Engineering Physics I Name _____
PHYS 1210 Spring 2015

Discussion 2 – Kinematics / Projectiles

Kinematics Equations
Only valid for constant acceleration!

$$x = \tfrac{1}{2}at^2 + v_0 t + x_0$$

$$v = at + v_0$$

$$v^2 = v_0^2 + 2a\Delta x$$

$$\langle v \rangle = \frac{v_0 + v_f}{2}$$

Definitions
Always true

$$v = \frac{dx}{dt}$$

$$a = \frac{dv}{dt}$$

Range Formula
Projectile landing at same height as launched

$$R = \frac{v_0^2 \sin(2\theta)}{g}$$

My Problem Solving Approach (for Kinematics / Projectiles)

1. Draw a picture
    a. Pick an origin and show +x and +y directions
    b. Label known quantities with number and letter
    c. Use a different color for velocity, acceleration
2. Know / Need
    a. List x and y separately
    b. x_0, x_f, v_{x0}, v_{xf}, a, t
    c. θ
3. Find a formula in x with only one unknown
    a. For more complex problems, find N-many formulae for N-many unknowns
4. Do Math
5. Sanity Check

Problems

Giancoli, D. C. (2008). Physics for Scientists and Engineers (4 ed.). Upper Saddle River, NJ: Pearson Education, Inc.

50. (II) A stunt driver wants to make his car jump over 8 cars parked side by side below a horizontal ramp (Fig. 3–46). (*a*) With what minimum speed must he drive off the horizontal ramp? The vertical height of the ramp is 1.5 m above the cars and the horizontal distance he must clear is 22 m. (*b*) If the ramp is now tilted upward, so that "takeoff angle" is 7.0° above the horizontal, what is the new minimum speed?

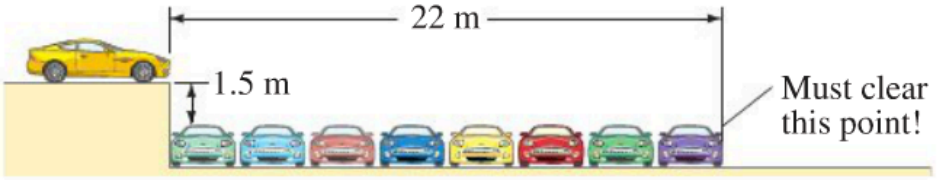

FIGURE 3–46 Problem 50.

77. Romeo is chucking pebbles gently up to Juliet's window, and he wants the pebbles to hit the window with only a horizontal component of velocity. He is standing at the edge of a rose garden 8.0 m below her window and 9.0 m from the base of the wall (Fig. 3–55). How fast are the pebbles going when they hit her window?

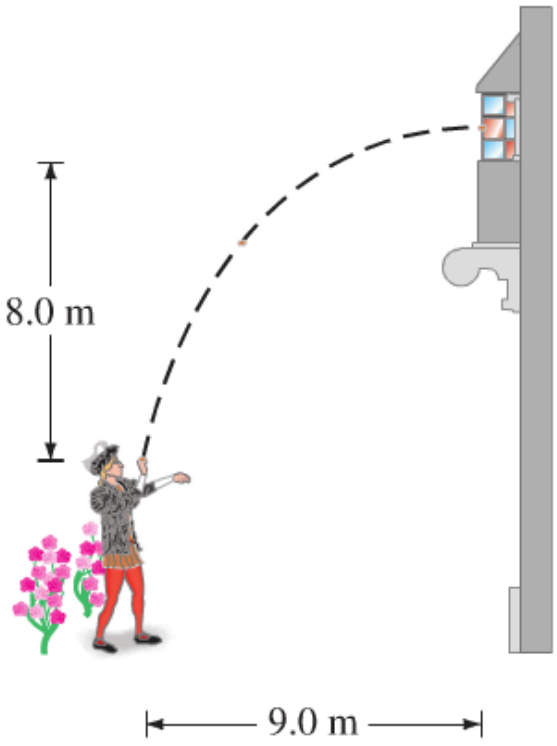

FIGURE 3–55 Problem 77.