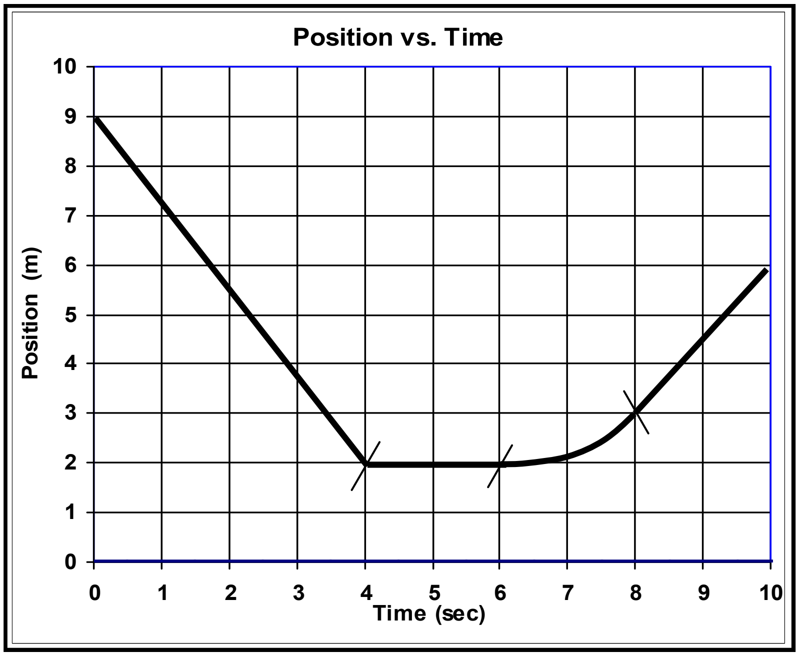
2009 PreAP Linear Motion 7

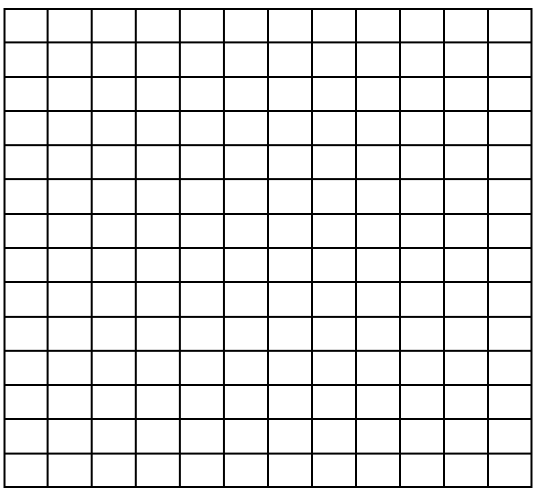
Due Wed., Sept 16
Due Mon., Sept 21

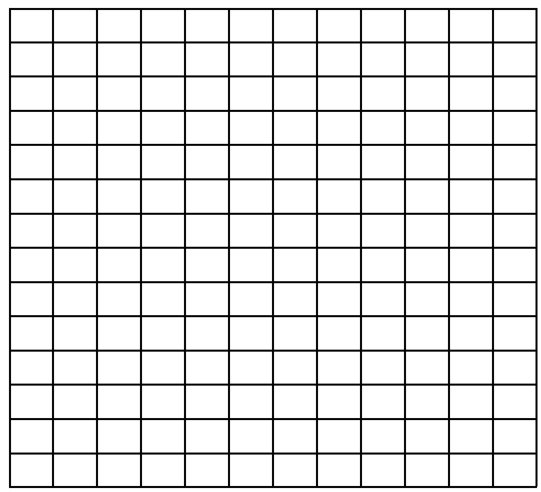


1. A. What is the displacement of the object for the 10 seconds on the graph?

   B. Calculate its average velocity.

2. Transfer the position vs time graph to a velocity and acceleration graph.



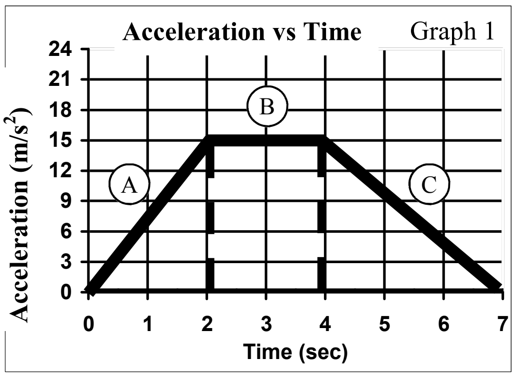


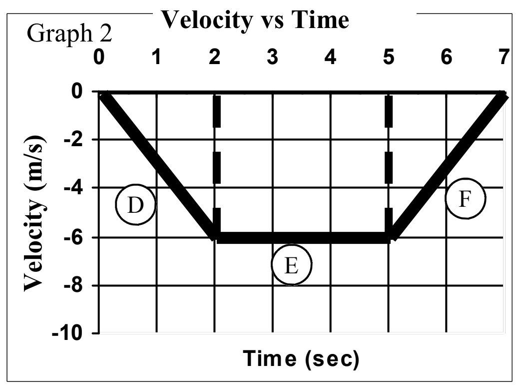
3. A ball is thrown into the air at 12 m/s. How far into the air will the ball rise?
   A. To find "how far into the air" means from where it is thrown to the very top, so V_f = _____.
   B. What is the acceleration of the ball?
   C. What variable are you looking for?
   D. Solve.

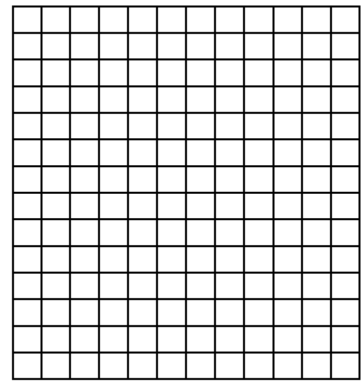
4. An object is thrown into the air from the ground going 10 m/s. How long does it take for it to get back to the ground?
   A. Since it comes back to the ground, what is its displacement?
   B. What is its final velocity?
   C. Solve.

5. An object is dropped from 25 m up. How fast is it going just before it hits the ground?

Let's learn something: The slope of a graph is always y/x, which for a velocity vs. time graph is m/s divided by s, which gives m/s^2, which is acceleration. For a position vs. time graph, slope is m divided by s OR velocity.
