	Height of a pop-up: A baseball is hit straight up form a height of 4 feet with an initial velocity of 70 ft/sec. a) Write an equation that models the height of the ball as a function of time. b) Use parametric mode to simulate the pop-up. c) Use parametric mode to graph height against time. (Let x(t) = t) d) How high is the ball after 3 seconds? e) What is the maximum height of the ball? How many seconds does it take to reach its maximum height? < , > **Hitting a baseball**: Kevin hits a baseball at 3 feet above the ground with an initial speed of 150ft/sec at angle of 18 degrees with the horizontal. * Will the ball clear a 20 feet wall that is 400 feet away? y x $x = 150t\cos 18$ $y = 150t\sin 18 - 16t^2 + 3$ $\frac{400}{150\cos 18} = \frac{150t\cos 18}{150\cos 18}$ 2.803 seconds $= t$ After 2.803 sec the ball is 7.178 ft High the ball will not clear a 20 ft wall

	The men's horseshoe pitching court has metal stakes **40 feet apart**. The stakes stand **18 inches** out of the ground. a. Alan pitches a horseshoe at **45 feet per second**, at a **14° angle** to the ground. He releases the horseshoe at about **3 feet above** the ground and **2 feet in front** of the stake at one end. **Write parametric equations** modeling a typical throw. $x = 45t\cos 14° + 2$ $y = 45t\sin 14° - 16t^2 + 3$ b. How long is the thrown horseshoe in the air? (Hits the ground) $y = 0$ $0 = 45t\sin 14 - 16t^2 + 3$ $t = .890$ sec c. How close to 40ft is the horizontal component when the horseshoe hits the ground? $t = .89$ sec hit ground plug t into $x = 45t\cos 14° + 2$ $x = 40.89$ ft .89 ft away $.89 \times 12$ in $= 10.68$ inches away

$x = vt\cos 20^\circ + 1.5$

$\boxed{y = vt\sin 20 - 16t^2 + 2}$

$40 = vt\cos 20^\circ + 1.5$
$-1.5 \qquad\qquad -1.5$

$\dfrac{38.5}{v\cos 20^\circ} = \dfrac{vt\cos 20^\circ}{v\cos 20^\circ}$

$\boxed{\dfrac{38.5}{v\cos 20^\circ} = t}$

18 inch = 1.5 ft

y is between $\boxed{0}$ and 1.5 ft

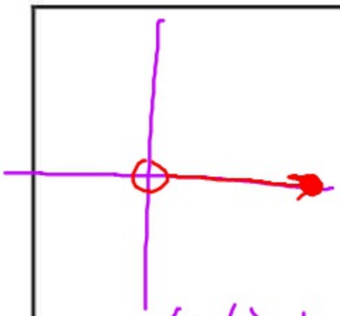
$0 = \cancel{v}\left(\dfrac{38.5}{\cancel{v}\cos 20^\circ}\right)\sin 20 - 16\left(\dfrac{38.5}{v\cos 20^\circ}\right)^2 + 2$

$\boxed{0 = \left(\dfrac{38.5}{\cos 20^\circ}\right)\sin 20^\circ - 16\left(\dfrac{38.5}{v\cos 20^\circ}\right)^2 + 2}$

$0 = 38.5\tan 20 -$

$\boxed{v = 40.95 \text{ ft/sec}}$

$\boxed{\text{Between } 40.95 \text{ and } 43 \text{ ft/sec}}$



$\cos(0)=1$

Joan Embery has spent much of her life researching the behavior of gorillas. Before examining injured gorillas, she must use a tranquilizer dart gun to sedate them. Her tranquilizer dart gun shoots darts at about 650 feet per second. Suppose Joan shot a dart (aimed horizontally at 5 ft above the ground) at a large injured gorilla 400 ft away.

a. Will the dart reach the gorilla?

$x = 650t\cos(0)$

$x = 650t$

$400 = 650t$

$y = 650t\sin(0) - 16t^2 + 5$

$y = -16t^2 + 5 \quad y = -1.059$

b. At what angle should Joan's aim be adjusted so that she can hit the gorilla at a point somewhere between 2 and 5 ft above the ground?

$x = 650t\cos\theta$

$$\frac{400}{650\cos\theta} = \frac{650t\cos\theta}{650\cos\theta}$$

$$\boxed{\frac{400}{650\cos\theta} = t}$$

$y = 650t\sin\theta - 16t^2 + 5$

$$2 = \cancel{650}\left(\frac{400}{\cancel{650}\cos\theta}\right)\sin\theta - 16\left(\frac{400}{650\cos\theta}\right)^2 + 5$$

$$2 = 400\tan\theta - 16\left(\frac{400}{650\cos\theta}\right)^2 + 5$$

$$\boxed{\theta = .43^\circ \text{ and } \theta = .86^\circ}$$

c. How much leeway does Joan have in choosing the angle at which to shoot?