

**Kinematics
Practice 5**Name SOLUTIONS

$$d = vt \quad v_f = v_i + at \quad d = v_i t + (1/2)at^2 \quad g = 9.8 \text{ m/s}^2$$

Show all your work

- 1) An arrow is fired straight up into the air at an initial speed of 137.2 m/s. How long does it take to reach its high point?

$$v_i = 137.2 \text{ m/s}$$

$$v_f = 0 \text{ m/s}$$

$$a = (-)9.8 \text{ m/s}^2$$

$$t = ?$$

$$v_f = v_i + at$$

$$0 = 137.2 + (-)9.8t$$

$$-137.2 = -9.8t$$

$$\frac{-137.2}{-9.8} = t = \boxed{14\text{s}}$$

How high does it go?

$$d = vt$$

$$d = \left(\frac{137.2 + 0}{2} \right) (14)$$

$$d = (68.6)(14) = \boxed{960.4\text{m}}$$

- 2) What is the acceleration of a gorilla that has an initial speed of 2 m/s and travels 45 m in 5 s?

$$v_i = 2 \text{ m/s}$$

$$d = 45 \text{ m}$$

$$t = 5 \text{ s}$$

$$a = ?$$

$$d = v_i t + \frac{1}{2}at^2$$

$$45 = 2(5) + \frac{1}{2}a(5)^2$$

$$45 = 10 + \frac{1}{2}(a)(25)$$

$$45 - 10 = 12.5a$$

$$35 = 12.5a$$

$$\frac{35}{12.5} = a = \boxed{2.8 \text{ m/s}^2}$$

$$d = vt \quad v_f = v_i + at \quad d = v_i t + (1/2)at^2 \quad g = 9.8 \text{ m/s}^2$$

- 3) A person starts from rest and accelerates at 2 m/s^2 for 5 s. They run at their new speed for the next 10 s. Then, they decelerate at (-2.5 m/s^2) until they come to a rest. How far did they travel all together?

phase 1

$$v_i = 0 \text{ m/s}$$

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

$$t = 5 \text{ s}$$

$$v_f = v_i + at$$

$$v_f = 0 + (2)(5)$$

$$v_f = 10 \text{ m/s}$$

$$d = vt$$

$$d = \left(\frac{0+10}{2}\right)(5)$$

$$d = (5)(5) = 25 \text{ m}$$

$$d_1 = \underline{\underline{25 \text{ m}}}$$

phase 2

$$t = 10 \text{ s}$$

$$v = 10 \text{ m/s}$$

$$d = vt$$

$$d = (10)(10)$$

$$d = \underline{\underline{100 \text{ m}}}$$

$$d_2 = \underline{\underline{100 \text{ m}}}$$

phase 3

$$a = (-2.5 \text{ m/s}^2)$$

$$v_f = 0 \text{ m/s}$$

$$v_i = 10 \text{ m/s}$$

$$v_f = v_i + at$$

$$0 = 10 + (-2.5)t$$

$$-10 = -2.5t$$

$$\frac{-10}{-2.5} = t = \underline{\underline{4 \text{ s}}}$$

$$d = vt$$

$$d = \left(\frac{0+10}{2}\right)(4)$$

$$d = (5)(4) = 20 \text{ m}$$

$$d_3 = \underline{\underline{20 \text{ m}}}$$

$$d_{\text{total}} = d_1 + d_2 + d_3$$

$$d_{\text{total}} = 25 + 100 + 20$$

$$d_{\text{total}} = \boxed{145 \text{ m}}$$

Answers: 1) 14 s 960.4 m 2) 2.8 m/s² 3) 145 m