Geometry 1-BE Monday 5-14-12

No calculators!

(1) Change each fraction to a per cent.

(A) $\frac{1}{4}$ (b) $\frac{3}{10}$ (C) $\frac{1}{8}$ (D) $\frac{3}{8}$

(2) Change each decimal to a per cent

(A) 8.5 (b) 0.085 (C) 1.75

(3) What is 20% of 80?

(4) What is $\frac{1}{2}$% of 18?

(5) 18 is what per cent of 90?

(6) 12 is 40% of what number?

Ch. 9-7 Transformations With Matrices

⇓

Reflect (↔ or ↕), Rotate ↻, Translate →, Dilate △△△

The preimage vertices are put into a column $\begin{bmatrix} x \\ y \end{bmatrix}$ matrix

(Ex) $\triangle PQR$ $P(3,5)$, $Q(1,-2)$, $R(-4,4)$

$$\triangle PQR = \begin{bmatrix} 3 & 1 & -4 \\ 5 & -2 & 4 \end{bmatrix}$$

coordinate or vertex matrix

To transform $\triangle PQR$, you will perform various operations on its matrix.

Note: This is an ideal task for a computer.

Note: Mapping a point

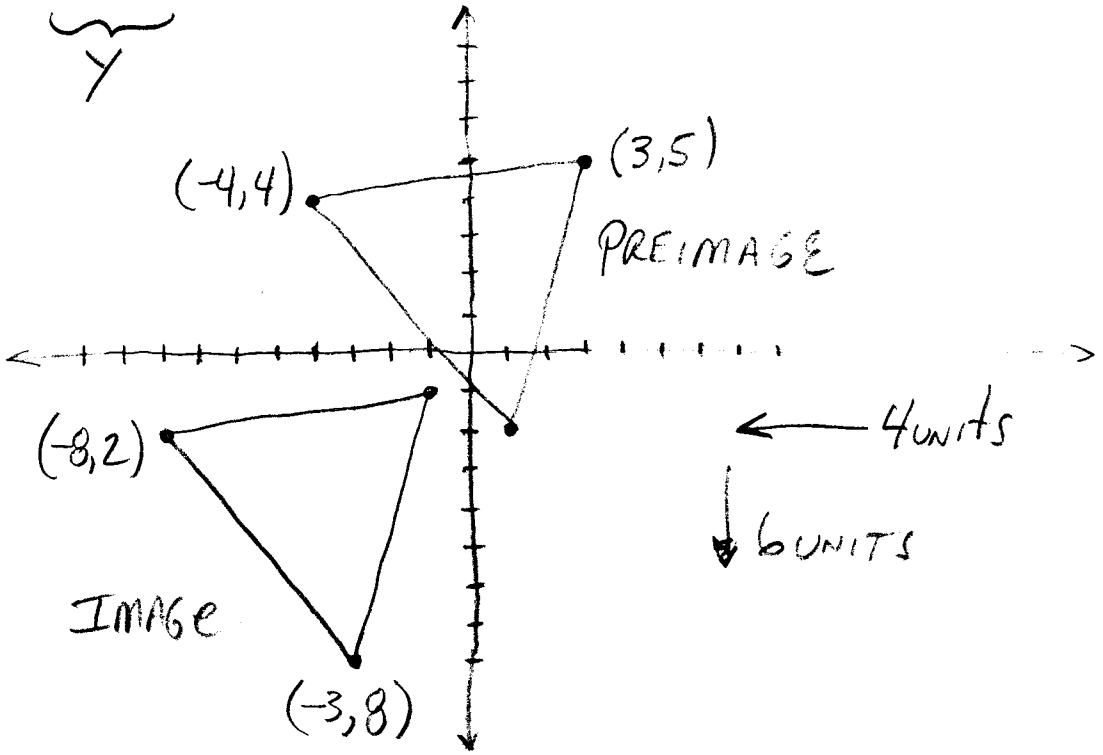
(Ex) $(x, y) \longrightarrow (x-2, y+3)$

preimage → image

Lets translate $\triangle PQR$ 4 units to the left ($\leftarrow$ -x direction) and 6 units down ($\downarrow$ -y direction). Our translation matrix will have the same number of rows and columns in the $\triangle PQR$ matrix Since we are going to subtract 4 units from each x and subtract 6 units from each y

$$\underset{\sim}{\overset{X}{\sim}}\begin{bmatrix} 3 & 1 & -4 \\ 5 & -2 & 4 \end{bmatrix} + \begin{bmatrix} -4 & -4 & -4 \\ -6 & -6 & -6 \end{bmatrix} = \begin{bmatrix} -1 & -3 & -8 \\ -1 & -8 & -2 \end{bmatrix}$$

