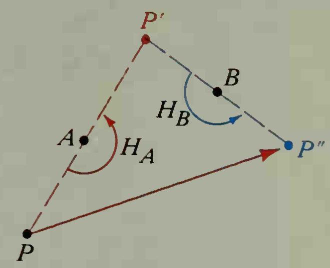
28. The figure shows that $H_B \circ H_A : P \to P''$.

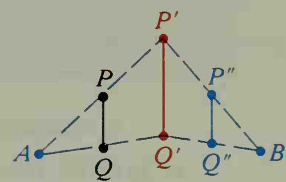


a. Copy the figure and verify by measuring that $PP'' = 2 \cdot AB$. What theorem about the midpoints of the sides of a triangle does this suggest?

b. Choose another point Q and carefully locate Q'', the image of Q under $H_B \circ H_A$. Does $QQ'' = 2 \cdot AB$?

c. Measure PQ and $P''Q''$. Are they equal? What kind of transformation does $H_B \circ H_A$ appear to be?

29. $D_{A,2}:\overline{PQ} \to \overline{P'Q'}$ and $D_{B,\frac{1}{2}}:\overline{P'Q'} \to \overline{P''Q''}$. What kind of transformation is the composite $D_{B,\frac{1}{2}} \circ D_{A,2}$? Explain.



30. The point P is called a *fixed point* of the transformation T if $T:P \to P$.

a. How many fixed points does each of the following have: $\mathcal{R}_{O,90}$? R_y? $D_{O,3}$? the translation $T:(x, y) \to (x - 3, y + 2)$?

b. O is the origin and A is the point $(1, 0)$. Find the coordinates of a fixed point of the composite $D_{O,2} \circ D_{A,\frac{1}{4}}$.

14-7 *Inverses and the Identity*

Suppose that the pattern below continues indefinitely to both the left and the right. The translation T glides each runner one place to the right. The translation that glides each runner one place to the *left* is called the *inverse* of T, and is denoted T^{-1}. Notice that T followed by T^{-1} keeps *all* points fixed:

$$T^{-1} \circ T:P \to P$$

The composite $T \circ T$, also written $T \cdot T$, and usually denoted by T^2, glides each runner two places to the right.

The mapping that maps every point to itself is called the **identity** transformation I. The words "identity" and "inverse" are used for mappings in much the same way that they are used for numbers. In fact, the composite of two mappings is very much like the product of two numbers. For this reason, the composite $S \circ T$ is often called the **product** of S and T.