# Review for Test #1

- Responsible for:

  Chapters 1, 2, 3, and 4 (except 2.3, 4.3, 4.6)
  - Notes from class
  - Problems worked in class
  - Homework assignments

- Test format:
  - 4 problems (15 points each), 1 prob (30 points)
  - 1 set of conceptual questions (10 points), bonus
  - Time: 75 minutes

- Test materials:
  - Pencil, eraser, and non-programmable calculator
  - No formulae sheet or paper; all provided
  - Closed textbook and notes

# Rules for the Test

- No talking during test, except to proctors or instructor
- Put name and 810 number on test (first page)
- Bring Student ID
- All electronics turned **off** (phones, tablets, computers, etc.), except simple calculator
- Proctor is watching!

# Material Covered

- Chapter 1: Introduction
  - Units, significant figures, dimensions
  - Order-of-magnitude estimates

- Chapters 2 and 4: 1D and 2D Kinematics
  - Displacement, velocity and speed, acceleration
  - Equations of kinematics -> solve problems
  - Horizontal and free-fall (1D motion)
  - Projectile motion (2D)
  - Uniform circular motion, radial acceleration
  - Tangential velocity, period

- Chapter 3: Scalars and Vectors
  - Components of a vector, unit vectors
  - Vector addition/subtraction
  - Resultant vector magnitude and direction

# Example Problem (intermediate)

A ball is thrown straight upward and rises to a maximum height of 16 m above its launch point. At which height above its launch point has the speed of the ball decreased to one-half of its initial value?

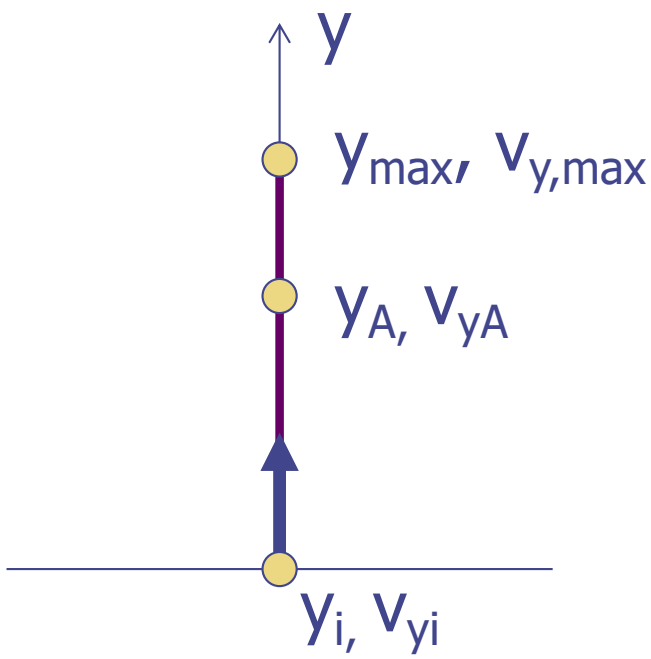
Solution:

Given: $y_{max} = 16$ m

Infer: $v_{y,max} = 0$, $y_i = 0$

Find: $y_A$ when $v_{yA} = v_{yi}/2$

Also, need $v_{yi}$



To maximum height (drop y subscript in v):

$v^2_{max} = v^2_i - 2g(y_{max}-y_i)$

Solve for $v_i$

$v^2_i = v^2_{max} + 2g(y_{max}-y_i) = 2gy_{max}$

To intermediate point:

$v^2_A = v^2_i - 2g(y_A-y_i)$

Solve for $y_A$

$y_A = (v^2_i - v^2_A)/(2g) = [v^2_i - (v_i/2)^2]/(2g)$

$= v_i^2(1-1/4)/(2g) = v_i^2\ (3/4)/(2g) = 3v_i^2/(8g)$

$= 3(2gy_{max})/(8g) = 3y_{max}/4 = 3(16m)/4 =$ **12 m**

# Example Problem (Intermediate)

- The figure in the textbook shows the angular-velocity-versus-time graph for a particle moving in a circle, starting from $\theta_0$=0 rad at $t$=0 s. Draw the angular-position-versus-time graph. Include appropriate scale on both axes (Problem 25, Chapter 4)

# Example Problem (Intermediate)

- A 6.0-cm-diameter gear rotates with angular velocity $\omega = (2.0 + t^2/2)$ rad/s, where $t$ is in seconds. At $t = 4.0$ s, what are (Problem 74, Chapter 4):

(a) The gear's angular acceleration?

(b) The radial acceleration of the top of a gear tooth?