# Graphing Displacement and Velocity

**2/2** points earned (100%)

Excellent!

Retake

Course Home

1 / 1 points

1.
[#211] **Marching speed**

You sing a suitably chosen tune at 84 beats per minute and walk (in time, exactly one step per beat) with a step length of 0.90 metres. What is your speed in km/hr? (Hint: use the multiply by one technique from week 1. It's worthwhile writing this out fully.)

Your speed is ____ km/hr. (Hint: how many significant figures?)

4.5

**Correct Response**

$v = \Delta x/\Delta t = 1 \text{ step/beat}$.

This is already the answer, if we count step as a length and beat as at time. It's just not in the right units. So let's write

$$v = \frac{1 \text{ step}}{1 \text{ beat}} \times \frac{84 \text{ beats}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{0.90 \text{ m}}{1 \text{ step}} \times \frac{1 \text{ km}}{1000 \text{ m}} = 4.5 \text{ km/hr}$$

(2 sig figs).

See how neat the multiply by one technique is: all units cancel except km and hr. Also, note that 1 step/beat is exact: it's not a 1 sig fig datum. Finally, this can be a reasonable way to estimate distances: think of a tune that you know well with a good rhythm for your normal walking rhythm, and measure your normal step length.

1 / 1 points

2.
[#212] **Your average speed**

You walk the first 0.20 km at 1.0 m/s and the next 0.20 km at 2.0 m/s. What is your average speed? (Be careful.)

Your average speed is _____ m/s.

1.3

**Correct Response**
The first 200 m takes 200 s and the second takes 100 s. So you travel 400 m in 300 s. Your average speed is $(400\ \mathrm{m})/(300\ \mathrm{s}) = 1.3\ \mathrm{m/s}$ to two significant figures.

Important: the average speed is not just $(v_1 + v_2)/2$. The average speed depends on how long you spend at each speed. It's defined as $\Delta x/\Delta t$, but we might also call it the time-weighted average of the speeds. If you have two different speeds, as here, your average speed obviously decreases if you spend more time at the lower speed.