Suppose $A = \begin{bmatrix} 1 & 2 \\ 2 & 6 \end{bmatrix}$ and $T : \mathbb{R}^2 \to \mathbb{R}^2$ is a linear transformation with the formula:

$$T(x) = Ax.$$

If $P$ is the parallelogram in $\mathbb{R}^2$ spanned by vectors $(1, -1)$ and $(1, 2)$, (i.e. with vertices $(0, 0)$, $(1, -1)$, $(1, 2)$, and $(2, 1)$), then the image of $P$ under $T$ is also a parallelogram.

(Recall: If $P$ is spanned by $(a_1, a_2)$ and $(b_1, b_2)$ then the area of $P$ is the absolute value of the determinant of the matrix $\begin{bmatrix} a_1 & a_2 \\ b_1 & b_2 \end{bmatrix}$.)

A) What is the area of $P$?

B) What is the area of the image of $P$ under $T$? (The image of $P$ under $T$ is parallelogram in $\mathbb{R}^2$, which you can find by applying $T$ to the vertices of $P$.)