$\underbrace{\quad}_{Y}$



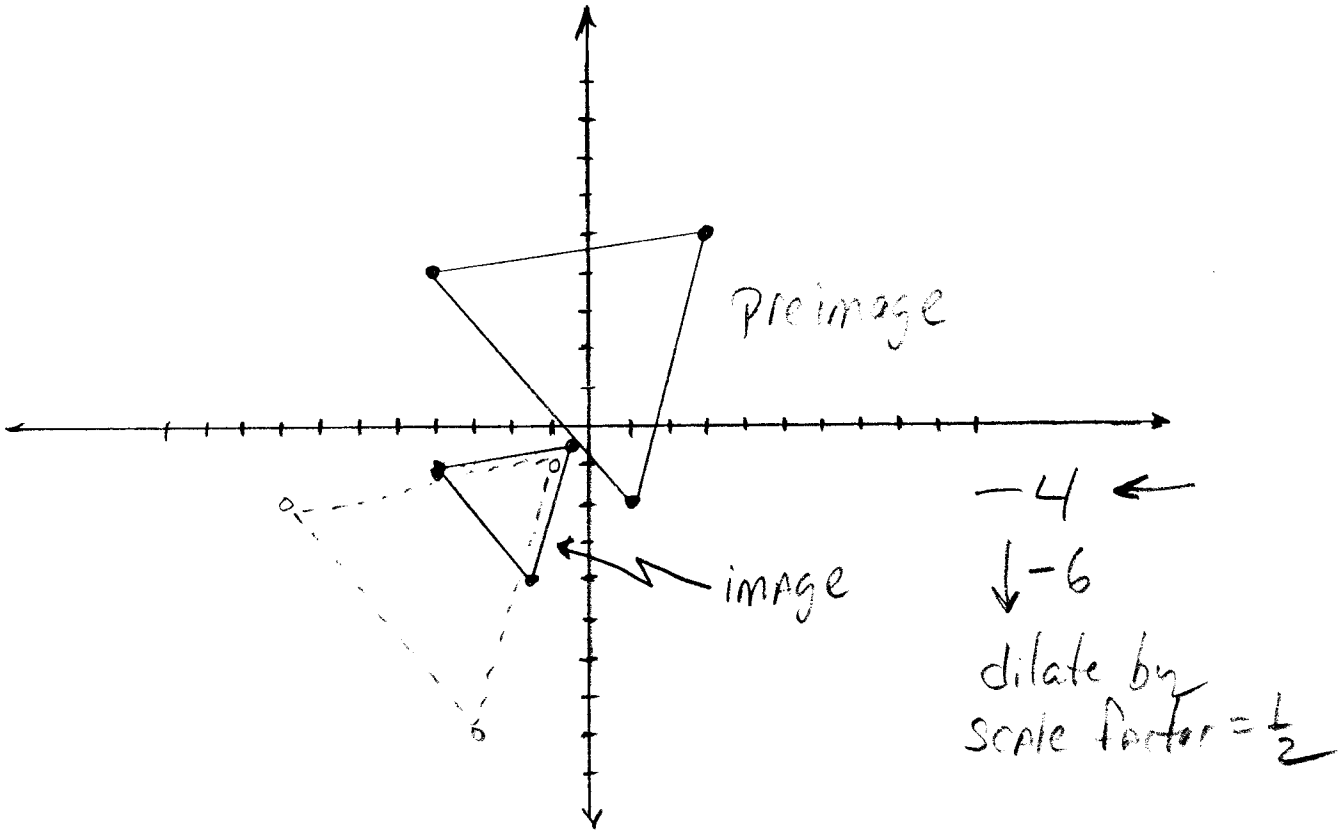
To dilate AN object, multiply the VERTEX MATRIX By A Scale factor (SCALAR MULTIPLICATION).

SCALE FACTOR >1 = ENLARGE scale factor $0<SF<1$ = SHRINK

$\triangle PQR$

LETS TRANSLATE $= \begin{bmatrix} 3 & 1 & -4 \\ 5 & -2 & 4 \end{bmatrix}$ By $\begin{bmatrix} -4 & -4 & -4 \\ -6 & -6 & -6 \end{bmatrix}$

And then scale the translated matrix by $\frac{1}{2} \Rightarrow \frac{1}{2}\begin{bmatrix} -1 & -3 & -8 \\ -1 & -3 & -2 \end{bmatrix} = \begin{bmatrix} -\frac{1}{2} & -\frac{3}{2} & -4 \\ -\frac{1}{2} & -4 & -1 \end{bmatrix}$

