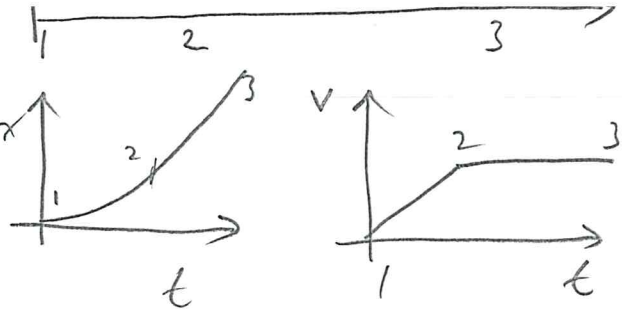
(58) Event 1 → start

Event 2 → finished acceleration

Event 3 → finish race



Pushy acceleration (1 → 2)

$\vec{V}_i = 0$ m/s

$\vec{V}_f = ?$

$\Delta t = 3.5$ s

$\vec{a} = 2.8\ m/s^2$

$\Delta \vec{x} = ?$

$$\vec{x} = \vec{V}_i \Delta t + \frac{1}{2}\vec{a}(\Delta t)^2$$

$$= (0\ m/s)(3.5\ s) + \frac{1}{2}(2.8\ m/s^2)(3.5\ s)^2$$

$$\boxed{\vec{x} = 17.15\ m}$$

Find $\vec{V}_f$

$$\vec{V}_2 = \vec{V}_1 + \vec{a}\Delta t$$

$$\vec{V}_2 = 0 + (2.8\ m/s^2)(3.5\ s)$$

$$\boxed{\vec{V}_2 = 9.8\ m/s}$$

Distance remaining $= 100 - 17.2\ m = 82.8\ m$

$$\vec{V} = \frac{\Delta \vec{x}}{\Delta t}$$

$$9.8\ m/s = \frac{82.8\ m}{\Delta t}$$

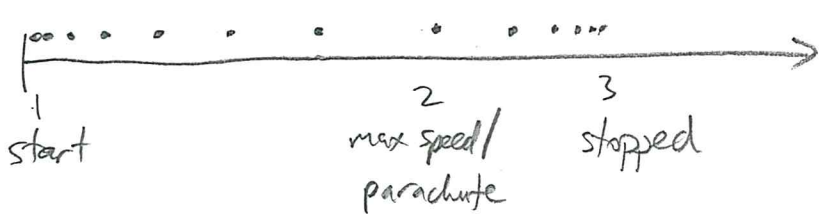
$$\Delta t = \frac{82.8\ m}{9.8\ m/s}$$

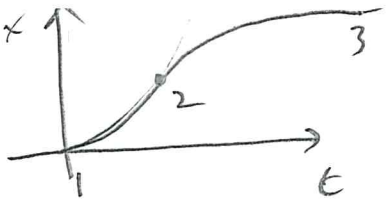
$$\Delta t = 8.4\ s$$

$$\therefore \Delta t_{total} = 3.5 + 8.4$$

$$\boxed{\Delta t_{total} = 11.9\ s}$$

(65)





Between events 1-2

$\vec{V}_i = 0$

$\Delta\vec{x} = 450\ m$

$\vec{a} = 14\ m/s^2$

$\vec{V}_p = ?$

$\Delta t = ?$

Find $\vec{V}_2$

$$\vec{V}_2^{\,2} = \vec{V}_1^{\,2} + 2\vec{a}\Delta\vec{x}$$

$$\vec{V}_2^{\,2} = (0)^2 + 2\left(14\ \tfrac{m}{s^2}\right)(450\ m)$$

$$\vec{V}_2^{\,2} = 12600\ \tfrac{m^2}{s^2}$$

$$\vec{V}_2 = 112.2\ m/s$$

Now events 2-3

$\vec{V}_i = 112.2\ m/s$

$\vec{V}_f = 0\ m/s$

$\vec{a} = -7.0\ m/s^2$

$\Delta\vec{x} = ?$

~~Δt~~

$$\vec{V}_f^{\,2} = \vec{V}_i^{\,2} + 2\vec{a}\Delta\vec{x}$$

$$0 = \left(112.2\ \tfrac{m}{s}\right)^2 + 2\left(-7.0\ \tfrac{m}{s^2}\right)\Delta x$$

$$0 = 12600\ \tfrac{m^2}{s^2} - 14.0\ \tfrac{m}{s^2}(\Delta x)$$

$$\frac{\left(14.0\ \tfrac{m}{s^2}\right)(\Delta x)}{14.0\ \tfrac{m}{s^2}} = \frac{12600\ \tfrac{m^2}{s^2}}{14.0\ m/s^2}$$

$$\Delta x = 900\ m$$

$\therefore$ total distance is $900 + 450 = 1350\ m$

(rounds to 1400 m)