$v_f = 150\ \frac{km}{hr} = \frac{150\ (1000m)}{60 \times 60\ s}$

$v_i = 0$

$\Delta t = 0.5s$

$a = ?$

$v_f = v_i + a(\Delta t)$

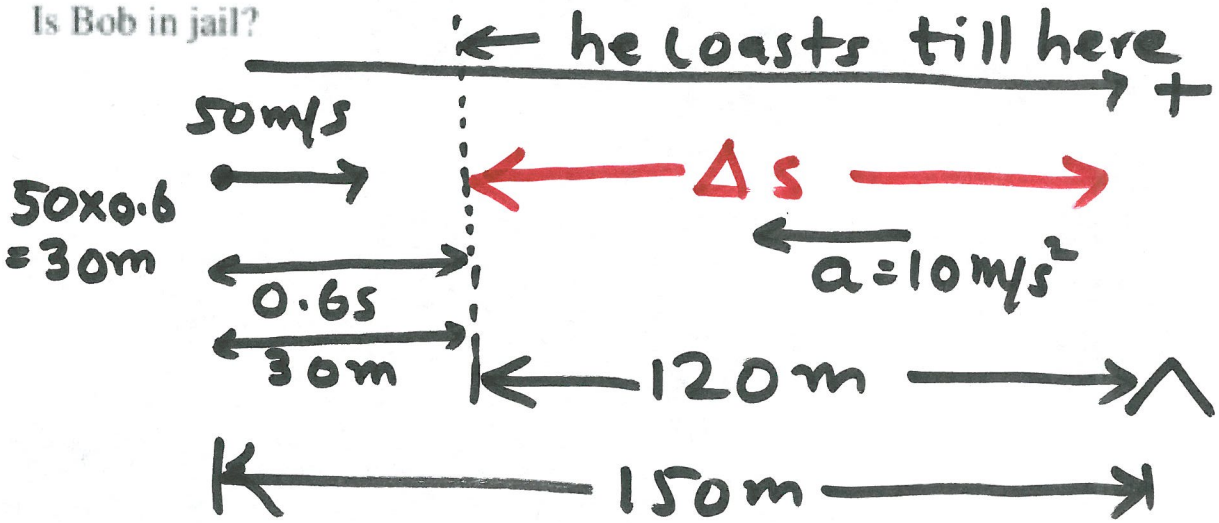
$\frac{150 \times 10^3}{3600} = a\ (0.5)$

$a = 83.3\ m/s^2 \sim 8.5g\ !$

WHITEBOARD PROBLEM 2.7
Ch2, #16

Whiteboard Problem 2.8, Ch2 #59

59. Bob is driving the getaway car after the big bank robbery. He's going 50 m/s when his headlights suddenly reveal a nail strip that the cops have placed across the road 150 m in front of him. If Bob can stop in time, he can throw the car into reverse and escape. But if he crosses the nail strip, all his tires will go flat and he will be caught. Bob's reaction time before he can hit the brakes is 0.60 s, and his car's maximum deceleration is 10 m/s^2. Is Bob in jail?



I chose this method

Either set $v_f = 0$ find Δs
If $\Delta s > 120$ m, IN JAIL!

OR

set $\Delta s = 120$ m, find v_f.
If $v_f > 0$, IN JAIL!

$$v_f^2 = v_i^2 + 2a\Delta s$$

$$0 = 50^2 + 2(-10)\Delta s$$

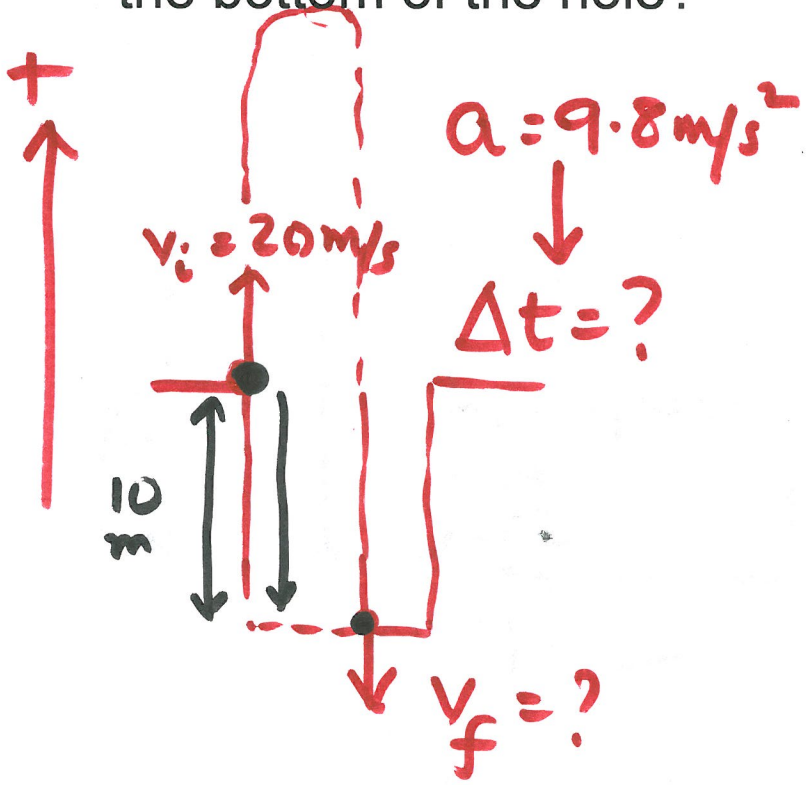
$$\Delta s = \frac{50^2}{20} = 125\text{m} > 120\text{m}$$

