Position & Velocity Review
Answers

1. Speed is the distance an object travels in a certain amount of time.

Velocity is the rate of change of position of an object in a particular direction

Speed is scaler and measures distance with respect to time and velocity is a vector which measures displacement with respect to time.

2. Distance is the amount of space between two objects.

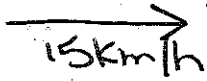
Displacement is the difference between the objects initial and final position.

Distance is the total length the object has travelled where as displacement takes into account direction. Distance is scaler and displacement is a vector quantity

3. a) You 35 km/h [W] $-15^{km/h}$ [E] or 15 km/h [W]

car 50 km/h [W]

b) 35 km/h [W] 50 km/h [E]



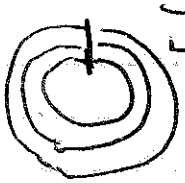
15 km/h [E]

4. a) You velocity v time t
Student velocity v 1/3 the time

This student was 3 times faster than you.

b) Student 1/5 your v

This student would take 5x longer to get to school compared to you.

5. 

The average velocity and average speed would not be the same. Average speed is a scaler quantity so the object travelled 12km in 48s, however the average velocity is a vector so we need to include direction, because the object moved in the same direction and finished where it started there was no displacement and therefore no average velocity.

$\vec{v}_{avg} = \frac{\vec{d}}{t} = 0 km/h$

$v_{sp} = \frac{d}{t}$

$t = 48s \times \frac{1h}{3600s} = 0.0133h$

$v_{sp} = \frac{12km}{0.0133h}$

$v_{sp} = 902 km/h$

6. $d = 715m$
$v_{sp} = 21 m/s$
$t = ?$

$v_{sp} = \frac{d}{t}$

$t \cdot \frac{21 m/s}{21} = \frac{715m}{t} \cdot t$

$t = \frac{715m}{21s} = 34 m/s$

7. $v_{sp} = 95$ km/h
$t = 45$ min
$d = ?$

$45\text{ min} \times \frac{1\text{ h}}{60\text{ min}} = 0.75\text{ h}$

$$v_{sp} = \frac{d}{t}$$

$$0.75\text{h} \cdot 95\text{km/h} = \frac{d}{0.75\text{h}} \cdot 0.75\text{h}$$

$$71.25\text{ km} = d$$

8. 59 m [E]
35 m [E]
112 m [W]
89 m [E]
46 m [W]

$t = 86$ s

$d = 59 + 35 + 112 + 89 + 46$
$d = 341$ m

$\vec{d} = 59 + 35 + (-112) + 89 + (-46)$
$\vec{d} = 25$ m [E]

a) $v_{sp} = \frac{d}{t}$

$= \frac{341\text{ m}}{86\text{ s}}$

$= 3.97$ m/s

b) $\vec{v}_{avg} = \frac{\vec{d}}{t}$

$\vec{v}_{avg} = \frac{25\text{ m [E]}}{86\text{ s}}$

$\vec{v}_{avg} = 0.29$ m/s [E]

9. 50km/h [S] · 0.5h = 25km [S]
90km/h [S] · 1.5h = 135km [S]
100km/h [N] · 2h = 200 km [N]

$d = 25 + 135 + 200 = 360\text{ km}$
$t = 0.5 + 1.5 + 2 = 4\text{ h}$

$v_{sp} = \frac{d}{t} = \frac{360\text{km}}{4\text{h}} = 90\text{ km/h}$

$\vec{d} = 25 + 135 + (-200) = -40\text{ km [S]}$
$t = 4\text{h}$

$\vec{v_{avg}} = \frac{\vec{d}}{t} = \frac{40}{4} = 10\text{ km/h [N]}$

10. a) 0 m/s
b) Jack at 4s and 10s
Jill at 6s

c) $\vec{v_{avg}} = \frac{d_f - d_o}{t_2 - t_1} = \frac{5 - 0}{10 - 2} = \frac{5}{8} = 0.625\text{ m/s [N]}$

d) Jill changed directions at 2s

e)

f) $\vec{v_{avg}}_{Jack} = \frac{d_f - d_o}{t_2 - t_1} = \frac{0 - 0}{10} = 0\text{ m/s}$

$\vec{v_{avg}}_{Jill} = \frac{d_f - d_o}{t_2 - t_1} = \frac{5 - 0}{10} = \frac{5}{10} = 0.5\text{ m/s [N]}$

g) v_{sp} Jack $= \frac{d}{t} = \frac{20m}{10s} = 2m/s$

v_{sp} Jill $= \frac{d}{t} = \frac{25m}{10s} = 2.5m/s$