Key

Part II. Show all work ! Include equations and substitution with units with a correctly rounded final answer.

1. A stone is dropped from a 75 m high building. When this stone has dropped 15 m, a second stone is thrown downward from the same height with an initial velocity such that the two stones hit the ground at the same time. What was the initial velocity of the second stone?

→ time for 1st stone to fall $\Delta x = v_0 t + \frac{1}{2} a t^2$

$-75m = \frac{1}{2}(-9.8 m/s^2)\, t^2$

$t = 3.9 s$

and $t = 1.75 s$ to fall 15m

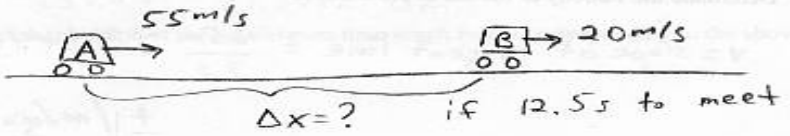
⇒ 2nd stone falls for $3.9 s - 1.75 s$ or 2.15 sec

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

$-75m = -v_0 (2.15 s) + \frac{1}{2}(-9.8 m/s^2)(2.15 s)^2$

$v_0 = -24 m/s$

2. Car A is traveling at 55 m/s and is heading towards car B along a straight line path. Car B is traveling at 20 m/s. A quick thinking AP B Physics student whips out her trusty stopwatch and measures 12.5 seconds from when she first saw the cars to the point when they meet. What was the distance between the cars at a time of zero seconds?



$\Delta x = \bar{v} \cdot t = 35 m/s \cdot 12.5 s = 437.5 m = 400 m$ (rounded)

Both velocities are positive

⇒ going in same direction.