Announcements 4 Feb 09

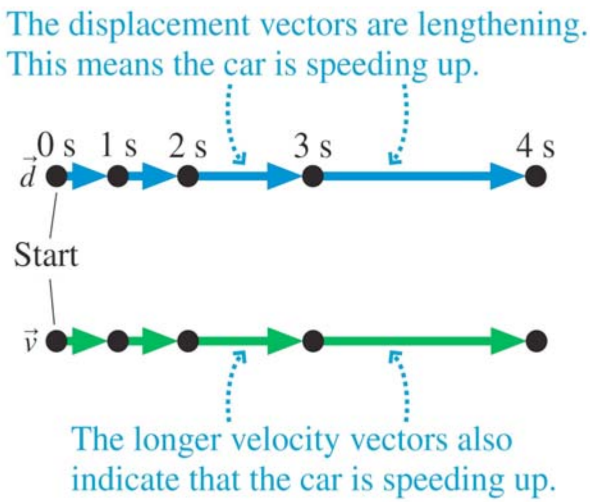
- Homework #1 due Friday morning
  - Online homework via MasteringPhysics by 8 am
  - Written homework to be handed at the start of class on Friday (do online homework first, then written homework)

- TA help
  - Teaching assistant: Yucel Altundal
  - Office hours:
    Wed 5 - 7 pm HAS 205 (physics help room)
    Thu 5 - 7 pm LGRT 1033 (lounge)

- Supplemental Instruction (Learning Resource Center)
  - SI leader: Nikki Woodward
  - Two 75-min sessions per week to be held at DuBois library (starting next week; times and rooms yet to be assigned)

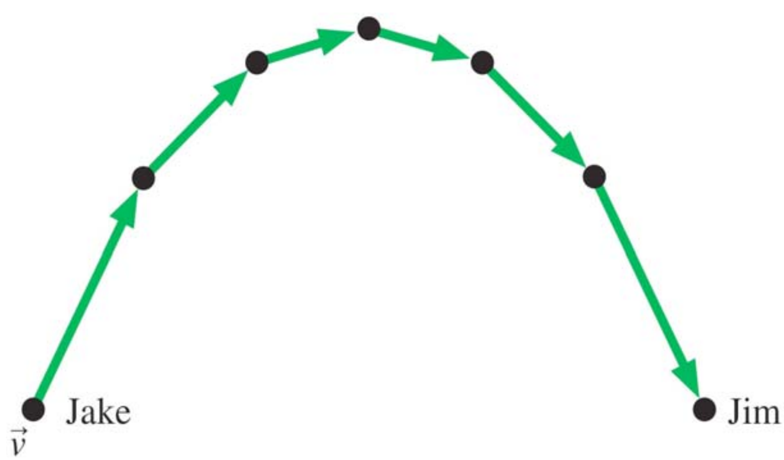
Homework #1 pointers

Velocity Vectors



Example: Velocity Vectors

Jake throws a ball at a 60° angle, measured from the horizontal. The ball is caught by Jim. Draw a motion diagram of the ball with velocity vectors.



Units

Units

Every measurement of a quantity must include a unit.

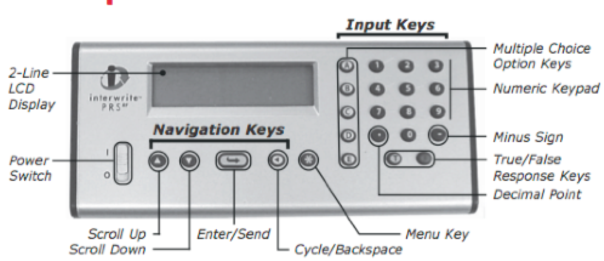
The standard system of units used in science is the SI system. Common SI units include:

- Length: meters (m)
- Time: seconds (s)
- Mass: kilograms (kg)

- Some advantages of metric (SI) system over British system:
  - 1 km = 1000 m   but 1 mi = 5280 ft
  - In international use

PRS clicker setup

PRS



Enter your student ID

First Time Users: You must enter your Student ID before you can use your PRS Clicker to transmit Responses.

1. Power on your Clicker.
2. When *autoscan* begins, press to stop it.
3. Press to display the **Setup Menu**.
4. Scroll or to display the **ID:** menu option. Press to select it.
5. Input your Student ID. Press to backspace. If your Student ID contains alpha characters, refer to the instructions on the right for entering alpha characters.
6. Press to save your Student ID.

