ABRHS PHYSICS (CP) NAME: KEY

Cliff Problems

1. A ball rolls off the edge of a table. It has an initial horizontal velocity of 3 m/s and is in the air for 0.75 seconds before hitting the floor.
   a. How high is the table?

$V_x = 3$ m/s
$V_{y_i} = 0$ m/s
$a = -10$ m/s^2
$t = 0.75$ s

$Y = \frac{1}{2}at^2 + V_{y_i}t$

$Y = \frac{1}{2}(-10)(.75)^2 + (0)(.75)$

$Y = -2.81$ m

(So height was 2.81 m)

   b. How far away (horizontally) from the edge of the table does the ball land?

$X = V_x t$

$X = (3)(.75)$

$X = 2.25$ m

   c. What are the horizontal and vertical components of the ball's velocity when it lands?

$V_x = 3$ m/s ! (it doesn't change)

$V_y = at + V_{y_i}$

$V_y = (-10)(.75) + 0$

$V_y = -7.5$ m/s

   d. How fast is the ball going when it lands?

$V^2 = V_x^2 + V_y^2$

$V^2 = (3)^2 + (-7.5)^2$

$V^2 = 9 + 56.25$

$V^2 = 65.25$

$V = 8.08$ m/s

2. The Coyote is chasing the Road Runner when the Road Runner suddenly stops at the edge of a convenient cliff. The Coyote, traveling with a speed of 15 m/s, does not stop and goes flying off the edge of the cliff, which is 100 meters high.
   a. How long is the Coyote in the air?

$V_x = 15$ m/s
$V_{y_i} = 0$ m/s
$a = -10$ m/s^2
$Y = -100$ m

$Y = \frac{1}{2}at^2 + V_{y_i}t$

$-100 = \frac{1}{2}(-10)t^2 + (0)t$

$-100 = -5t^2$

$t^2 = 20$

$t = 4.47$ s

   b. Where does the Coyote land?

$X = V_x t$

$X = (15)(4.47)$

$X = 67.1$ m

   c. What are ~~the horizontal~~ and vertical components of the Coyote's velocity when he lands?

$V_x = 15$ m/s & $V_y = at + V_{y_i}$

$V_y = (-10)(4.47) + 0$

$V_y = -44.7$ m/s

Cliff Problems

d. How fast is the Coyote going when he lands?

$v^2 = v_x^2 + v_y^2$

$v^2 = (15)^2 + (-44.7)^2$

$v^2 = 2223$

$v = 47.2\ m/s$

3. A car full of bad guys goes off the edge of a cliff. If the cliff was 75 meters high, and the car landed 60 meters away from the edge of the cliff, calculate the following:

a. The total time the car was in the air.

$Y = -75\ m$

$X = 60\ m$

$a = -10\ m/s^2$

$V_{y_i} = 0\ m/s$

$Y = \frac{1}{2}at^2 + V_{y_i}t$

$-75 = \frac{1}{2}(-10)t^2 + (0)t$

$-75 = -5t^2$

$t^2 = 15$

$t = 3.87\ s$

b. The initial ~~velocity of the car~~. (Give the components.)

$V_{y_i} = 0\ m/s$ & $X = V_x t$

$60 = V_x (3.87)$

$V_x = 15.5\ m/s$

c. The final ~~velocity of the car~~ just as it hits the ground. (Give the components.)

$V_x = 15.5\ m/s$ & $V_y = at + V_{y_i}$

$V_y = (-10)(3.87) + 0$

$V_y = -38.7\ m/s$

d. The final speed of the car just as it hits the ground.

$v^2 = v_x^2 + v_y^2$

$v^2 = (15.5)^2 + (-38.7)^2$

$v^2 = 1737.7$

$v = 41.7\ m/s$

Answers:

1. a) 2.81 m	*b) 2.25 m*	*c) v_x= 3 m/s & v_y = -7.5 m/s*	*d) 8.1 m/s*
2. a) 4.47 s	*b) 67.1 m*	*c) v_x= 15 m/s & v_y = -44.7 m/s*	*d) 47.2 m/s*
3. a) 3.87 s	*b) v_x = 15.5 m/s & v_y = 0 m/s*	*c) v_x = 15.5 m/s & v_y = -38.7 m/s*	*d) 41.7 m/s*