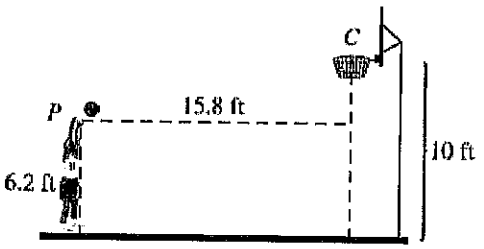
Chapter 6 Practice Test **Name**_____

Through the 2007–2008 season, Mark Price had the best ever lifetime free-throw percentage in the National Basketball Association. Suppose that when Price releases the ball, its center is 15.8 feet from the center of the basket. The basket is 10 ft above the floor. A free-throw will go in the basket if the center of the ball is within 4.25 in. of the center of the basket as shown below.



When Mark Price shoots from the free-throw line, the ball follows a path that can be described by the following parametric equations.

$x = 28t \cos 50°$ $y = 28t \sin 50° - 16t^2 + 8$

a. Explain what the 28, 50°, and 8 tell you about the free-throw shot.

28 - Initial Velocity

8 - height ball was released (Initial height)

50° - Angle of Shot

b. At what time t does the ball reach the height of the basket? Show your work.

$10 = -16t^2 + 28 \sin 50\, t + 8$

$0 = -16t^2 + 28 \sin 50\, t - 2$

$= -16t^2 + 21.45 - 2$

$\frac{-21.45 \pm \sqrt{(21.45)^2 - 4(-16)(-2)}}{-32}$

$t = .1, \boxed{1.24}$

c. Assuming that Price shoots the ball on an accurate path toward the center of the basket, will the shot go in the basket without hitting the backboard? Show your work.

$x = 28(1.24) \cos 50°$

$= 22.32$

No Ball travels to Far. Hits Backboard

d. Assuming Mark Price shoots the ball at the same 50° angle, what should the velocity be to get the ball in the basket. Show your work.

$15.8 = V_0 \cos 50\, t$

$V_0 = \frac{15.8}{\cos 50\, t}$

$V_0 = \frac{15.8}{\cos 50\,(1.03)}$

$= 23.86$

$y = -16t^2 + V_0 \sin 50\, t + 8$

$10 = -16t^2 + \frac{15.8}{\cos 50\, t} \cdot \sin 50\, t + 8$

$10 = -16t^2 + 15.8 \tan 50 + 8$

$10 = -16t^2 + 26.83$

$-16.83 = -16t^2$

$t^2 = 1.05$

$t = 1.03$

2. Determine whether a baseball hit from a height of 1.75 feet off the ground and at a speed of 135 feet per second at an angle of 23° relative to level ground will clear a 10–foot wall 380 feet away. Justify your answer using parametric equations and algebra.

$x = 135\cos 23\,t$

$380 = 135\cos 23\,t$

$t = \frac{380}{135\cos 23}$

$t = 3.06$

$y = -16t^2 + 135\sin 23\,t + 1.75$

$y = -16(3.06)^2 + 135\sin 23(3.06) + 1.75$

$= 13.34$

Yes HR!

$10 = -16t^2 + 135\sin 23\,t + 1.75$

$0 = -16t^2 + 52.75t - 8.25$

$\frac{-52.75 \pm \sqrt{(52.75)^2 - 4(-16)(8.25)}}{-32}$

$t = 3.13$

$x = 135\cos 23(3.13)$

$= 388$ HR!

3. A professional golfer hits the golf ball with a velocity of 192 feet per second off the ground.

a. If the ball hits the green(ground) **615 yards** away, at what angle was the ball launched at?

$x = 192\cos\theta\, t$

$615 = 192\cos\theta\, t$

$t = \frac{615}{192\cos\theta}$

$y = -16t^2 + 192\sin\theta\, t$

~~$y = -16\left(\frac{615}{192\cos\theta}\right) + 192\sin\theta\left(\frac{615}{192\cos\theta}\right)$~~

$y = -16\left(\frac{615}{192\cos\theta}\right)^2 + 192\left(\frac{615}{192\cos\theta}\right)\sin\theta$

$= \frac{-42025}{256\cos^2\theta} + 615\tan\theta$

Put in $y =$ to find θ

$\theta = 16^\circ$

b. What is the maximum height of the golf ball during this shot?

$t = \frac{-b}{2a} = \frac{-192\sin 16^\circ}{-32}$

$t = 1.65$

$y = -16(1.65)^2 + 192\sin 16(1.65)$

$= 43.76$ ft

The men's horseshoe pitching court has metal stakes 40 feet apart. The stakes stand 18 inches out of the ground.

Alan pitches a horseshoe at 50 feet per second, at a 15° angle to the ground. He releases the horseshoe at about 2.5 feet above the ground and 1.75 feet in front of the stake at one end.

a. Write parametric equations modeling a typical throw.

$x = 50t\cos 15^\circ + 1.75$ $\quad y = -16t^2 + 50t\sin 15 + 2.5$

b. How long is the thrown horseshoe in the air?

$$\frac{-12.94 \pm \sqrt{(12.94)^2 - 4(-16)(2.5)}}{-32} = .9699$$

c. How close to 40ft is the horizontal component when the horseshoe hits the ground?

$x = 50(.9699)\cos 15 + 1.75$

$= 48.59$

8.59 ft long

d. If the angle remains the same at what velocity should Alan throw the horseshoe to land it 40 feet away from him

$40 = V_0 \cos 15\, t$

$V_0 = \frac{40}{\cos 15\, t}$

$= \frac{40}{\cos 15 (.909)}$

$V_0 = 45.56$

$y = -16t^2 + V_0 \sin 15t + 2.5$

$= -16t^2 + \frac{40}{\cos 15\, t} \cdot \sin 15\, t + 2.5$

$= -16t^2 + 40 \tan 15 + 2.5$

$0 = -16t^2 + 13.22$

$16t^2 = 13.22$

$t^2 = .82625$

$t = .909$