A jogger runs along a straight and level road for a distance of 8.0 km and then runs back to her starting point. The time for this roundtrip is 2.0 h. Which one of the following is true?
Her average speed is 8.0 km/h, and her average velocity is 8.0 km/h.
Her average speed is 8.0 km/h, but there is not enough information to determine her average velocity.
Her average speed is 8.0 km/h, and her average velocity is 0 km/h

Solution

A jogger runs distance of 8.0 km two times, so she pass the distance:

$$S = 2 * 8.0 \text{ km} = 16\ km.$$

Average speed of the jogger

$$v = \frac{S}{t} = \frac{16\ km}{2.0\ h} = 8.0\frac{km}{h}.$$

Average velocity is a vector equal:

$$\vec{v} = \frac{\vec{s}}{t},$$

where $\vec{s}$ – the displacement of the student, t – time of jogging.

The displacement of the jogger is zero because she runs distance of 8.0 km two times and returns to her initial position.

Average velocity of the jogger:

$$\vec{v} = \frac{0}{2.0 \text{ h}} = 0.$$

Answer: Her average speed is 8.0 km/h, and her average velocity is 0 km/h.