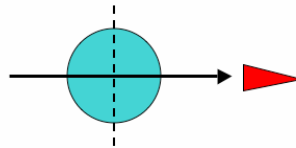


HOMEWORK 2
(due Thurs. Feb.9)

Read: Notes on Motion, Hewitt selection on classical motion, Lightman selection on relativity

Problems: Problems are to be handed in at the due date. Note that the acceleration due to gravity is $g = 9.8 \text{ m/sec}^2$.

1. A hockey puck is hit and travels at a velocity of 90 Km/hr toward the goal, 60 m away. How long will it take to reach the goal?
2. A spy satellite travels around the earth in a low orbit every 90 minutes. What is the speed of the satellite? Is it accelerating?
3. A ball is dropped straight down from the top of a tall building. The ball hits the ground directly below in 5 sec. (Ignoring air resistance, of course.)
 - a. How tall is the building?
 - b. If the ball is thrown from the top of the building horizontally at 10 m/s, how long does it take to reach the ground?
 - c. In the latter case, how far from the point directly below does the ball land?
4. The same ball that is dropped straight down from the top of the building (and hits the ground directly below in 5 sec) is viewed from a small plane going by horizontally at 100 Km/hr. How far back does the ball hit the ground, in the plane's frame of reference?
5. An astronaut is in a spaceship zooming by the earth at $0.95 c$ (where $c=3.0 \times 10^8 \text{ m/s}$).
 - a. In one second of the astronaut's life, how much time elapses on the earth?
 - b. What would the diameter of the earth measure according to the astronaut (consider the diameter that is parallel to the direction of motion of the spaceship)?
 - c. What is the measurement of the diameter perpendicular to the spaceship motion?



From a portrait by Kneller (1702)
National Portrait Gallery in London