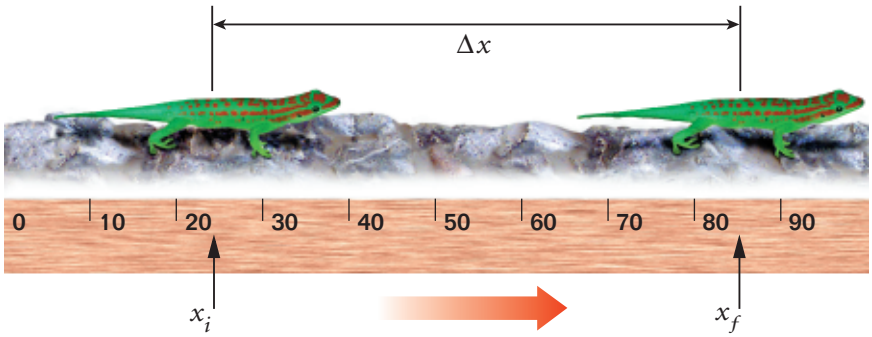

Figure 2
A gecko moving along the *x*-axis from x_i to x_f undergoes a displacement of $\Delta x = x_f - x_i$.

If an object is at rest (not moving), its position does not change with respect to a fixed frame of reference. For example, the benches on the platform of one subway station never move down the tracks to another station.

In physics, any frame of reference can be chosen as long as it is used consistently. If you are consistent, you will get the same results, no matter which frame of reference you choose. But some frames of reference can make explaining things easier than other frames of reference.

For example, when considering the motion of the gecko in **Figure 2,** it is useful to imagine a stick marked in centimeters placed under the gecko's feet to define the frame of reference. The measuring stick serves as an *x*-axis. You can use it to identify the gecko's initial position and its final position.

DISPLACEMENT

As any object moves from one position to another, the length of the straight line drawn from its initial position to the object's final position is called the **displacement** of the object.

Displacement is a change in position

The gecko in **Figure 2** moves from left to right along the *x*-axis from an initial position, x_i, to a final position, x_f. The gecko's displacement is the difference between its final and initial coordinates, or $x_f - x_i$. In this case, the displacement is about 61 cm (85 cm – 24 cm). The Greek letter delta (Δ) before the *x* denotes a *change* in the position of an object.

DISPLACEMENT

$$\Delta x = x_f - x_i$$

displacement = change in position = final position – initial position

TIP

A change in any quantity, indicated by the Greek symbol delta (Δ), is equal to the final value minus the initial value. When calculating displacement, always be sure to subtract the initial position from the final position so that your answer has the correct sign.

displacement

the change in position of an object

Why it Matters

Conceptual Challenge

1. Space Shuttle

A space shuttle takes off from Florida and circles Earth several times, finally landing in California. While the shuttle is in flight, a photographer flies from Florida to California to take pictures of the astronauts when they step off the shuttle. Who undergoes the greater displacement, the photographer or the astronauts?

2. Roundtrip

What is the difference between the displacement of the photographer flying from Florida to California and the displacement of the astronauts flying from California back to Florida?