61 [W66°N], and **C** = 50 m [E76°S]

d. $2\mathbf{B} - 3\mathbf{C} = F$

W ← → E (− W, + E)

$B_E = -61\cos 66$
$= -25\text{ m}$

$B_N = 61\sin 66$
$= 56\text{ m}$

$C_E = 50\cos 76$
$= 12\text{ m}$

$C_N = -50\sin 76$
$= -49\text{ m}$

$F_E = 2B_E - 3C_E$
$= 2(-25) - 3(12)$
$= -50 - 36$
$= -86\text{ m}$

$F_N = 2B_N - 3C_N$
$= 2(56) - 3(-49)$
$= 112 + 147$
$= 259\text{ m}$

$|\vec{F}| = \sqrt{(F_E)^2 + (F_N)^2} = \sqrt{(-86)^2 + (259)^2}$
$\approx 273\text{ m}$

$\theta = ?$ $\quad \tan\theta = \left|\frac{F_N}{F_E}\right|$

$\theta = \tan^{-1}\left|\frac{259}{86}\right| = 72°$

$\vec{F} = 273\text{ m}\ [W\ 72°N]$

Physics 122: Application of Vectors Examples

5. An object initially has a velocity of 25 m/s [E62°N] and accelerates at 5.5 m/s^2 [E12°N] for 15 seconds. What is the displacement in that time?

$\vec{v}_0 = 25\ m/s\ [E\ 62°\ N]$ $\vec{a} = 5.5\ m/s^2\ [E\ 12°\ N]$ N+ ↑ → E+

$t = 15s$ $\vec{d}_f = ?$ $\vec{d}_0 = 0\ m$

$v_{0E} = 25\cos 62 = 11.7\ m/s$

$v_{0N} = 25\sin 62 = 22.1\ m/s$

$a_E = 5.5\cos 12 = 5.4\ m/s^2$

$a_N = 5.5\sin 12 = 1.1\ m/s^2$

$$\vec{d}_f = \vec{d}_0 + \vec{v}_0 t + \frac{1}{2} a t^2$$

$d_{fE} = v_{0E} t + \frac{1}{2} a_E t^2$

$= (11.7)(15) + \frac{1}{2}(5.4)(15)^2$

$= 175.5 + 607.5$

$= 783\ m$

$d_{fN} = v_{0N} t + \frac{1}{2} a_N t^2$

$= (22.1)(15) + \frac{1}{2}(1.1)(15)^2$

$= 331.5 + 123.8$

$= 455.3\ m$

$$|d_f| = \sqrt{(d_{fE})^2 + (d_{fN})^2}$$

$$= \sqrt{(783)^2 + (455.3)^2}$$

$$= 906\ m$$

$$\theta = \tan^{-1}\left|\frac{d_{fN}}{d_{fE}}\right| = \tan^{-1}\frac{455.3}{783} = \tan^{-1}(0.58)$$

$\theta = 30°$

$\vec{d}_f = 906\ m\ [E\ 30°\ N]$