37. Ben can sprint at the rate of 20ft/sec. Jerry sprints at 15ft/sec. Ben gives Jerry a 15ft head start. The following parametric equations can be used to model a race.

Ben: $\boxed{x_1 = 20t - 15 \quad y_1 = 2}$ Jerry: $\boxed{x_1 = 15t \quad y_1 = 4}$

a) Find a viewing window to simulate a 100 yard dash. Graph simultaneously with t starting at t = 0 and Tstep = .05.

b) Who is ahead after 2 seconds? 3seconds? 4 seconds?

gravity
16 ft/sec

Famine Relief Air Drop: A relief agency drops food containers ~~form~~ from an airplane on a war torn famine area. The drop was made from an altitude of 2000 feet above ground level.

A) Use an equation to model the height of the containers (during free fall) as a function of time t.

$x = 5$ $\quad y = 2000 - \underline{\underline{16}}t^2$

9.8 meters/sec

b) Use parametric mode on your calculator to simulate the drop during the first 6 seconds.

c) After 5 seconds of free fall, parachutes open. How many feet above the ground are the food containers when the parachutes open?

$y = 2000 - 16(5)^2 = 1600 ft$

$y = -16t^2 + v_0 t \sin\theta + h_0$

$\boxed{y = ax^2 + bx + c}$ y value of the vertex $t = \frac{-b}{2a}$	**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. $x = 70t\cos 90^\circ$ $\boxed{y = -16t^2 + 70t\sin 90^\circ + 4}$ b) Use parametric mode to simulate the pop-up. a b c c) Use parametric mode to graph height against time. (Let x(t) = t) d) How high is the ball after 3 seconds? $y = -16(3)^2 + 70(3)\sin 90^\circ + 4$ $y = 70$ ft e) What is the maximum height of the ball? How many seconds does it take to reach its maximum height? $t = \frac{-70\sin 90}{2(-16)} = \frac{-70}{-32} = 2.1875$ sec $y = -16(2.1875)^2 + 70(2.1875) + 4$ $y = 80.56$ ft **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 $\boxed{x = v_0 t\cos\theta \quad y = -16t^2 + v_0 t \sin\theta + h_0}$ $x = 150t\cos 18^\circ$ $y = -16t^2 + 150t\sin 18^\circ + 3$ $\frac{400}{150\cos 18} = \frac{150t\cos 18}{150\cos 18}$ $y = -16(2.803)^2 + 150(2.803)\sin 18^\circ + 3$ $y = 7.17$ ft $2.803 = t$ Not a HR. 2.803 seconds to get 400ft way