Whiteboard Problem 2.9: Ch2 #22

A rock is tossed straight up with a speed of 20 m/s. When it returns, it falls into a hole 10 m deep.

a) What is the rock's velocity as it hits the bottom of the hole?

b) How long is the rock in the air, from the instant it is released until it hits the bottom of the hole?



- $v_f^2 = v_i^2 + 2a\Delta s$

$v_f^2 = 20^2 + 2(-9.8)(-10)$

$v_f = \pm 24.4$ m/s

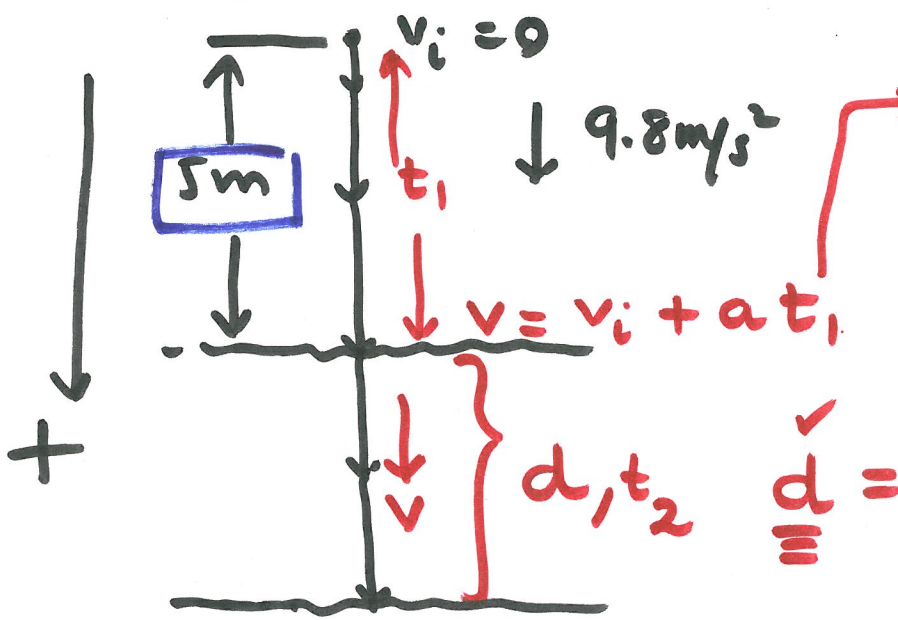
- $v_f = v_i + a(\Delta t)$

$-24.4 = +20 + (-9.8)\Delta t$

$\Delta t = \frac{-44.4}{-9.8} = 4.53$ s

Whiteboard Problem 2.10: Ch2 #51

51. ||| A lead ball is dropped into a lake from a diving board 5.0 m above the water. After entering the water, it sinks to the bottom with a constant velocity equal to the velocity with which it hit the water. The ball reaches the bottom 3.0 s after it is released. How deep is the lake?



$t_1 + t_2 = 3$ — (i)

$v = 0 + 9.8 t_1 \Rightarrow v = 9.8 t_1$ — (ii)

Substitute eqn (ii) in (iii).

$d = 9.8 t_1 t_2$ — (iii)

Find t_1: $\Delta y = v_i \Delta t + \frac{1}{2} a (\Delta t)^2$

$5 = 0 + \frac{1}{2}(9.8) t_1^2$

$t_1 = \sqrt{\frac{2 \times 5}{9.8}} = 1.01 s$

Then $t_2 = 3 - 1.01 = 1.99 s$

$d = \bar{v} t_2$ — (iii)

$d = 19.7 m$
(20m)