

1. Motorcycle

$$v_i = 25 \text{ m/s}$$

$$a = 8.0 \text{ m/s}^2$$

$$\Delta d_m = ?$$

$$\Delta t = ?$$

$$\Delta d = v_i \Delta t + \frac{1}{2} a (\Delta t)^2$$

$$\Delta d_m = 25 \Delta t + \frac{1}{2} (8) \Delta t^2$$

$$\Delta d_m = 25 \Delta t + 4 \Delta t^2$$

Car

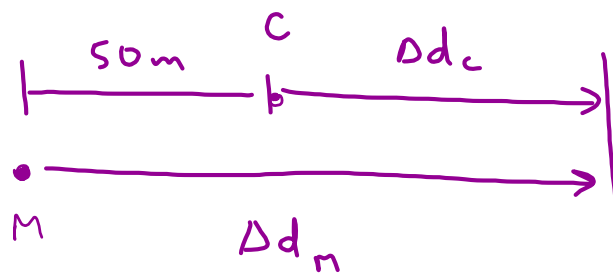
$$v = 25 \text{ m/s}$$

$$\Delta d_c = ?$$

$$\Delta t = ?$$

$$v = \frac{\Delta d}{\Delta t}$$

$$\Delta d_c = 25 \Delta t$$



$$\Delta d_m = \Delta d_c + 50$$

$$25 \Delta t + 4 \Delta t^2 = 25 \Delta t + 50$$

$$4 \Delta t^2 = 50$$

$$\Delta t^2 = 12.5$$

$$\Delta t = \pm \sqrt{12.5}$$

$$\Delta t = 3.5$$

It takes 3.5 seconds

2. Rock 1

$$v_i = 21 \text{ m/s [up]}$$

$$a = 9.8 \text{ m/s}^2 \text{ [down]}$$

$$\Delta d = ?$$

$$\Delta t = x$$

$$\Delta d = v_i \Delta t + \frac{1}{2} a (\Delta t)^2$$

$$\Delta d = 21x + \frac{1}{2}(-9.8)x^2$$

$$\Delta d_1 = 21x - 4.9x^2$$

Rock 2

$$v_i = 21 \text{ m/s [up]}$$

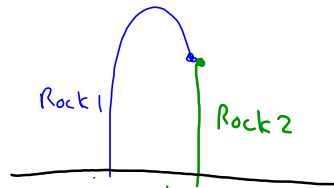
$$a = 9.8 \text{ m/s}^2 \text{ [down]}$$

$$\Delta d = ?$$

$$\Delta t = x - 3$$

$$\Delta d = v_i \Delta t + \frac{1}{2} a (\Delta t)^2$$

$$\Delta d_2 = 21(x-3) + \frac{1}{2}(-9.8)(x-3)^2$$



$$\Delta d_1 = \Delta d_2$$

$$21x - 4.9x^2 = 21(x-3) - 4.9(x-3)^2$$

$$21x - 4.9x^2 = 21x - 63 - 4.9(x^2 - 6x + 9)$$

$$-4.9x^2 = -63 - 4.9x^2 + 29.4x - 44.1$$

$$107.1 = 29.4x$$

$$x = 3.64$$

$$\Delta d = 21x - 4.9x^2$$

$$= 21(3.64) - 4.9(3.64)^2$$

$$= 11.5$$

The first rock is in the air for 3.64 s when it meets the second rock at a height of 11.5 m.