Physics 2A
Fall 2018

ave. = 6.1
σ = 2.6

Name Answer Key

Lab: early late (circle one)

Quiz #3: Vectors and Motion in Two Dimensions

Problem 1 (2 points)
A baseball is hit at an angle θ and travels along a parabolic arc before it strikes the ground. Which one of the following statements is true?

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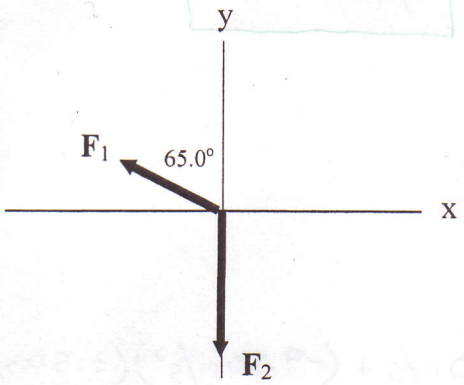
a) The acceleration of the ball decreases as the ball moves upward.
b) The velocity of the ball is 0 when the ball is at the highest point in the arc.
c) The acceleration of the ball is 0 when the ball is at the highest point in the arc.
d) The velocity of the ball is a maximum when the ball is at the highest point in the arc.
(e) The x-component of the velocity of the ball is the same throughout the ball's flight.

Problem 2 (4 points)
Find the magnitude and direction of the sum of the two forces. The magnitude of F_1 = 75.0 N and the magnitude of F_2 = 135 N.



magnitude = 124N
θ = 237°

Vector	x-component	y-component
$\vec{F}_1$	$F_{1x} = -(75.0N)\sin 65.0°$	$F_{1y} = (75.0N)\cos 65.0°$
	$= -68.0N$	$= 31.7N$
$\vec{F}_2$	$F_{2x} = 0N$	$F_{2y} = -135N$

$\vec{F}_{net} = \vec{F}_1 + \vec{F}_2$ $\quad \vec{F}_{net,x} = -68.0N$ $\quad \vec{F}_{net,y} = -103.3N$

$|\vec{F}_{net}| = \sqrt{(-68.0N)^2 + (-103.3N)^2} = 124N$

$\theta = \tan^{-1}\left(\frac{-103.3N}{-68.0N}\right) = 56.6°$ wrong quadrant so add 180° → θ = 237°

Problem 3 (4 points)
A projectile is launched at 50.0 m/s at a 30.0° angle. Air resistance is negligible.

a) What is the maximum height reached by the projectile?

$(V_x)_i = (50.0\ m/s)\cos 30.0° = 43.3\ m/s$

$(V_y)_i = (50.0\ m/s)\sin 30.0° = 25.0\ m/s$

$y_i = 0\ m$

$y_f = ?$

$(V_y)_i = 25.0\ m/s$

$(V_y)_f = 0\ m/s$ at highest point $= 0$

$a_y = -9.80\ m/s^2$

$\Delta t = ?$

$(V_y)_f^2 = (V_y)_i^2 + 2a_y \Delta y$

$\Delta y = \dfrac{-(V_y)_i^2}{2a_y}$

$\Delta y = \dfrac{-(25.0\ m/s)^2}{2(-9.80\ m/s^2)} =$

$y_f = 31.9\ m$

b) What is the speed of the projectile at t = 3.50 s?

we need $(V_x)_f$ and $(V_y)_f$ at $\Delta t = 3.50\ s$

$(V_x)_f = (V_x)_i = 43.3\ m/s$

$(V_y)_f = (V_y)_i + a_y \Delta t \longrightarrow (V_y)_f = 25.0\ m/s + (-9.80\ m/s^2)(3.50\ s)$

$(V_y)_f = -9.30\ m/s$

$V = \sqrt{V_x^2 + V_y^2} \longrightarrow V = \sqrt{(43.3\ m/s)^2 + (-9.30\ m/s)^2}$

$V = 44.3\ m/s$