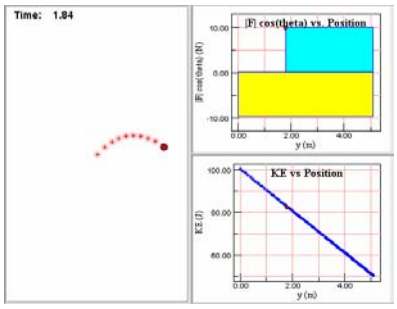
Worksheet for Exploration 6.3: The Gravitational Force and Work



A 1-kg ball is subjected to the force of gravity as shown in the animation **(position is given in meters and time is given in seconds)**. The ball starts at x = 0 m and y = 0 m. You can vary the ball's initial velocity and view how this affects the motion of the ball and the ball's kinetic energy. Also shown are the graphs of force cos(θ) vs. position and kinetic energy vs. position. Restart.

With v_{0x} = 0 m/s and v_{0y} = 0 m/s:

a. In what direction does the net force on the ball point?
   i. Draw a sketch showing the ball, the direction of the net force and the direction of the acceleration on the ball.

b. How would you describe the KE vs. position graph?
   i. You should consider initial kinetic energy, final, slope etc.

KE_i=_____
KE_f=_____
Slope=_____

With v_{0x} = 10 m/s and v_{0y} = 0 m/s:

c. What is the minimum amount of kinetic energy the ball has?

KE_{min}=_____

   i. Where is the ball when the kinetic energy is minimum?

   ii. What is different about the plot now than in part b above? You may want to run each simulation and clone the plots to compare (right mouseclick).

With v_{0x} = 10 m/s and v_{0y} = 10 m/s:

d. How would you describe the KE vs. position graph? Be explicit about what happens to the kinetic energy.
   i. KE_i=_____
   KE_f=_____
   Slope=_____

e. What is the condition for the work done by gravity to be zero?
   i. Examine the $|F|\cos(\theta)$ plot to determine where the $W_{gravity}$ is zero (that is work done since the initial launch time).

   ii. Predict when the ball is at this position.

f. What is the ball's minimum kinetic energy?
   i. Where and when does this occur?

With v_{0x} = -10 m/s and v_{0y} = 10 m/s:

g. How would you describe the KE vs. position graph? Be explicit about what happens to the kinetic energy.

h. What is the condition for the work done by gravity to be zero?

i. What is the minimum amount of kinetic energy the ball has?