Adding Vectors: Distance/Speed – Displacement/Velocity

Name: _____SOLUTION_____   Date: _____

- Show all work, all units, label the vectors. Use the most suitable method (either algebra or vectors)

1. Ashlynne walks 200 m [E], then 100 m [W], then 700m [E]. Using the combined method, calculate the resultant displacement and total distance travelled.

   (1D)
   [E]+

$$\vec{\Delta d} = 200m\ [E] + 100m\ [W] + 700m\ [E]$$
$$= 200m\ [E] - 100m\ [E] + 700m\ [E]$$
$$\vec{\Delta d} = 800m\ [E]$$

$$\Delta d = 100m + 200 + 700m = 1000m\ (1km)$$
$$(1\times10^3 m)$$

2. Simon drives his Lamborghini down the street. He travels 85 m [E] in 1.5 seconds, stops to say hi to hi friends for 5 minutes and then travels 285 m [W] in 4 seconds to his final position. Calculate both his resultant displacement and total distance travelled? Also, calculate the average velocity and speed.

   [E]+

$$\vec{\Delta d} = 85m\ [E] + 285m\ [W]$$
$$= 85m\ [E] - 285m\ [E]$$
$$= -200m\ [E]$$
$$\therefore\ \boxed{\vec{\Delta d} = 200m\ [W]}$$

$$\Delta d = 85m + 285m$$
$$\therefore\ \boxed{\Delta d = 370m}$$

TOTAL TIME!

$$\boxed{\vec{V}_{av} = \frac{\vec{\Delta d}}{\Delta t} = \frac{200m\ [W]}{305.5s} = 0.65\ \tfrac{m}{s}\ [W]}$$

$$\boxed{V = \frac{\Delta d}{\Delta t} = \frac{370m}{305.5s} = 1.2\ \tfrac{m}{s}}$$

3. Marisa drives her mustang convertible 150 km [N] to talk to Alanna. She talks with Alanna for a while and then travels 250 km [E] to meet with Cody and then travels 100 km [S20°E] to get home. Calculate her resultant displacement and total distance travelled.

scale: 1 cm = 50 km

$\vec{\Delta d_2} = 250$ km

$\vec{\Delta d_1} = 150$ km

$\vec{\Delta d_3} = 100$ km

END

START

$\vec{\Delta d_R} = ?$

$6\,cm \times \dfrac{50 km}{cm} = 300\,km$
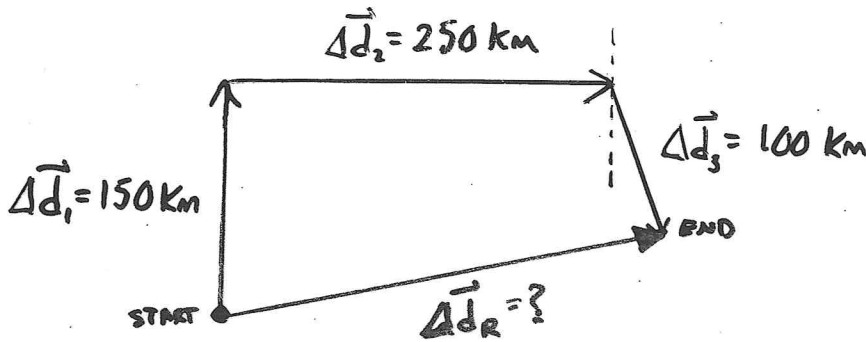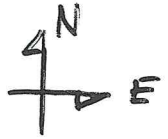
$\Delta d = 150\,km + 250\,km + 100\,km$

$\boxed{\Delta d = 500\,km}$

$\boxed{\vec{\Delta d_R} = 300\,km\,[E\,11°\,N]}$
$= 300\,km\,[N\,79°\,E]$
$= 300\,km\,[79°\,E\,of\,N]$
$= 300\,km\,[11°\,N\,of\,E]$

4. Savannah walks her friend's pet lizard 800 m [E] in 1 hour. She then decides to walk 400 m [S] for 0.5 hours. She then walks 100 m [W45°N] for 1 hour. Calculate her average speed and velocity.

scale = 1 cm = 100 m

S

$\vec{\Delta d_1} = 800$ m

θ

$\vec{\Delta d_R} = ?$

$\vec{\Delta d_2} = 400$ m

E

$\vec{\Delta d_3} = 100$ m
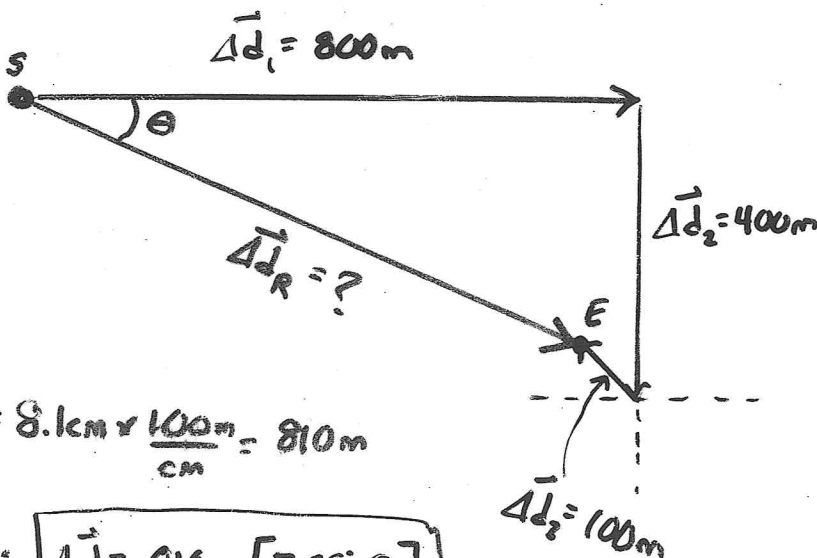
$|\vec{\Delta d}| = 8.1\,cm \times \dfrac{100 m}{cm} = 810\,m$

$\therefore \boxed{\vec{\Delta d} = 810\,m\,[E\,25°\,S]}$

$\Delta d = 800\,m + 400 + 100$
$\boxed{\Delta d = 1300\,m}$

$\vec{V}_{av} = \dfrac{\vec{\Delta d}}{\Delta t} = \dfrac{810\,m\,[E\,25°\,S]}{9000\,s}$

$\therefore \boxed{\vec{V}_{av} = 0.1\,m/s\,[E\,25°\,S]}$

$\therefore \boxed{V_{av} = \dfrac{\Delta d}{\Delta t} = \dfrac{1300\,m}{9000\,s} = 0.14\,\frac{m}{s}}$