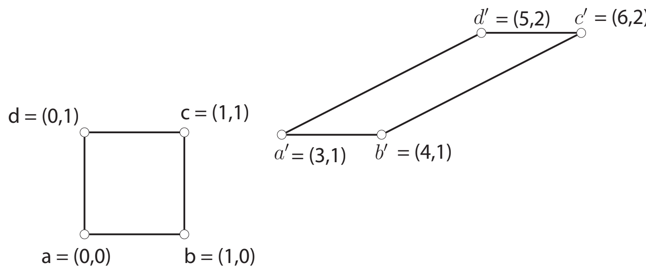

Figure 24.18: The effect of a shear.

this affine map is the composition of a shear, followed by a rotation of angle $\pi/4$, followed by a magnification of ratio $\sqrt{2}$, followed by a translation. The effect of this map on the square (a, b, c, d) is shown in Figure 24.19. The image of the square (a, b, c, d) is the parallelogram (a', b', c', d').

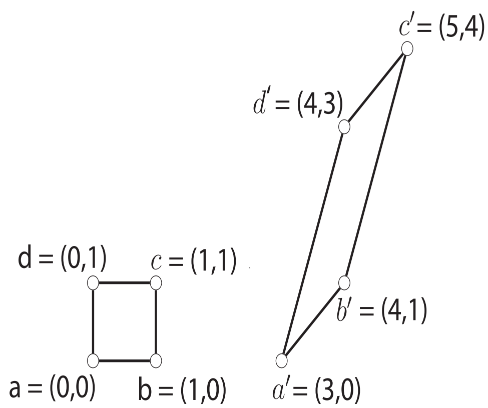

Figure 24.19: The effect of an affine map.

The following proposition shows the converse of what we just showed. Every affine map is determined by the image of any point and a linear map.

Proposition 24.8. *Given an affine map $f\colon E \to E'$, there is a unique linear map $\overrightarrow{f}\colon \overrightarrow{E} \to \overrightarrow{E'}$ such that*

$$f(a + v) = f(a) + \overrightarrow{f}(v),$$

for every $a \in E$ and every $v \in \overrightarrow{E}$.

Proof. Let $a \in E$ be any point in E. We claim that the map defined such that

$$\overrightarrow{f}(v) = \overrightarrow{f(a)f(a+v)}$$