Learning Resource Center SI help sessions

PRS

If you *actually* plan to attend these sessions, please select your preferred time slot:

1. Mon 8, 9 pm
2. Tue 4, 5, 6, 7, 8, 9 pm
3. Wed 8, 9 pm
4. Thu 4, 5, 6, 7, 8, 9 pm

Chapter 2
Motion in One Dimension

Topics:

- The kinematics of motion in one dimension
- Problem-solving strategies
- Free fall

Question:

Horses can run much faster than humans, but if the length of the course is right, a human can beat a horse in a race. When, and why, can a man outrun a horse?

Different Descriptions of Motion

Motion diagram (student walking to school)

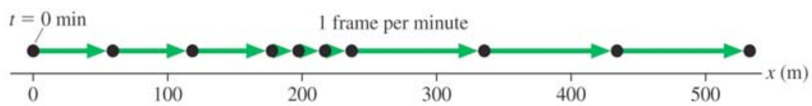
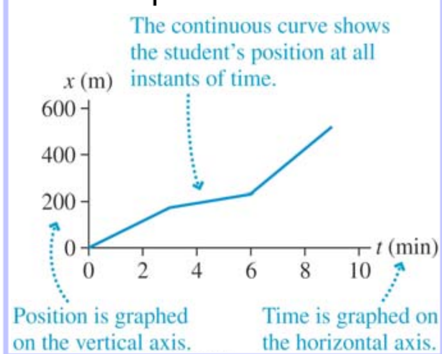


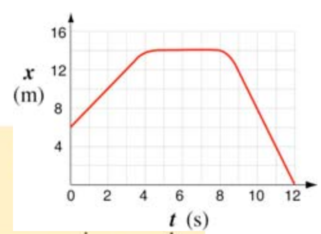
Table of data

Time t (min)	Position x (m)	t	x
0	0	5	220
1	60	6	240
2	120	7	340
3	180	8	440
4	200	9	540

Graph



Interpreting Graphs



TACTICS BOX 2.1 Interpreting position-versus-time graphs

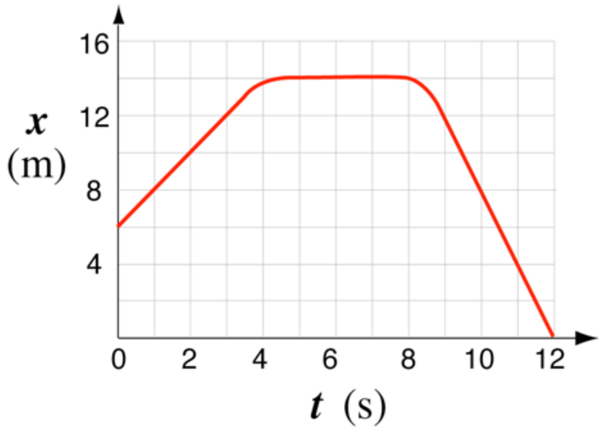
Information about motion can be obtained from position-versus-time graphs as follows:

1. Determine the *position* at time t by reading the graph at that instant of time.
2. Determine the *speed* at time t by finding the magnitude of the slope at that point. Steeper slopes correspond to greater speeds.
3. Determine the *direction of motion* by noting the sign of the slope. Positive slopes correspond to positive velocities and, hence, to motion to the right (or up). Negative slopes correspond to negative velocities and, hence, to motion to the left (or down).

Velocity = slope of position-vs-time graph = rise / run

$$v = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

Position-vs-time graph



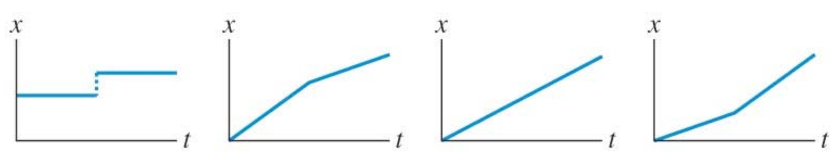
Sue moves according to the plot. What are her (*instantaneous)* velocities at t = 2, 6, and 10 s?

Position-vs-time graph question

PRS

Here is a motion diagram of a car moving along a straight stretch of road:

Which of the following position-versus-time graphs matches this motion diagram?



