(b) $\mathcal{M}$ is the product of an improper rigid motion and an improper rigid motion.

(c) $\mathcal{M}$ is the product of a reflection and a rotation.

(d) $\mathcal{M}$ is the product of a reflection and a reflection.

60. In each case, state whether the rigid motion $\mathcal{M}$ has (i) no fixed points, (ii) exactly one fixed point, or (iii) infinitely many fixed points.

(a) $\mathcal{M}$ is the product of a reflection with axis $l_1$ and a reflection with axis $l_2$. Assume the lines $l_1$ and $l_2$ intersect at a point $C$.

(b) $\mathcal{M}$ is the product of a reflection with axis $l_1$ and a reflection with axis $l_3$. Assume the lines $l_1$ and $l_3$ are parallel.

61. Suppose that a rigid motion $\mathcal{M}$ is the product of a reflection with axis $l_1$ and a reflection with axis $l_2$, where $l_1$ and $l_2$ intersect at a point $C$. Explain why $\mathcal{M}$ must be a rotation with center $C$.

[Hint: See Exercises 59(d) and 60(a).]

62. Suppose that the rigid motion $\mathcal{M}$ is the product of the reflection with axis $l_1$ and the reflection with axis $l_3$, where $l_1$ and $l_3$ are parallel. Explain why $\mathcal{M}$ must be a translation.

[Hint: See Exercises 59(d) and 60(b).]

63. Jogging

63. Suppose that lines $l_1$ and $l_2$ intersect at $C$ and that the angle between them as shown in the following figure is $\alpha$.

(a) Give the rotocenter, angle, and direction of rotation of the product of the reflection with axis $l_1$ and the reflection with axis $l_2$.

(b) Give the rotocenter, angle, and direction of rotation of the product of the reflection with axis $l_2$ and the reflection with axis $l_1$.

65. Translation 1 moves point $P$ to point $P'$; translation 2 moves point $Q$ to point $Q'$, as shown in the figure.

(a) Find the images of $P$ and $Q$ under the product of translation 1 and translation 2.

(b) Show that the product of translation 1 and translation 2 is a translation. Give a geometric description of the vector of the translation.

66. (a) Given a glide reflection with axis $l$ and vector $\mathbf{v}$ as shown in the figure, find the image of the triangle $ABC$ under the product of the glide reflection with itself.

(b) Show that the product of a glide reflection with itself is a translation. Describe the direction and amount of the translation in terms of the direction and amount of the original glide.

67. (a) Explain why a border pattern cannot have a refe-