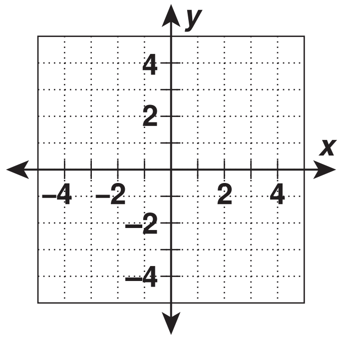
Name ______________________________ Date __________ Class __________

LESSON **4-3**

Algebra Lab

Using Matrices to Transform Geometric Figures

Use with Lesson 4-3



Activity 1

You and your partner are going to explore the concept of using matrices to transform geometric figures.

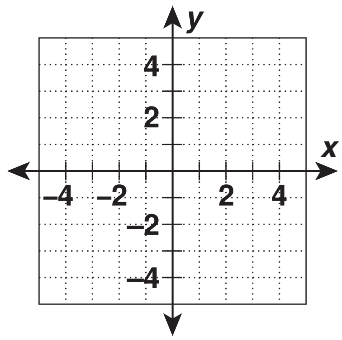
Step 1 Sketch the triangle ABC on the grid to the right. $A(0, 0)$, $B(4, 0)$, and $C(4, 3)$.

Step 2 Represent triangle ABC as matrix C.

$C =$ __________ Let $K = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$. Find KC. ________

Step 3 Graph the triangle represented by KC, $\triangle A'B'C'$, on the coordinate plane with ABC. How are $\triangle ABC$ and $\triangle A'B'C'$ related?

____



Activity 2

Step 1 Use the same coordinates as before to sketch triangle ABC on the grid to the right.

Step 2 Represent triangle ABC as matrix D.

Step 3 Let $M = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$. Find MD. __________

Step 4 Graph the triangle represented by MD, $\triangle A'B'C'$, on the coordinate plane with ABC.

How are $\triangle ABC$ and $\triangle A'B'C'$ related? ______________________________

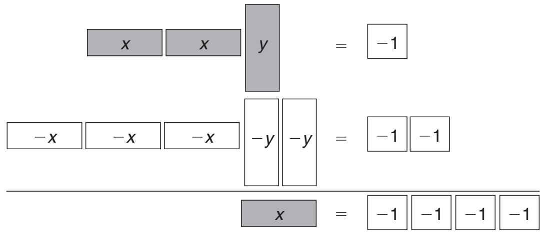
Try This

1. Sketch triangle $A(0, 0)$, $B(3, 0)$, and $C(3, 4)$. Represent the coordinates of the triangle as a matrix and find the product with matrix D. Let $D = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$.

   How are the two triangles related? ______________________________

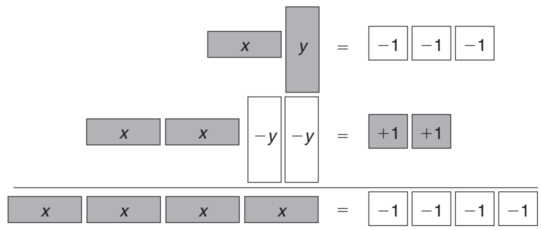
2. Using the same coordinates and matrix $E = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$. How are the two triangles related? ______________________________

3.



So $x = -4$, substitute that and find $y = 7$.

4.



So $x = -1$, substitute that and find $y = -2$.

LESSON 3-5

1. It is two planes that intersect in 3-D.
2. This line represents the intersection of two planes in the 3-D.
3. It represents the line of intersection of two planes although you can not see the two planes as you can in Step 4.
4. They represent the intersection of either two planes intersecting along the line two dimensional line $y = 25$; or three planes intersecting at the point (0, 25, 0), i.e., the (0, 25, 0), i.e., the y-intercept of 25.

