AP Projectile Review

Ignore air resistance

1. (MC). An object is launched with an initial velocity of 25 m/s @ 30 degrees above the horizontal. It lands some time later at the same level that it was launched. Ignoring air resistance, the velocity as it hits the ground is
   (A) the same as when it was launched
   (B) smaller in magnitude than when it was launched
   (C) larger in magnitude than when it was launched
   (D) has the same magnitude but a different direction
   (E) has a different magnitude but the same direction

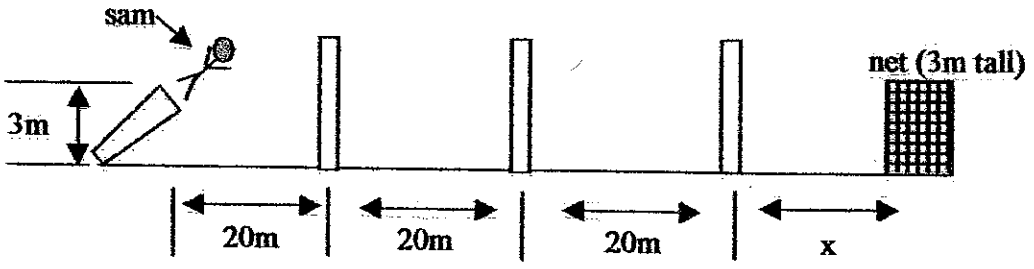
2. A quarterback throws a ball to a receiver down field. The initial velocity of the ball is 15 m/s at an angle of 25 degrees. If the quarter back releases the ball 1.5 meters above the ground, and the receiver catches it 2.7 meters above the ground, how long was the ball in the air and how far down field was the receiver?

3. You fire a potato cannon perfectly horizontal. Once the potato leaves the "barrel" of the potato gun, what does it do?

4. A body is projected at 40° form the horizontal (upward) with an initial velocity of 32 m/s.
   (A) What is the object's velocity at the peak of the path?
   (B) What is the final velocity of the object as it hits the level ground?
   (C) At what time does the object have a height of 4 meters?

5. A rocket is fired straight into the air with a velocity of 15 m/s.
   (A) What is the acceleration of the ball 2 seconds after release?
   (B) What is the maximum height of the ball?
   (C) How long is the ball in the air?

6. Stunt man Sam decides to attempt a human cannon ball trick. He attempts to be fired with an initial velocity of 26.5 m/s at an angle of 53° with the horizontal over 3 Ferris wheels (as shown in the picture). Does Sam clear the Ferris wheels? How do you know? Where would you place the net so Sam can land safely (assuming he clears the ferris wheels)? If he doesn't clear the ferris wheels, what angle would he need to be launched so he did? Each Ferris wheel is 18 meters tall.

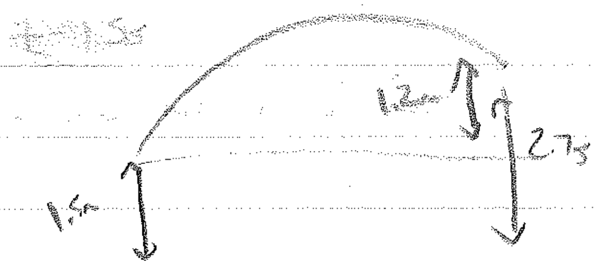


Remi's

AP Projectile Answers

1. D

2. (~~[illegible]~~)



$V_y = 6.34$ m/s

$V_x = 13.6$ m/s

$y = \frac{1}{2}(-9.8)t^2 + v$

$1.2 = -4.9t^2 + 6.34t$

$t = .23$ s , $t = 1.06$ s

([illegible]) ([illegible])

$x = vt$

$V = \frac{x}{t}$

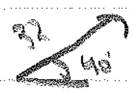
$(13.6)(.23)$

$x = 3.1$ m

$(13.6)(1.06)$

$x = 14.4$ m

3. Begins to $\vec{a}$ (-9.8 m/s²) → starts to fall

4. 

$V_x = 24.5$ m/s

$V_y = 20.6$ m/s

a) 24.5 m/s E

b) 32 m/s @ 40° SE

c) $4 = \frac{1}{2}(-9.8)t^2 + 20.6t$

.2, 4 s

Rene

AP Physics Answers

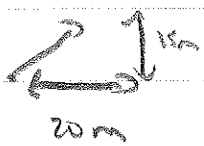
5. ↑15 m/s (Answers from other sheet)

a) $-9.8\,m/s^2$

b) 11.5 m

c) $t = 1.53\,s \times 2 = 3.06\,s$

6. Sam



$V_x = 26.5\cos 53 = 15.94\,m/s$

$V_y = 26.5\sin 53 = 21.2\,m/s$

To clear 1st Ferris wheel

$15.94 = \frac{20}{t}$ $\qquad y = -4.9(1.25)^2 + (21.2)(1.25)$

$t = 1.25\,s$ $\qquad y = 18.84\,m$ (it clears ⇒ only needs to be 15 m)

3rd Ferris wheel

$15.94 = \frac{60}{t}$ $\qquad y = \frac{1}{2}(-9.8)(3.76)^2 + (21.2)(3.76)$

$t = 3.76\,s$ $\qquad y = 10.44\,m$ (not 15) → he hits it!

($x = 59.9\,m$) — from Ashley

6.

x	y
$v = 15.95\,m/s$	$v_y = 21.2\,m/s$

1st one

$v = \frac{x}{t}$

$t = \frac{20}{15.95}$

$t = 1.25\,sec$

$y = \frac{1}{2}(-9.8)(1.25)^2 + 21.2(1.25)$

(Yes) $y = 18.9\,m$

only needs to be 18

2nd one

$t = \frac{40}{15.95}$

$t = 2.51\,sec$

only needs to be 18 m $y = \frac{1}{2}(-9.8)(2.51)^2 + 21.2(2.51)$

(Yes) $y = 22.34\,m$

3rd one

$t = \frac{60}{15.95}$

$t = 3.76\,sec$

only needs to be 18 $y = \frac{1}{2}(-9.8)(3.76)^2 + 21.2(3.76)$

(NO) $y = 10.4\,m$

I change V_0

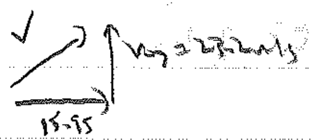
Same V_x

3rd one

$18 = \frac{1}{2}(-9.8)(3.76)^2 + v_{oy}t$

$18 = -69.27 + v_{oy}(3.76)$

$v_{oy} = 23.2\,m/s$



$v_0 = 28.15\,m/s$

$\theta = 55.5^\circ$ NE (above horizontal