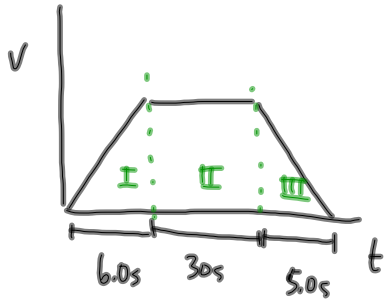
Review

8.



Section I

$V_1 = 0$

$V_2 = ?$

$\Delta t = 6.0s$

$a = 2.0 m/s^2$

(constant acc)

$a = \frac{\Delta V}{\Delta t}$

$a = \frac{V_2 - V_1}{\Delta t}$

$a\Delta t = V_2 - V_1$

$V_2 = V_1 + a\Delta t$

$V_2 = 0 + (2.0 m/s^2)(6.0s)$

$\boxed{V_2 = 12 m/s}$

$\Delta d = V_{ave}\Delta t$

$\Delta d = \left(\frac{V_1 + V_2}{2}\right)\Delta t$

$\Delta d = \left(\frac{0 + 12 m/s}{2}\right)(6.0s)$

$\boxed{\Delta d = 36 m}$

Section II (constant velocity)

$V = 12 m/s$

$\Delta t = 3.0s$

$\Delta d = ?$

$V = \frac{\Delta d}{\Delta t}$

$\Delta d = V\Delta t$

$\Delta d = (12 m/s)(3.0s)$

$\Delta d = 36.0 m$

Section III

$V_1 = 12 m/s$

$V_2 = 0$

$\Delta t = 5.0s$

$\Delta d = ?$

$\Delta d = V_{ave}\Delta t$

$\Delta d = \left(\frac{V_1 + V_2}{2}\right)\Delta t$

$\Delta d = \left(\frac{12 m/s + 0}{2}\right)(5.0s)$

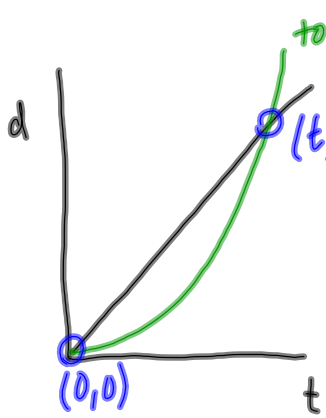
$\boxed{\Delta d = 30 m}$

TOTAL

$$\begin{array}{r} 36 m \\ 360 m \\ + \quad 30 m \\ \hline 426 m \end{array}$$

$\boxed{4.3 \times 10^2 m}$

9.



Easter Bunny (constant v)

$v = 25\ m/s$

$\Delta d = d$

$\Delta t = t$

$v = \frac{\Delta d}{\Delta t}$

$\Delta d = v\Delta t$

$\boxed{d = (25\frac{m}{s})t}$

Tortoise (constant a)

$v_i = 0$

$a = 3.0 \times 10^{-3}\ m/s^2$

$\Delta d = d$

$\Delta t = t$

$\Delta d = \cancel{v_i \Delta t}^{0} + \frac{1}{2}a(\Delta t)^2$

$d = \frac{1}{2}(3.0 \times 10^{-3}\frac{m}{s^2})t^2$

$\boxed{d = (1.5 \times 10^{-3}\frac{m}{s^2})t^2}$

$(25\frac{m}{s})t = (1.5 \times 10^{-3}\frac{m}{s^2})t^2$

$0 = (1.5 \times 10^{-3}\frac{m}{s^2})t^2 - (25\frac{m}{s})t$

$0 = t((1.5 \times 10^{-3}\frac{m}{s^2})t - (25\frac{m}{s}))$

$t = 0$ $\quad (1.5 \times 10^{-3}\frac{m}{s^2})t - (25\frac{m}{s}) = 0$

$(1.5 \times 10^{-3}\frac{m}{s^2})t = 25\frac{m}{s}$

$t = \frac{25\ m/s}{1.5 \times 10^{-3}\ m/s^2}$

$t = ?\ s$

$\frac{m/s}{m/s^2} = \frac{m}{s} \div \frac{m}{s^2}$

$= \frac{\cancel{m}}{s} \cdot \frac{s^2}{\cancel{m}}$

$= s$

Dynamics

Newton's Laws:

1. Law of Inertia
2. $F_{net} = ma$ $\left(a \propto F,\ a \propto \frac{1}{m}\right)$
3. Action-Reaction

$$a \propto \frac{F}{m}$$

$$F \propto ma \quad \leftarrow \quad 1\,N \rightarrow 1\,kg \cdot m/s^2$$

$$F = kma$$

$$F_{net} = ma$$

$$\sum F = ma$$

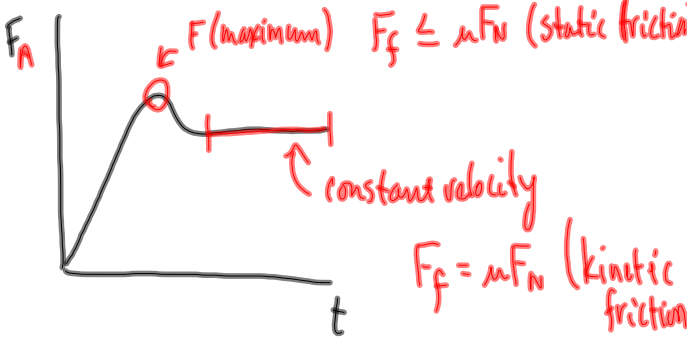
Weight - force of gravity

$$F_g = mg \quad \left(g = 9.81\ \frac{m}{s^2} \text{ near the Earth's surface}\right)$$

Friction - static | kinetic
(stationary) (moving)

$F_f \propto F_N$ (the normal force | perpendicular to surface)

$F_f = \mu F_N$ (μ depends on the surfaces)



FBD - free body diagram