ABRHS PHYSICS (CP) NAME: KEY

More Cliff Problems

4. A ball is shot horizontally from a window. It has an initial horizontal velocity of 4 m/s and is in the air for 1.35 seconds before hitting the ground.

$v_x = 4$ m/s
$v_{y_i} = 0$ m/s
$t = 1.35$ s
$a = -10$ m/s^2

a. How high is the window?

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

$Y = \frac{1}{2}(-10)(1.35)^2 + (0)(1.35)$

$Y = (-5)(1.35)^2$

$Y = -9.1$ m

(so 9.1 m high)

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

$X = v_x t$

$X = (4)(1.35)$

$X = 5.4$ m

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

$v_x = 4$ m/s &

$v_y = at + v_{y_i}$

$v_y = (-10)(1.35) + 0$

$v_y = -13.5$ m/s

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

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

$v^2 = (4)^2 + (-13.5)^2$

$v^2 = 198.3$

$v = 14.1$ m/s

5. 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 25 m/s, does not stop and goes flying off the edge of the cliff, which is 200 meters high.

$v_x = 25$ m/s
$v_{y_i} = 0$ m/s
$a = -10$ m/s^2
$Y = -200$ m

a. How long is the Coyote in the air?

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

$-200 = \frac{1}{2}(-10)t^2 + (0)t$

$-200 = -5t^2$

$t^2 = 40$

$t = 6.32$ s

b. Where does the Coyote land?

$X = v_x t$

$X = (25)(6.32)$

$X = 158.1$ m

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

$v_x = 25$ m/s &

$v_y = at + v_{y_i}$

$v_y = (-10)(6.32) + 0$

$v_y = -63.2$ m/s

More Cliff Problems

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

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

$v^2 = (25)^2 + (-63.2)^2$

$v^2 = 625 + 3994$

$v^2 = 4619$

$v = 68 \text{ m/s}$

6. A plane is flying across a level field and is 150 meters off the ground. When the plane is directly over point A, it releases a package, which then falls to the ground, and lands at point B, which is 500 meters away from point A. Calculate the following:

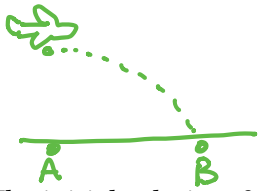
$Y = -150 \text{ m}$

$x = 500 \text{ m}$

$a = -10 \text{ m/s}^2$

$v_{y_i} = 0 \text{ m/s}$

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



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

$-150 = \frac{1}{2}(-5)t^2 + (0)t$

$-150 = -5t^2$

$t^2 = 30$

$t = 5.48 \text{ s}$

b. The initial velocity of the package. (Give the components.)

$v_{y_i} = 0 \text{ m/s}$ &

$x = v_x t$

$500 = v_x(5.48)$

$v_x = 91.3 \text{ m/s}$

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

$v_x = 91.3 \text{ m/s}$ &

$v_y = at + v_{y_i}$

$v_y = (-10)(5.48) + 0$

$v_y = -54.8 \text{ m/s}$

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

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

$v^2 = (91.3)^2 + (-54.8)^2$

$v^2 = 8333 + 3003$

$v^2 = 11,336$

$v = 106.5 \text{ m/s}$

Answers:

4. a) 9.1 m	*b) 5,4 m*	*c) v_x = 4 m/s & v_y = -13.5 m/s*	*d) 14.1 m/s*
5. a) 6.32 s	*b) 158.1 m*	*c) v_x = 25 m/s & v_y = -63.2 m/s*	*d) 68 m/s*
6. a) 5.48 s	*b) v_x = 91.3 m/s & v_y = 0 m/s*	*c) v_x = 91.3 m/s & v_y = -54.8 m/s*	*d) 106.5 m/s*