

# Trouble-Maker Thomas

Physics 432

Name \_\_\_\_\_

1 2 3 4 5 6 7 8

1) Thomas is dropping stones from a bridge. If it takes 3.0 seconds to hit the cars beneath, how high was the bridge?

G:  $t = 3.0$   
 $a = -9.8 \text{ m/s}^2$   
 $v_i = 0 \text{ m/s}$

U:  $d = ?$   
 $E: d = v_i t + \frac{1}{2} a t^2$

S/S:  $d = 0 + \frac{1}{2} (-9.8) (3.0)^2$   
 $d = -44.1 \text{ m}$

→ **Height = 44.1 m**

2) Thomas tips a flower pot off a window sill ( $v_i = 0$ ) and strikes the ground 45 meters below. How fast is it going when it strikes the ground?

G:  $d = -45 \text{ m}$   
 $a = -9.8 \text{ m/s}^2$   
 $v_i = 0 \text{ m/s}$

U:  $v_f = ?$   
 $E: v_f^2 = v_i^2 + 2ad$

S/S:  $v_f^2 = 0^2 + 2(-9.8)(-45)$   
 $v_f^2 = 882$   
 $v_f = -29.7 \text{ m/s}$  → **Speed = 29.7 m/s**

3) A boy throws a water balloon straight up into the air with a velocity of 50 m/s. (a. How high will the balloon go? (b. Graph this action at right).

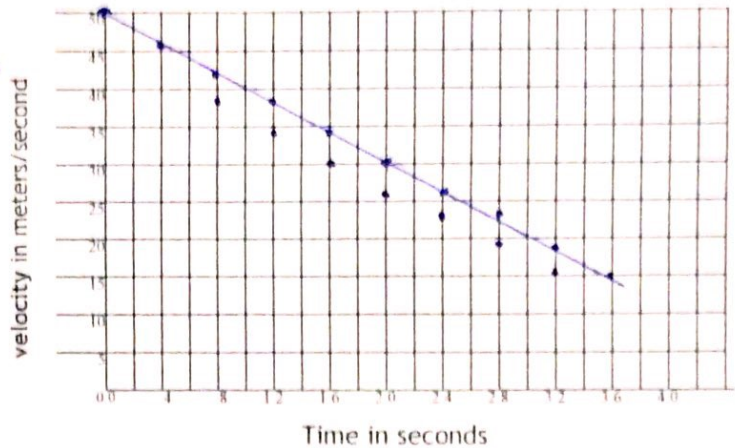
a) G:  $v_i = 50 \text{ m/s}$   
 $a = -9.8 \text{ m/s}^2$   
 $v_f = 0 \text{ m/s}$

U:  $d = ?$   
 $E: v_f^2 = v_i^2 + 2ad$

S/S:  $0^2 = 50^2 + 2(-9.8)(d)$   
 $-2500 = -19.6d$   
 **$d = 128 \text{ m}$**

b) 

t	v
0	50
0.4	46
0.8	42
1.2	38
1.6	34
2.0	30
2.4	26
2.8	23
3.2	19
3.6	15
4.0	11
4.2	9



4) Thomas launches a firework with an initial velocity of 40 m/s. (a. if the firework turned out to be a dud (no explosion), how much time will it spend in the air? (b. Graph this Position Vs. Time Graph Below).

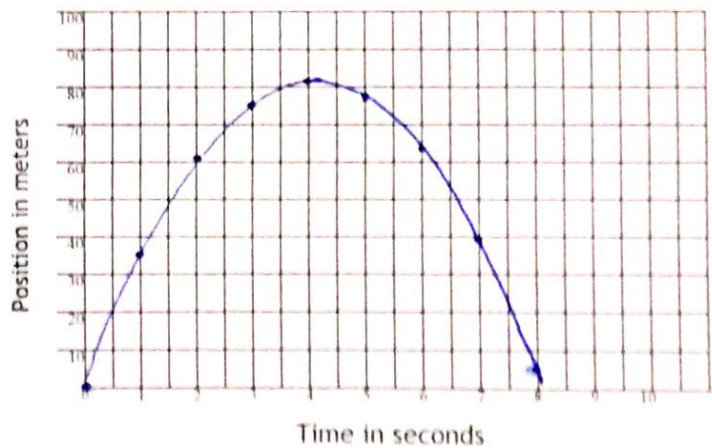
a) G:  $v_i = 40 \text{ m/s}$   
 $a = -9.8 \text{ m/s}^2$   
 $d = 0 \text{ m}$

U:  $t = ?$   
 $E: d = v_i t + \frac{1}{2} a t^2$

S/S:  $0 = 40t + \frac{1}{2} (-9.8)t^2$   
 $0 = t(40 - 4.9t)$   
 ~~$0 = 40 - 4.9t$~~   
 $0 = 40 - 4.9t$   
 **$t = 8.16 \text{ s}$**

b) 

t	x
0	0
1	35.1
2	60.4
3	75.9
4	81.6
5	77.5
6	63.6
7	39.9
8	6.4



5) Standing on the top of a 110 meter cliff, Thomas throws a Picasso original directly down at a speed of 5.6 meters per second. How fast will the painting be traveling when it strikes the ground?

G:  $v_i = -5.6 \text{ m/s}$   
 $d = -110 \text{ m}$   
 $a = -9.8 \text{ m/s}^2$

U:  $v_f = ?$   
 $E: v_f^2 = v_i^2 + 2ad$

S/S:  $v_f^2 = (-5.6)^2 + 2(-9.8)(-110)$   
 $v_f = -46.8 \text{ m/s}$  → **speed = 46.8 m/s**

6) Thomas is now on a 7 meter bridge is spitting on the ducks below him. If his spit takes 1.0 seconds to hit the ground below, how fast is his saliva traveling out of his mouth?

G:  $d = -7 \text{ m}$   
 $a = -9.8 \text{ m/s}^2$   
 $t = 1.0$

U:  $v_f = ?$   
 $E: d = v_i t + \frac{1}{2} a t^2$

S/S:  $-7 = v_i(1) + \frac{1}{2} (-9.8)(1)^2$   
 $-7 = v_i - 4.9$   
 $v_i = -2.1 \text{ m/s}$  → **speed = 2.1 m/s**