

$$\begin{aligned}
 9. \quad & 50 \text{ km/h [S]} \cdot 0.5 \text{ h} = 25 \text{ km [S]} \\
 & 90 \text{ km/h [S]} \cdot 1.5 \text{ h} = 135 \text{ km [S]} \\
 & 100 \text{ km/h [N]} \cdot 2 \text{ h} = 200 \text{ km [N]}
 \end{aligned}$$

$$\begin{aligned}
 d &= 25 + 135 + 200 = 2860 \text{ km} \\
 t &= 0.5 + 1.5 + 2 = 4 \text{ h}
 \end{aligned}$$

$$v_{sp} = \frac{d}{t} = \frac{2860 \text{ km}}{4 \text{ h}} = 715 \text{ km/h}$$

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

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

10. a) 0 m/s

b) Jack at 4 s and 10 s
Jill at 6 s

$$c) \vec{v}_{avg} = \frac{d_f - d_o}{t_2 - t_1} = \frac{5 - (-10)}{10 - 2} = \frac{15}{8} = 1.875 \text{ m/s [N]}$$

d) Jill changed directions at 2 s

e)

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

Jack

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

Jill