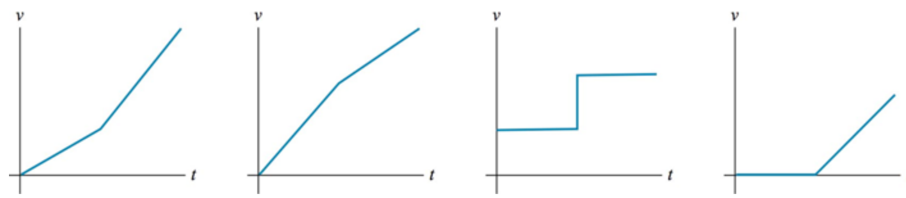
A. **B.** **C.** **D.**

Velocity-vs-time graph question

PRS

Here is a motion diagram of a car moving along a straight stretch of road:

Which of the following velocity-versus-time graphs matches this motion diagram?



A. **B.** **C.** **D.**

Problem 2.11

In an 8.00 km race, one runner runs at a steady 12.0 km/h and another runs at 14.9 km/h. How far from the finish line is the slower runner when the faster runner finishes the race?

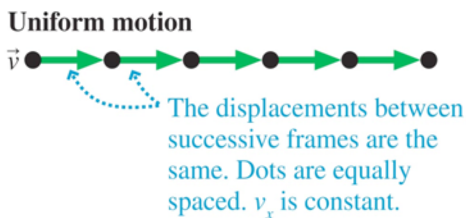
How do we approach this sort of problem?

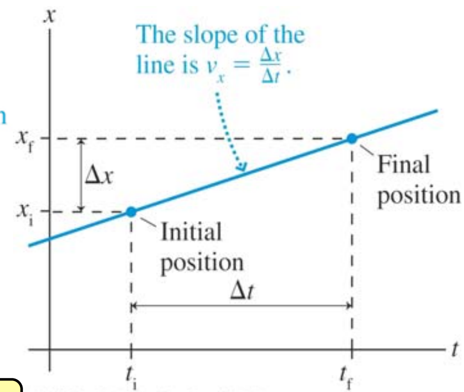
Find the equation then plug-and-play?

First figure out what kind of motion this is
What changes? What remains the same?

Uniform Motion

Straight-line motion with equal displacements during any successive equal-time intervals
➔ motion with constant velocity





$$v = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

$$\Rightarrow \Delta x = v\Delta t \Rightarrow \boxed{x_f = x_i + v\Delta t}$$

Solving Problems in 3 steps: Prepare, Solve & Assess

MP Problem-Solving Strategy

PREPARE The "Prepare" step of a solution is where you identify important elements of the problem and collect information you will need to solve it. It's tempting to jump right to the "solve" step, but a skilled problem solver will spend the most time on this step, the preparation. Preparation includes:

- **Drawing a picture.** In many cases, this is the most important part of a problem. The picture lets you model the problem and identify the important elements. As you add information to your picture, the outline of the solution will take shape. We will give tips for drawing effective pictures for different problems. For the problems in this chapter, a picture could be a motion diagram or a graph—or perhaps both. Later in the chapter you will learn a strategy for drawing a complete *visual overview* of a problem that incorporates these and other elements.
- **Collecting necessary information.** The problem's statement may give you some values of variables. Other important information may be implied, or must be looked up in a table. Gather everything you need to solve the problem, and include it as part of your picture or an accompanying table.
- **Doing preliminary calculations.** In some cases, there are a few calculations, such as unit conversions, that are best done in advance of the main part of the solution.

SOLVE The "Solve" step of a solution is where you actually do the mathematics or reasoning necessary to arrive at the answer needed. This is the part of the problem-solving strategy that you likely think of when you think of "solving problems." But don't make the mistake of starting here! If you just choose an equation and plug in numbers, you will likely go wrong and will waste time trying to figure out why. The "Prepare" step will help you be certain you understand the problem before you start putting numbers in equations.

ASSESS The "Assess" step of your solution is very important. When you have an answer, you should check to see if it makes sense. Ask yourself:

- **Does my solution answer the question that was asked?** Make sure you have addressed all parts of the question and clearly written down your solutions.
- **Does my answer have the correct units and number of significant figures?**
- **Does the value I computed make physical sense?** In this book all calculations use physically reasonable numbers. You will not be given a problem to solve in which the final velocity of a bicycle is 100 miles per hour! If your final answer seems unreasonable, you should go back and check your work.
- **Can I estimate what the answer should be to check my solution?**
- **Does my final solution make sense in the context of the material I am learning?**

Problem 2.11

In an 8.00 km race, one runner runs at a steady 12.0 km/h and another runs at 14.9 km/h. How far from the finish line is the slower runner when the faster runner finishes the race?