# Softball Throw

The initial velocity of a projectile may be found
by measuring the amount of time it is in the air,
the horizontal distance it travels during that time,
and applying these values to a few simple calculations.

**Procedure:**

Record the name of the person throwing the softball. Throw the ball and measure the distance (feet) and the time (seconds) the ball travels through the air. Record these values in the appropriate place in the data table. Repeat this procedure until this portion of the data table is complete.

Use the formula $d_x = v_x t$ to find the horizontal velocity, in ft/s, for each trial. Record these values in the data table.

To find the initial vertical velocity, $v_y$, use the formula $v_y = gt$, where g is the acceleration of gravity and t is the time for the upward trip of the ball only. Use g = 32 ft/s/s and one-half of the total time in the air. Record these values in the data table.

You now have the horizontal and vertical components of the initial velocity. Use the Pythagorean Theorem ($v^2 = v_x^2 + v_y^2$) to calculate the magnitude of the initial velocity in ft/s. Record these values in the data table.

To convert these speeds from ft/s to mph, use the relationship that 1 mile = 5280 feet and 1 hour = 3600 sec. Record these values in the data table.

Divide the initial vertical velocity by the horizontal velocity and find the inverse tangent of this result to find the angle above the horizontal that the ball was thrown. Record these values in the data table.

The maximum height, in feet, the ball traveled above the release point is found by squaring the initial vertical velocity (in ft/s) and dividing by twice the acceleration of gravity (2 x 32 ft/s/s = 64 ft/s/s).

# Data Table

| Name | Horizontal Distance, feet | Time, seconds | Horizontal Velocity, ft/s | Vertical Velocity, ft/s | Velocity, ft/s | Velocity, mph | Angle, θ | Maximum height, ft |
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Name some factors that decrease the likelihood that your results are 100% accurate.