But there is more you can learn from a graph by looking at the ***AREA UNDER THE CURVE****. Just like the area of a rectangle is width times height, the area under a curve (area of a graph) is y times x. By looking at what the units multiplied together gives, you can figure out what the area under the curve tells you. For instance, on Graph 1 below, the area is Acceleration times time, which is m/s^2 × s = m/s or the Δvelocity. On Graph 2 below, velocity times time give the displacement (m/s) ×s = meters.*
Area under the curve means the area from the line (or curve) to the x-axis. This means that the area could be positive (if the line is above the x-axis) or negative (if the line is below the x-axis). If a graph has both positive and negative areas you just add them together. STUDY both of the examples below to understand how to find the area under the graph. (Ignore the blank graph below.)







Area A (triangle) = ½(2)(15) = 15 m/s
Area B (rectangle) = (2)(15) = 30 m/s
Area C (triangle) = ½(3)(15) = 22.5 m/s
Total Area = 15 + 30 + 22.5 = 67.5 m/s

Δvelocity for Graph 1 = 67.5 m/s

Area D (triangle) = ½(2)(-6) = -6 m
Area E (rectangle) = (3)(-6) = -18 m
Area F (triangle) = ½(2)(-6) = -6 m
Total Area = -6 -18 -6 = -30 m

Δposition for Graph 2 = -30 m

6. A. Calculate the change of position of the object on the velocity vs. time graph (area).

   B. Translate the following graph to the position and acceleration graphs below. (*Remember that all graphs need titles and labels [with units*]).