Practice Numerical Problems on Linear Motion

1. Due to continental drift, the North American and European continents are drifting apart at an average speed of about 3 cm per year. At this speed, how long (in years) will it take for them to drift apart by another 1500 m?

Solution:

The average speed is the distance traveled divided by the elapsed time. Since the average speed and distance are known, we can use this relation to find the time.

The time it takes for the continents to drift apart by 1500 m is

$$\text{Elapsed time} = \frac{\text{Distance}}{\text{Average speed}} = \frac{1500\text{m}}{\left(3\frac{\text{cm}}{\text{yr}}\right)\left(\frac{1\text{ m}}{100\text{ cm}}\right)} = \boxed{5\times10^4\text{ yr}}$$

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2. One afternoon, a couple walks three-fourths of the way around a circular lake, the radius of which is 1.50 km. They start at the west side of the lake and head due south to begin with. (a) What is the distance they travel? (b) What are the magnitude and direction (relative to due east) of the couple's displacement?

Solution:

Distance and displacement are different physical quantities. Distance is a scalar, and displacement is a vector. Distance and the magnitude of the displacement, however, are both measured in units of length.

a. The distance traveled is equal to three-fourths of the circumference of the circular lake. The circumference of