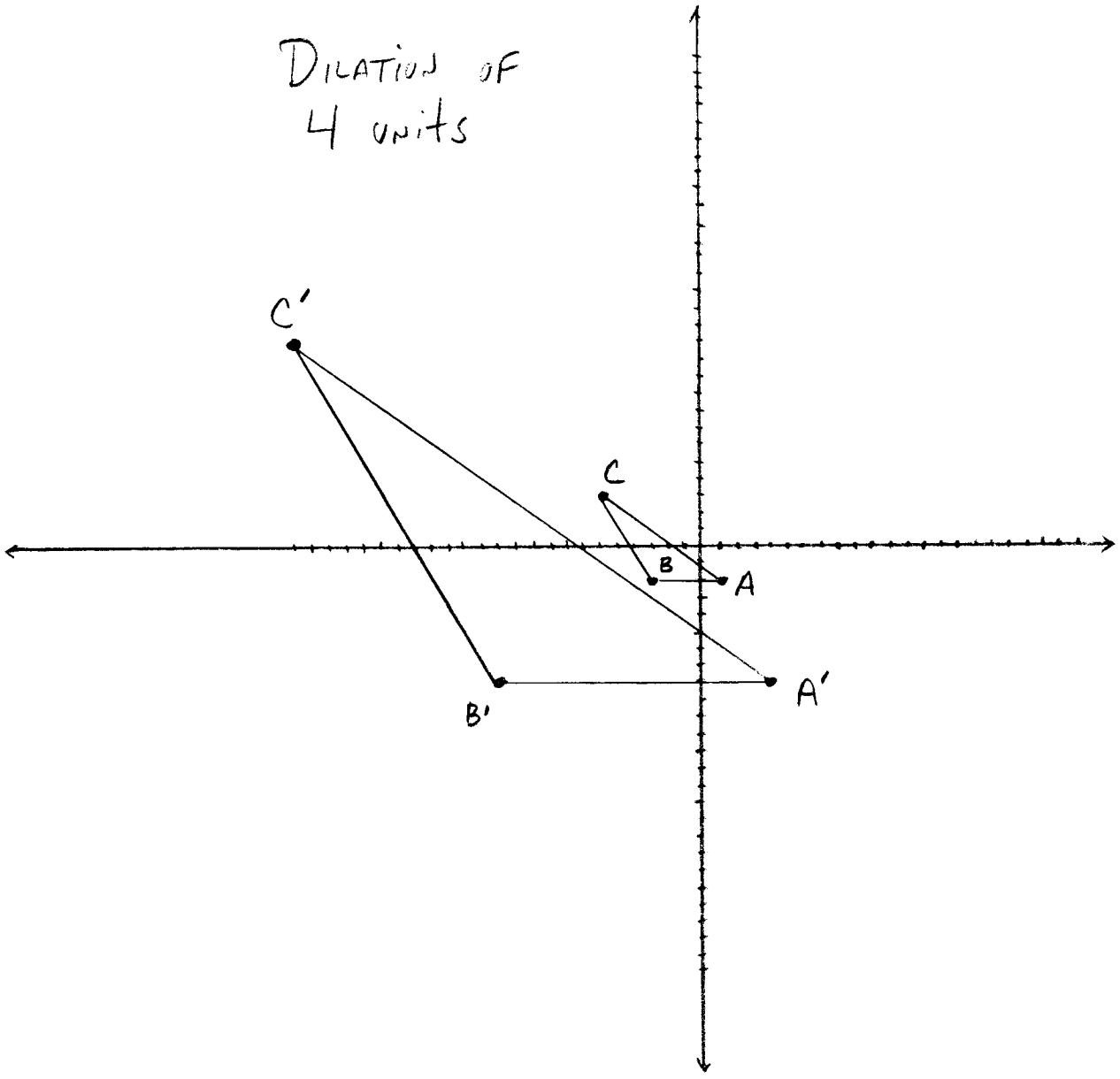


$\triangle ABC \Rightarrow A(1,-2),\ B(-3,-2),\ C(-6,3)$

Scale by 4

$$4\begin{bmatrix} 1 & -3 & -6 \\ -2 & -2 & 3 \end{bmatrix} = \begin{bmatrix} 4 & -12 & -24 \\ -8 & -8 & 12 \end{bmatrix}$$

$\triangle A'B'C' \Rightarrow A'(4,-8),\ B'(-12,-8),\ C'(-24,12)$



Using MATRICES for REFLECTION

⇒ ALWAYS multiplying the preimage matrix by A 2×2 MATRIX TO do the following → PUT 2×2 FIRST!

REFLECT IN	MULTIPLY	RESULT
X	$\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$	CHANGES SIGNS OF Y'S
Y	$\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$	CHANGES SIGNS OF X'S
ORIGIN (POINT)	$\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$	CHANGES SIGNS OF X AND Y'S
LINE $Y=X$	$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$	SWAPS X AND Y'S

USE tennis hopper (EX) REFLECT IN X

(ROTATE TO MAKE HOPPER)

$$\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \cdot \begin{bmatrix} x & x & x & x & x \\ y & y & y & y & y \end{bmatrix} \Rightarrow 2\times 5 \checkmark$$

$2\times 2 \qquad 2\times 5$

Finally – some simple rotations:

Counterclockwise ↺ about origin

How many degrees	Multiply	Result
90°	$\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$	swaps x and y and changes sign of new x's
180	$\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$	changes signs of x and y's same as reflection in origin
270°	$\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$	swaps x and y's and changes signs of new y's

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Homework: • Read Ch 9-7