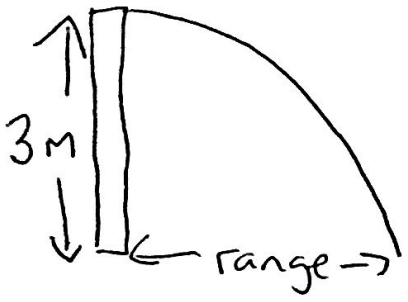
Name SOLUTIONS Date

41 Horizontal Projectile Problems

Show ALL work including givens, formula, final answer and units.

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

1) A bullet is fired horizontally from a height of 3.0 m at a speed of 400 m/s. How long does it take to land?



What is the bullet's range?

X

$v = 400\ m/s$

$t = .78\ sec$

$* d = vt$

$d = (400)(.78)$

$d = \boxed{312\ m}$ range

Y ON THE * WAY DOWN

$* v_i = 0\ \frac{m}{s}$

$* a = 9.8\ m/s^2$

$d = 3\ m$

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

$3 = 4.9t^2$

$\sqrt{\frac{3}{4.9}} = t = \boxed{.78\ sec}$ TO LAND

A second bullet is dropped from the same height. How long does it take to land?

$* v_i = 0\ m/s$

$* a = 9.8\ m/s^2$

$d = 3m$

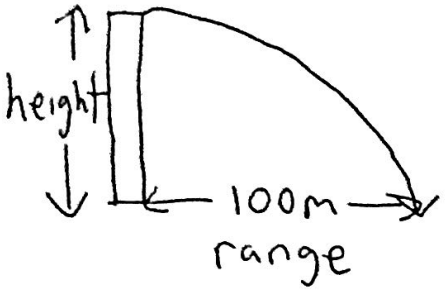
$t = ?$

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

$3 = 4.9t^2$

$\sqrt{\frac{3}{4.9}} = t = \boxed{.78\ sec}$

2) A rock is thrown horizontally off a cliff. It hits the ground 3.5 s later at a distance of 100 m from the bottom of the cliff. What is the height of the cliff?



X

$d = 100m$

$t = 3.5sec$

$* d = vt$

Y ON THE * WAY DOWN

$* V_i = 0 m/s$

$* a = 9.8 m/s^2$

$t = 3.5sec$

$d = V_i t + \frac{1}{2} a t^2$

$d = 4.9(3.5)^2$

$d = \boxed{60m}$ HEIGHT

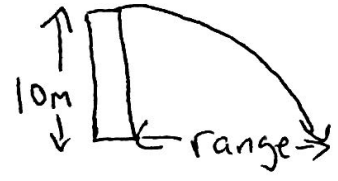
What was the initial velocity of the rock?

$100 = v(3.5)$

$\frac{100}{3.5} = v$

$\boxed{28.6 m/s} = v$ INITIAL SPEED

3) A soccer ball is kicked horizontally from a height of 10 m at a speed of 15 m/s. How long does it take to land? (ANS: 1.4sec)



What is its range?

X

$v = 15 m/s$

$t = 1.4sec$

$* d = vt$

$d = (15)(1.4)$

range $\boxed{d = 21m}$

Y * ON THE WAY DOWN

$* V_i = 0 m/s$

$* a = 9.8 m/s^2$

$d = 10m$

$* d = 4.9 t^2$

$10 = 4.9 t^2$

$\frac{10}{4.9} = t =$

$t = \boxed{1.4sec}$

A second soccer ball is dropped from the same height. How long does it take to land?

SAME AS Y ABOVE 1.4sec

4) An arrow is fired horizontally off a platform. It hits the ground 1.2 seconds later at a distance of 90 m from the bottom of the cliff. What is the height of the platform?

X

$d = 90m$

$t = 1.2sec$

$\rightarrow V = ?$

What was the initial velocity of the arrow?

$* d = range$

$* d = vt$

$90 = v(1.2)$

$\frac{90}{1.2} = V =$ **75 m/s**

Y (ON THE WAY DOWN *)

$* V_i = 0 m/s$

$* a = 9.8 m/s^2$

$t = 1.2 sec$

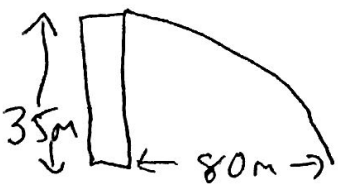
$\rightarrow$ d = height *

$d = 4.9t^2$ *

$d = 4.9(1.2)^2$

$d =$ **7.06m** HEIGHT

5) A (fill in with a noun) SNOWBALL is fired horizontally from a tower that is 35 m high. It lands 80 m from the bottom of the tower. How long did it take to land?



X

$d = 80m$

$t = 2.7sec$

What was the initial speed of the SNOWBALL?

$\rightarrow V = ?$

$* d = vt$

$80 = v(2.7)$

$\frac{80}{2.7} = V =$ **29.6 m/s**

Y (ON THE * WAY DOWN)

$V_i = 0 m/s$

$a = 9.8 m/s^2$

$d = 35m$

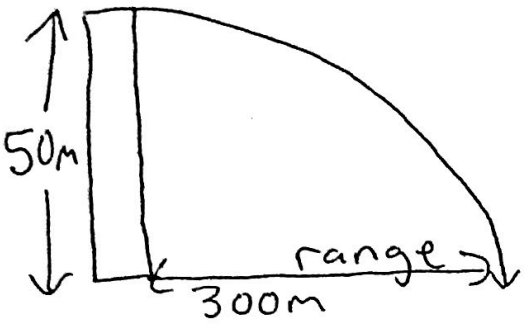
$d = 4.9t^2$

$35 = 4.9t^2$

$\sqrt{\frac{35}{4.9}} = t =$

2.7sec TIME TO LAND

6) A horizontally fired projectile has a range of 300 m and was fired from a height of 50 m. How long did it take to land?



What was its initial speed?

X

$d = 300\,m$

$t = 3.2\,sec$

$V = ?$

$d = vt$

$300 = v(3.2)$

$\frac{300}{3.2} = v$

$93.8\,m/s = v$

Y

ON THE WAY DOWN

$* v_i = 0\,m/s$

$* a = 9.8\,m/s^2$

$d = 50m$

$d = 4.9t^2$

$50 = 4.9t^2$

$\sqrt{\frac{50}{4.9}} = t = 3.2\,sec$

TIME TO LAND

1) 0.78 s 312 m 0.78 s 2) 60 m 28.6 m/s 3) 1.4 s 21 m 1.4 s 4) 7.06 m 75 m/s 5) 2.7 s 29.6 m/s 6) 3.2 s 93.8 m/s