a)(J)$? What are the center and the angle of rotation for the resulting rotation?



Point C,
90° rotation

b. Reasoning Use the results of part (a) and Problem 2. Make a conjecture about the center of rotation and the angle of rotation for any rotation that is the result of any composition of reflections across two intersecting lines.

p513

Glide Reflection... pg 514

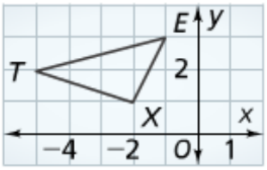
Any composition of isometries can be represented by a reflection, translation, rotation, or glide reflection. A **glide reflection** is the composition of a translation (a glide) and a reflection across a line parallel to the direction of translation. You can map a left paw print onto a right paw print with a glide reflection.

p514

not in book

Problem 3 Finding a Glide Reflection Image

Coordinate Geometry What is $(R_{x=0} \circ T_{<0,-5>})(\triangle TEX)$?



solution...

Problem 3 Finding a Glide Reflection Image

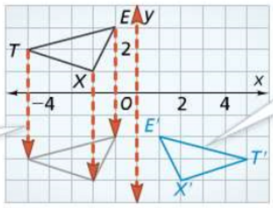
Coordinate Geometry What is $(R_{x=0} \circ T_{<0,-5>})(\triangle TEX)$?

Know
- The vertices of $\triangle TEX$
- The translation rule
- The line of reflection

Need
The image of $\triangle TEX$ for the glide reflection

Plan
First use the translation rule to translate $\triangle TEX$. Then reflect the translation image of each vertex across the line of reflection.

Use the translation rule $T_{<0,-5>}(\triangle TEX)$ to move $\triangle TEX$ down 5 units.

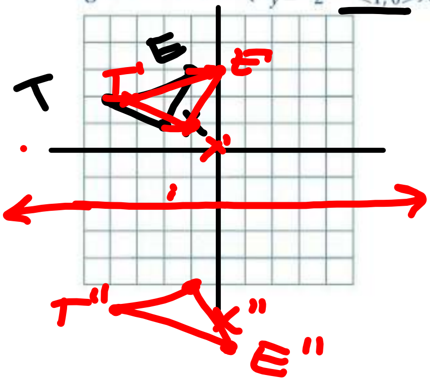


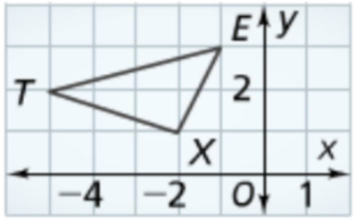
Reflect the image of $\triangle TEX$ across the line x = 0.

Got it pg 514

T(-4, 2), E(-1, 3), X(-2, 1)

Got It? Graph △*TEX* from Problem 3. What is the image of △*TEX* for the glide reflection $(R_{y=-2} \circ T_{<1,0>})(\triangle TEX)$?

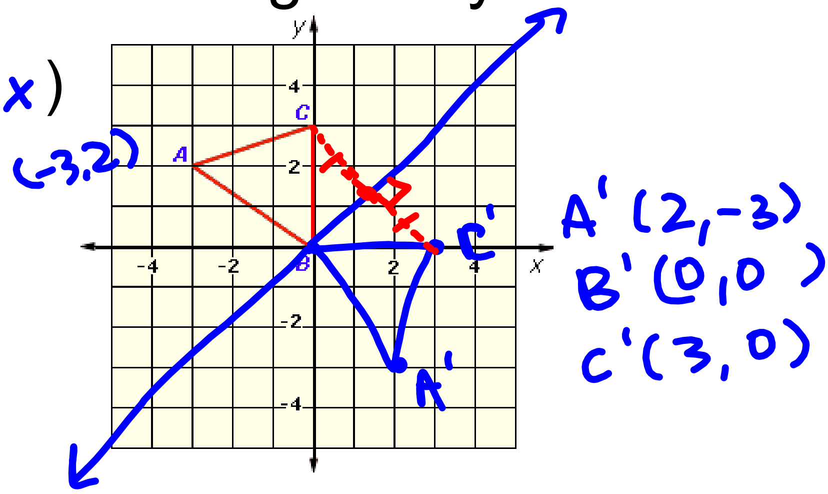




p514

Reflecting over y = x

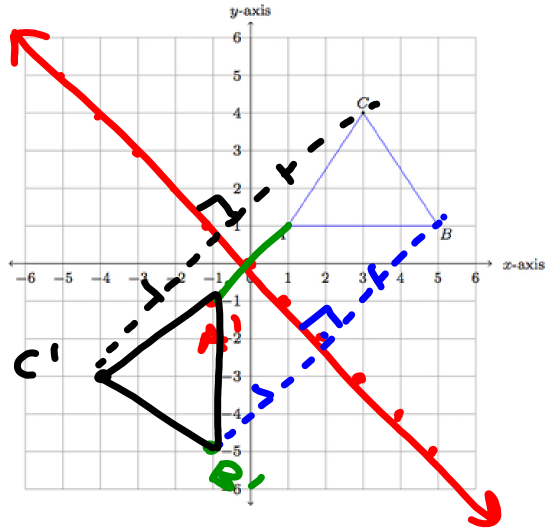
(x, y) --> (y , x)



Reflecting over y = -x

(x, y) --> (-y, -x)

A'(-1, -1)
B'(-1, -5)
C'(-4, -3)



9.4 #s 1-8, 10-16 evens, 19-20, 26-32 evens