LESSON 4-2

Activity
Step 8:
second; first
11
first; second
second; second

$$\begin{bmatrix} 9 & 27 \\ 11 & -20 \end{bmatrix}$$

Try This

1. $\begin{bmatrix} -15 & -16 \\ -7 & 10 \\ 4 & -2 \\ -8 & -4 \end{bmatrix}$

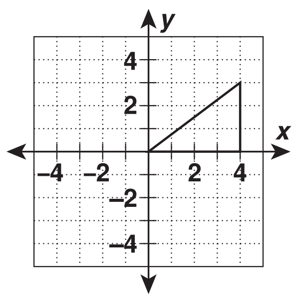
2. $\begin{bmatrix} 11 & 3 \\ -27 & -5 \end{bmatrix}$

3. 3×3; $\begin{bmatrix} 3 & -5 & 2 \\ 6 & -1 & -2 \\ 2 & 5 & 1 \end{bmatrix}$

4. No. The number of columns of the left matrix is 2. The number of rows of the right matrix is 1. They are not equal.

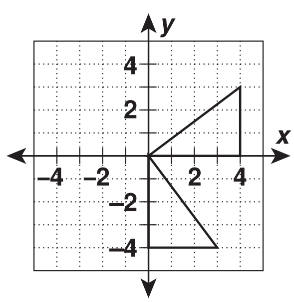
LESSON 4-3

Activity 1



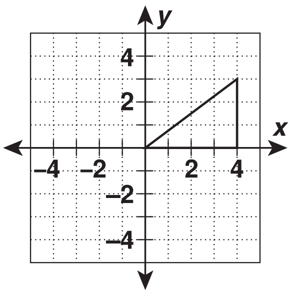
$$C = \begin{bmatrix} 0 & 0 \\ 4 & 0 \\ 4 & 3 \end{bmatrix}$$

$$KC = \begin{bmatrix} 0 & 0 \\ 0 & -4 \\ 3 & -4 \end{bmatrix}$$



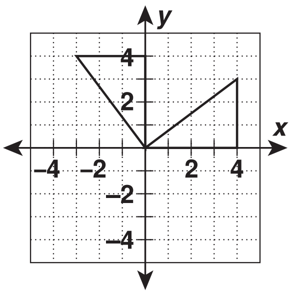
The triangle is rotated about the origin counterclockwise 90 degrees.

Activity 2



$$D = \begin{bmatrix} 0 & 0 \\ 4 & 0 \\ 4 & 3 \end{bmatrix}$$

$$KD = \begin{bmatrix} 0 & 0 \\ 0 & 4 \\ -3 & -4 \end{bmatrix}$$



The triangle is rotated about the origin clockwise 90 degrees.

Try This

1. The triangle is rotated about the origin 180 degrees.
2. The triangle is rotated 360 degrees about the origin.

LESSON 5-3

1.

Completing the Square		
Expression	Number of 1-tiles needed to complete the square	Expression written as a square
$x^2 + 2x +$ ___	1	$x^2 + 2x + 1 = (x + 1)^2$
$x^2 + 4x +$ ___	4	$x^2 + 4x + 4 = (x + 2)^2$
$x^2 + 6x +$ ___	9	$x^2 + 6x + 9 = (x + 3)^2$
$x^2 + 8x +$ ___	16	$x^2 + 8x + 16 = (x + 4)^2$
$x^2 + 10x +$ ___	25	$x^2 + 10x + 25 = (x + 5)^2$
$x^2 + 12x +$ ___	36	$x^2 + 12x + 36 = (x + 6)^2$

2. d = half of b
3. $c = d^2$
4. Find the square of half the coefficient on b.

LESSON 6-4

Activity 1

Try This

1. Possible answer: The large cube has side length a, so its volume is a^3. The small cube has side length b, so its volume is b^3. The volume of the figure is the volume of the two cubes, $a^3 + b^3$.
2. $V_{\text{I}} = a^2(a - b)$;
   $V_{\text{II}} = ab(a - b)$;
   $V_{\text{III}} = b^2(a + b)$
3. $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

LESSON 7-1

Activity
Step 2: 4, $\frac{1}{4}$

Fold number	**1**	**2**	**3**	**4**	**5**	**6**
Number of regions	1	2	4	8	16	32
Fraction area of each region	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$

Step 3 and Step 4: Check student's table and graph.

Try This

1. growth
2. $y = 2^x$
3. 256
4. decay
5. $y = \left(\frac{1}{2}\right)^x$
6. $\frac{1}{256}$