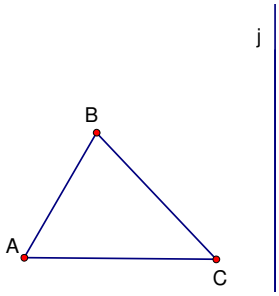
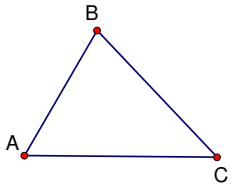
MATH 406 Session 25 Some Isometries of the Plane

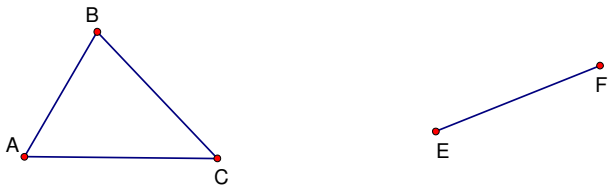
Sketch the image of ΔABC under a reflection in line j.



Sketch the image of ΔABC under a rotation of 180^0 about point C.



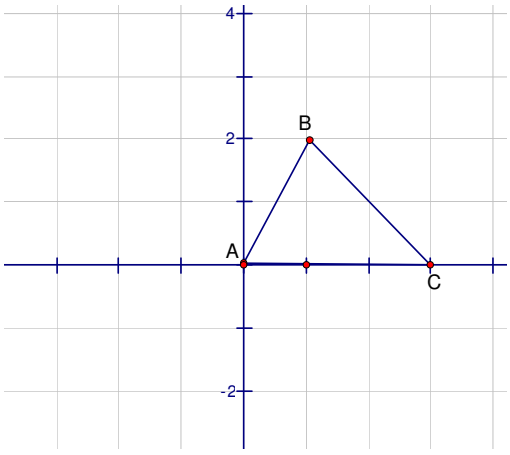
Sketch the image of ΔABC under a translation defined by the slide vector EF.



Representing Isometries with Matrices

Reflections in the x- or y-axis:

Sketch the image of ΔABC under a reflection in the y-axis. Label the image ΔA'B'C'. Next, sketch the image of ΔABC under a reflection in the x-axis. Label that image ΔA''B"C".



Consider an arbitrary point P = $\begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$ **in the Euclidean plane. The image of P under a reflection in the y-axis is P' where P' has coordinates P' =**

The image of P under a reflection in the x-axis is P" where P" has coordinates P" =

Using matrix notation.

P' = T_1P = $\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$ **and P" = T_2P =** $\begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$**.**

Translations by shifting x-coordinates e units and y-coordinates f units:

Consider an arbitrary point P = $\begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$ **in the Euclidean plane. The image of P under a translation shifting x-coordinates e units and y-coordinates f units is P' where P'**

has coordinates P' = $\begin{bmatrix} x+e \\ y+f \\ 1 \end{bmatrix}$**.**

Using matrix notation.

P' = T_3P = $\begin{bmatrix} 1 & 0 & e \\ 0 & 1 & f \\ 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$**.**

Sketch the image of ΔABC under a translation through a horizontal shift of 4 and a vertical shift of 2.