Quiz #2A

Clearly indicate (with a box) your answers to the following questions. SHOW ALL WORK.

1. A car travels at a speed of 45 miles/hour for 35 minutes. The driver takes a 12 minute break, then realizes that he has to hurry to cover the last 33 miles. To arrive on time, the driver needs to have an average velocity of 42 miles/hour for the entire trip.

How fast must the driver go during the last segment of his trip in order to achieve this average velocity?

Pt 1	Pt 2	Pt 3
$\bar{V}_1 = 45\ mi/hr$	$\bar{V}_2 = 0$	$\bar{V}_3 = ?$
$\Delta x_1 = ?$	$\Delta x_2 = 0$	$\Delta x_3 = 33$
$t_1 = 35\ min = .583\ hr$	$t_2 = 12\ min = .2\ hr$	$t_3 = ?$

$$\Delta x_1 = \bar{V}_1 t_1$$
$$= 26.25\ mi$$

$$\bar{V}_{tot} = \frac{\Delta x_1 + \Delta x_2 + \Delta x_3}{t_1 + t_2 + t_3} = 42\ \frac{mi}{hr}$$

$$\frac{26.25 + 0 + 33}{0.583 + 0.2 + t_3} = 42$$

$$59.25 = 42(0.783 + t_3)$$

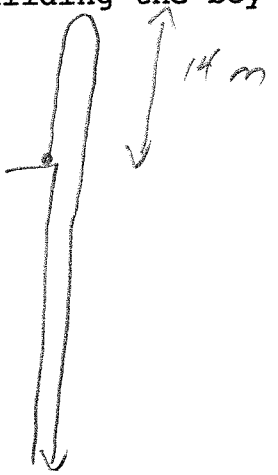
$$1.41 = 0.783 + t_3$$

$$t_3 = 0.6277\ hr$$

$$\bar{V}_3 = \frac{\Delta x_3}{t_3} = \frac{33}{0.6277} = \boxed{53\ mi/hr}$$

2. A boy throws a stone directly upward from the edge of a building. The stone reaches a maximum height of 14 meters above the boy's level and drops from there straight down to the ground, just missing the edge of the building on which the boy is standing. The stone hits the ground exactly 5.0 seconds after it leaves the boy's hand.

What is the initial velocity of the stone, and how tall is the building the boy is standing on?



On the way up:

$\Delta y_1 = 14$

$v_{0_1} = ?$

$v_1 = 0$

$a_1 = -9.8$

$t_1 = ?$

$v^2 = v_0^2 + 2a\Delta y$

$0^2 = v_0^2 - 19.6(14)$

$v_0 = 16.57 \text{ m/s}$

$\boxed{v_0 = 17 \text{ m/s}}$

Total motion

$\Delta y = ?$

$V_0 = 16.57$

$V = ?$

$a = -9.8$

$t = 5.0 \text{ s}$

$\Delta y = v_0 t + \frac{1}{2} a t^2$

$\Delta y = (16.57)(5) - 4.9(5)^2$

$= -39.65$

Building is $\boxed{40\text{m tall}}$

or

On the way down

t_1: $\Delta y = v_1 t_1 - \frac{1}{2} a_1 t_1^2$

$14 = 4.9 t_1^2$

$t_1 = 1.69 \text{ s}$

$t_2 = 5.0 - t_1$

$\Delta y = ?$

$V_0 = 0$

$V = ?$

$a = -9.8$

$t = 3.31$

$\Delta y = v_0 t + \frac{1}{2} a t^2$

$= 0 - 4.9(3.31)^2 = -53.7$

$53.7 - 14 = 39.7 \rightarrow 40\text{m}$