

$$\#9) \quad v_f = v_o + at \quad a = \frac{v_f - v_o}{t}$$

$$v_f = \sqrt{v_{fE}^2 + v_{fN}^2}$$

$$v_{oE} = 6.5 \cos 20 \quad a_E = 2.1 \cos 60$$

$$= 6.11 \text{ m/s} \quad = 1.05 \text{ m/s}^2$$

$$v_{oN} = -6.5 \sin 20 \quad a_N = 2.1 \sin 60$$

$$= -2.22 \quad = 1.82$$

$$v_{fE} = v_{oE} + a_E t$$

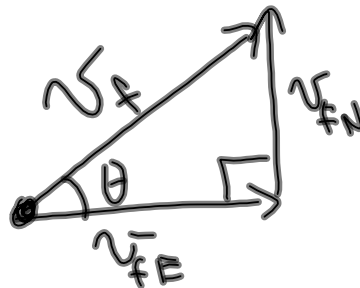
$$= 6.11 + 18.9$$

$$= \underline{\underline{25.01 \text{ m/s}}}$$

$$v_{fN} = v_{oN} + a_N t$$

$$= -2.22 + 32.7$$

$$= \underline{\underline{30.5 \text{ m/s}}}$$



$$v_f = \sqrt{25.01^2 + 30.5^2} \quad \theta = \tan^{-1} \left| \frac{v_{fN}}{v_{fE}} \right|$$

$$= 39.4 \text{ m/s} \quad \theta = \tan^{-1} \left| \frac{30.5}{25.0} \right|$$

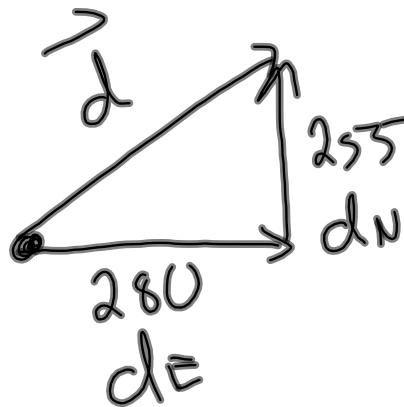
$$\theta = 51^\circ$$

$$\boxed{v_f = 39.4 \text{ m/s} \text{ [E } 51^\circ \text{ N]}}$$

$$\#9b) \vec{d} = ? \quad d_f = d_0 + v_0 t + \frac{1}{2} a t^2$$

$$\begin{aligned} d_E &= v_{0E} t + \frac{1}{2} a_{E} t^2 \\ &= (6.11)(18) + \frac{1}{2} (1.05)(18)^2 \\ &= 109.9 + 170.1 = \underline{\underline{280\text{m}}} \end{aligned}$$

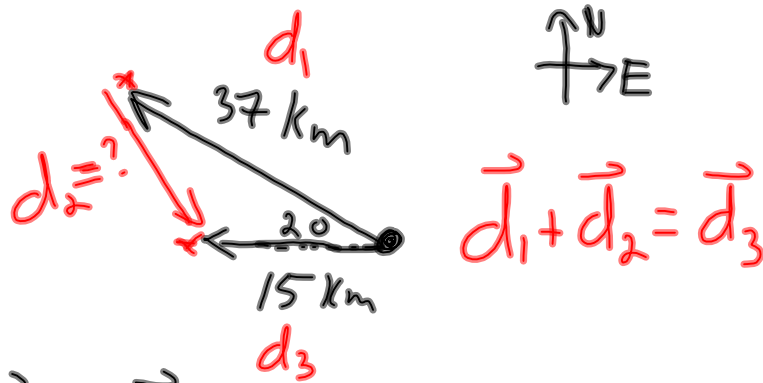
$$\begin{aligned} d_N &= v_{0N} t + \frac{1}{2} a_{N} t^2 \\ &= (-2.22)(18) + \frac{1}{2} (1.82)(18)^2 \\ &= -40\text{m} + 295\text{m} \\ &= \underline{\underline{255\text{m}}} \end{aligned}$$



$$\begin{aligned} d &= \sqrt{280^2 + 255^2} & \theta &= \tan^{-1}\left(\frac{255}{280}\right) = 42^\circ \\ &= 378\text{m} \end{aligned}$$

$$d = 378\text{m} \text{ [E } 42^\circ \text{ N]}$$

11)



$$\vec{d}_2 = \vec{d}_3 - \vec{d}_1$$

$$d_{1E} = -37 \cos 20 = \underline{\underline{-34.8}}$$

$$d_{1N} = 37 \sin 20 = \underline{\underline{12.7}}$$

$$d_{3E} = \underline{\underline{-15}}$$

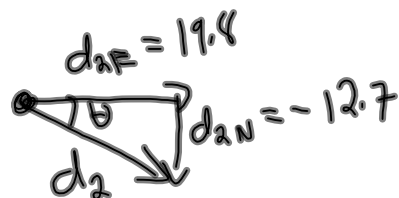
$$d_{3N} = \underline{\underline{0}}$$

$$\begin{aligned} d_{2E} &= d_{3E} - d_{1E} \\ &= -15 - (-34.8) \\ &= -15 + 34.8 \\ &= \underline{\underline{19.8 \text{ km}}} \end{aligned}$$

$$\begin{aligned} d_{2N} &= d_{3N} - d_{1N} \\ &= 0 - 12.7 \\ &= \underline{\underline{-12.7 \text{ km}}} \end{aligned}$$

$$d_2 = \sqrt{d_{2E}^2 + d_{2N}^2}$$

$$\begin{aligned} d_2 &= \sqrt{(19.8)^2 + (-12.7)^2} \\ &= \underline{\underline{23.1}} \end{aligned}$$



$$\begin{aligned} \theta &= \tan^{-1} \left(\frac{12.7}{19.8} \right) \\ &= \underline{\underline{31^\circ}} \end{aligned}$$

$$\boxed{d_2 = 23.1 \text{ km} [\text{E } 31^\circ \text{ S}]}$$