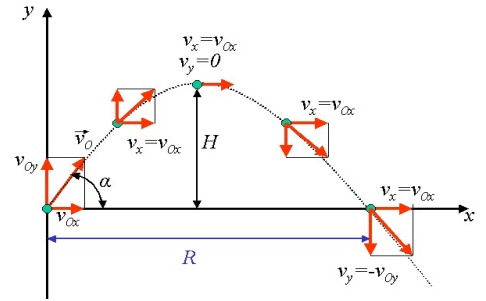


Consider the motion of a ball thrown upwards at an angle. It experiences a two-dimensional curved path called a parabola. Any object that moves in response to gravity along a two-dimensional curved trajectory is called a **projectile**. The motion of a projectile under gravity is called **projectile motion**.



Problem

To analyze the projectile motion of a basketball.

Instructions

- This is an individual assignment. If you do not know what you are doing, seek help. Because of the nature of this analysis everyone will have slightly different results. Be sure to save your work as you progress through!
- Get the movie to analyze.
 - Insert > Movie > Basketball Shot G:\Science\Young\SPH3U Material
- Analyze the ball's vertical and horizontal motion once it has left the man's hands until it is at the same level as it left.
 - the length of the scale on the floor is 2.0 m
 - set the origin at first data point or use the wood trim (makes the analysis easier)
- Data Table
 - double-click on 'x' heading label 'X Position', 'dx', 'm'
 - double-click on 'y' heading label 'Y Position', 'dy', 'm'
 - double-click on 'x velocity' heading label 'X Velocity', 'vx', 'm/s'
 - double-click on 'y velocity' heading label 'Y Velocity', 'vy', 'm/s'
- Graphs
 - Insert > Graph should come up 'Y Velocity'
 - add horizontal velocity (if not there already) right-click on 'v-t' graph > Graph Options
 - axes options, check 'X Velocity'
 - 'Point Protectors' on, 'Connect Points' off, 'Legend' on
 - right-click on the graphs > Graph Options
 - reorient graphs so 'd-t' graph above 'v-t' graph
 - lines of best fit for both
 - appropriate title for each
- When you are finished you should end up with two graphs: a position-time and a velocity-time graph (with two lines on each - thus the need for a legend). Shrink all but the lines-of-best-fit boxes for vertical velocity. Be sure to submit a copy of your graphs. (Delete the video once you are finished with it otherwise it shows up on your print!)
 - File > Page Setup set the page orientation to "Landscape"
 - File > print be sure to include your name in the footer

Questions (Show your work and express all mathematical answers to 2 significant digits!)

- What type of motion does the ball experience horizontally? Explain how you determined this.
- What type of motion does the ball experience vertically? Explain how you determined this.
- What is the acceleration due to gravity (a_g) according to the experiment?
- What are two potential sources of error in this experiment and how do they affect the results?
- A landing party on the Moon discovers that the acceleration due to lunar gravity is 1.6 m/s^2 . An object is projected from a level surface on the Moon in such a way as to provide an initial vertical component of velocity of 24 m/s and a horizontal component of velocity of 32 m/s .
 - What is the initial velocity of the object? Don't forget that a velocity requires a value and a direction. (Hint: $v = v_x + v_y$ so draw a vector diagram and then use pythagoras to find v and trigonometry to find θ)
 - What is the final velocity of the object? (Hint: it will be similar to (a) except for its direction)
 - How many seconds will the object remain in flight?
 - How high will the object go?
 - How far will the object travel horizontally?
 - In order to solve projectile problems what two major assumptions about projectile motion were made?