

# Worksheet - Free Fall

1. K | V  
 $h = 45\text{m}$  |  $t$   
 $g = 9.8\frac{\text{m}}{\text{s}^2}$  |  $v_f$   
 $v_i = 0$

$$h = \frac{1}{2}gt^2$$

$$45 = \frac{1}{2}(9.8)t^2$$

$$t = 3.03\text{s}$$

$$v_f = v_i + at$$

$$= 0 + 9.8(3.03)$$

$$v_f = 29.7\frac{\text{m}}{\text{s}}$$

2. K | V  
 $v_i = 12\frac{\text{m}}{\text{s}}$  |  $t$   
 $a = -9.8\frac{\text{m}}{\text{s}^2}$   
 $d = -45\text{m}$

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

$$-45 = 0 + 12t + \frac{1}{2}(-9.8)t^2$$

$$4.9t^2 - 12t - 45 = 0$$

$$t = 4.5\text{s}$$

3. K | V  
 $v_f = 0$  |  $v_i$   
 $a = -9.8\frac{\text{m}}{\text{s}^2}$   
 $h = 10\text{m}$

$$v_f^2 = v_i^2 + 2ad$$

$$0 = v_i^2 + 2(-9.8)(10)$$

$$215.6 = v_i^2$$

$$v_i = 14.7\frac{\text{m}}{\text{s}}$$

4. K | V  
 $h = 110\text{m}$  |  $t$   
 $t = 3.5\text{s}$   
 $a = -9.8\frac{\text{m}}{\text{s}^2}$

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

$$110 = 0 + v_i(3.5) + \frac{1}{2}(-9.8)(3.5)^2$$

$$v_i = 48.6\frac{\text{m}}{\text{s}}$$

5. K | V  
 $v_s = 343\frac{\text{m}}{\text{s}}$   
 $a = 9.8\frac{\text{m}}{\text{s}^2}$   
 $t = 2.3\text{s}$

$$h = \frac{1}{2}gt_a^2$$

$$h = 4.9t_a^2$$

$$h = 24.3\text{m} \quad 4.9t_a^2 = 788.9 - 343t_a$$

$$4.9t_a^2 + 343t_a - 788.9 = 0$$

$$t_a = 2.229\text{s}$$

$$h = v t_o \quad t_d + t_o = 2.3\text{s}$$

$$h = 343(2.3 - t_o) \quad t_o = 2.3 - t_d$$

$$h = 788.9 - 343t_d$$

$$24.3\text{m}$$