

Physics Practice Problems – Linear Motion SOLUTIONS:

1. A car is initially traveling at 4 m/s then accelerates at 17.5 m/s^2 for 25s. How fast is it going after this time?

Given:

$$4 \text{ m/s} = v_i \quad (\text{initial velocity})$$

$$17.5 \text{ m/s}^2 = a \quad (\text{acceleration})$$

$$25 \text{ s} = \Delta t \quad (\text{the change in time})$$

$$? = v_f \quad (\text{final velocity})$$

$$v_f = 4 + (17.5) * (25)$$

$$v_f = 4 + 437.5$$

$$v_f = 441.5 \text{ m/s}$$

2. A penny is dropped from a roof top 72m above the ground. How fast is it going when it hits the ground?

Given:

$$72 \text{ m} = \Delta d \quad (\text{the change in distance})$$

$$? = v_f \quad (\text{final velocity})$$

$$A = 9.81 \text{ m/s}^2 \quad (\text{acceleration downward due to gravity ONLY – Free Fall})$$

$$v_i = 0 \text{ m/s} \quad (\text{initial velocity})$$

$$v_f^2 = 0^2 + 2 * 9.81 * 72$$

$$v_f^2 = 0 + 19.62 * 72$$

$$v_f^2 = 0 + 1412.64$$

$$v_f^2 = 1412.64$$

$$v_f = \sqrt{1412.64}$$

$$v_f = 37.6 \text{ m/s}$$

3. A firecracker is shot into the air. It needs to reach a height of 90m at the top of its flight. What does its initial velocity have to be to do this?

Given:

$$90\text{m} = \Delta d \quad (\text{the change in distance})$$

$$? = v_i \quad (\text{initial velocity})$$

$$A = -9.81 \text{ m/s}^2 \quad (\text{acceleration upward due to gravity ONLY})$$

$$V_f = 0 \text{ m/s} \quad (\text{final velocity})$$

$$0^2 = v_i^2 + 2 * (-9.81) * 90$$

$$0^2 = v_i^2 + (-19.62) * 90$$

$$0^2 = v_i^2 + (-1765.8)$$

$$0 = v_i^2 + (-1765.8)$$

$$1765.8 = v_i^2$$

$$\sqrt{1765.8} = v_i$$

$$42.02 \text{ m/s} = v_i$$

4. A bowler drops her bowling ball 1.2m onto her foot. How fast was the ball going when it hit?

Given:

$$1.2\text{m} = \Delta d \quad (\text{the change in distance})$$

$$? = v_f \quad (\text{final velocity})$$

$$A = 9.81 \text{ m/s}^2 \quad (\text{acceleration downward due to gravity ONLY – Free Fall})$$

$$V_i = 0 \text{ m/s} \quad (\text{initial velocity})$$

$$v_f^2 = 0^2 + 2 * 9.81 * 1.2$$

$$v_f^2 = 0 + 19.62 * 1.2$$

$$v_f^2 = 0 + 23.54$$

$$v_f^2 = 23.54$$

$$v_f = \sqrt{23.54}$$

$$v_f = 4.85 \text{ m/s}$$