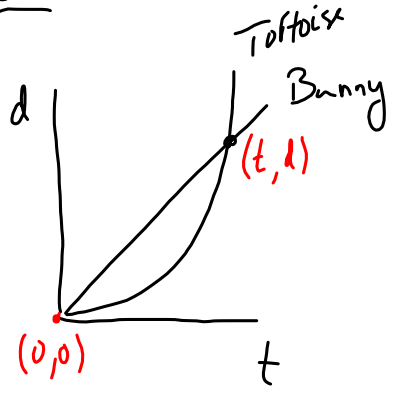
Review

9.



$\Delta d = d - 0 = d$

$\Delta t = t - 0 = t$

Bunny: constant velocity

$d = 25t$

Tortoise: constant acc.

$d = \cancel{v_1 t}^{0} + \frac{1}{2}at^2$

$d = \frac{1}{2}(0.003)t^2$

15. $\Delta t_{reaction} = 0.60s$

$v_1 = 72 km/h \times \frac{1000}{3600} = 20 m/s$

40m

$m = 1000kg$

$F_{net} = -8000N$

$v_2 = 0$

$F_{net} = ma$

$a = \frac{F_{net}}{m}$

$a = \frac{-8000N}{1000kg}$

$a = -8 m/s^2$

$v_2^2 = v_1^2 + 2a\Delta d$

$v_2^2 - v_1^2 = 2a\Delta d$

$\Delta d = \frac{\cancel{v_2^2}^{0} - v_1^2}{2a}$

$\Delta d = \frac{-(20m/s)^2}{2(-8m/s^2)}$

$\Delta d = 25m$

braking distance

"Thinking Distance"

$\Delta d = v\Delta t$

$\Delta d = (20m/s)(0.60s)$

$\Delta d = 12m$

TOTAL DISTANCE = 37m

So the child is safe.

14. $m = 1.8\,g$ $\quad F_{net} = ma$

$V_1 = 0$

$V_2 = 500\,m/s$ $\rightarrow a = ?$

$\Delta d = 25\,cm$

$F = ?$

$V_2^2 = V_1^2 + 2a\Delta d$

$V_2^2 - V_1^2 = 2a\Delta d$

$a = \dfrac{V_2^2 - V_1^2}{2\Delta d}$ ($V_1 = 0$)

$F_{net} = ma$

$F_{net} = (1.8\times10^{-3}\,kg)(5.0\times10^5\,m/s^2)$

$F_{net} = 750\,N$

$(7.5\times10^2\,N)$

$a = \dfrac{(500\,m/s)^2}{2(0.25\,m)}$

$a = 5.0\times10^5\,m/s^2$

Dynamics Review

Newton's Laws

1. Law of Inertia - objects at rest stay at rest, objects in motion stay in motion unless acted upon by an unbalanced force.

2. $a \propto F$, $a \propto \frac{1}{m}$ $\Rightarrow a \propto \frac{F}{m} \Rightarrow F \propto ma$

$F = kma$

where $k = \frac{1N}{1kg \cdot m/s^2}$

So $F_{net} = ma$

3. $F_{A \text{ on } B} = -F_{B \text{ on } A}$

The force of A on B is equal but opposite the force of B on A.

Weight (Force of Gravity) $\Rightarrow F_g = mg$

where $g = 9.81 m/s^2$ (near the Earth's surface)

Friction $F_f \leq max$

Static - the frictional force that acts on an object when not moving

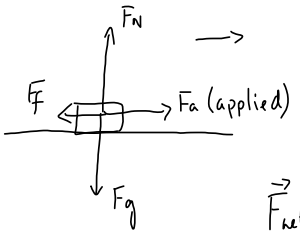
Kinetic - the frictional force that acts on an object in motion

$F_f = \mu F_N$

Where μ is the coefficient of friction.

F_N is the normal force (N)

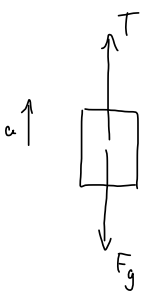
F_f is the frictional force (N)



FBD (free body diagrams)

$\vec{F}_{net} = m\vec{a}$

$F_a - F_f = ma$



$\vec{F}_{net} = m\vec{a}$

$T - F_g = ma$