

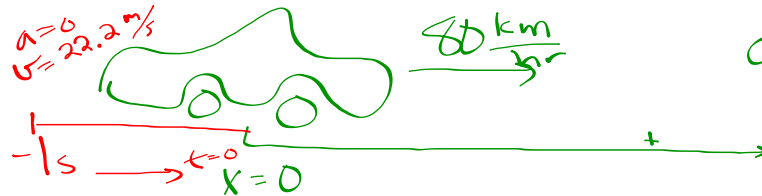
23. What is the stopping distance for an automobile having an initial speed of 80 km/h if the human reaction time is 1.0 s.

a) For an acceleration of $a = -4.0 \text{ m/s}^2$?

b) For an acceleration of $a = -8.0 \text{ m/s}^2$?

$$t = 1.0 \text{ s}$$

$$a = -4.0 \frac{\text{m}}{\text{s}^2}$$



$$x_0 = 0$$

$$x = x$$

$$v_0 = 80 \frac{\text{km}}{\text{hr}} \cdot \frac{1000 \text{ m}}{\text{km}} \cdot \frac{1 \text{ hr}}{3600 \text{ s}} = 22.2 \frac{\text{m}}{\text{s}}$$

$$v = 0 \frac{\text{m}}{\text{s}}$$

$$a = -4.0 \frac{\text{m}}{\text{s}^2}$$

$$t = t$$

$$\cancel{x = x_0 + v_0 t + \frac{1}{2} a t^2}$$

$$v^2 = v_0^2 + 2a(x - x_0)$$

$$0 = (22.2)^2 + 2(-4)x$$

$$x = \frac{-(22.2)^2}{-8} = 61.6 \text{ m}$$

From $t = -1$ to $t = 0$,

$$v = 22.2 \frac{\text{m}}{\text{s}} \rightarrow$$

$$x = 22.2 \text{ m}$$

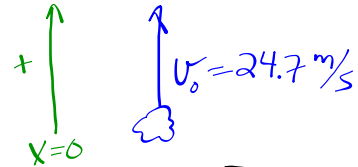
$$\text{total } x = 83.8 \text{ m}$$

33. A baseball is thrown vertically into the air with a speed of 24.7 m/s.

a) How high does it go?

b) How long does it take to return to the ground?

$$a_y = -9.8 \frac{\text{m}}{\text{s}^2}$$



$$\begin{aligned} x_0 &= 0 \\ x &= x \\ v_0 &= 24.7 \frac{\text{m}}{\text{s}} \\ v &= 0 \frac{\text{m}}{\text{s}} \\ a &= -9.8 \frac{\text{m}}{\text{s}^2} \\ t &= t \end{aligned}$$

$$\begin{aligned} v^2 &= v_0^2 + 2a(x - x_0) \\ 0 &= (24.7)^2 + 2(-9.8)x \end{aligned}$$

$$x = 33.1 \text{ m}$$

$$\begin{aligned} x_0 &= 0 \text{ m} \\ x &= 0 \text{ m} \\ v_0 &= 24.7 \frac{\text{m}}{\text{s}} \\ v &= v \\ a &= -9.8 \frac{\text{m}}{\text{s}^2} \\ t &= t \end{aligned}$$

$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

$$0 = 0 + 24.7(t) + \frac{1}{2}(-9.8)t^2$$

$$-4.9t^2 + 24.7t = 0$$

$$t(-4.9t + 24.7) = 0$$

$$t = 0$$

$$\text{or } -4.9t + 24.7 = 0$$

$$t = \frac{-24.7}{-4.9} = 5.04 \text{ s}$$