You are probably familiar with the terms distance and displacement, as well as speed and velocity. To a physicist these terms all have meanings in addition to your understandings of them. The term **scalar** is applied to distance and speed, while the term **vector** is applied to displacement and velocity. A vector is a measured quantity which has both magnitude and direction. A scalar only has magnitude. It turns out that vector math is quite different from scalar math. However, you will find you already know enough math to deal with both effectively.

(A) What? – You will be taking a trip through the halls of McFarland High School to measure displacements and times as you travel from one area of the building to another.

(B) How? – Using a trundle wheel, a stopwatch, and a map of the school’s floor plan you will record distances, directions, and times for each leg of your trip from the exit by the A gym to just outside room 185 (Mr. Kuehl’s physics room).

(C) Purpose Statements:
   1. The student should be able to use a trundle wheel to measure distance, a stopwatch to measure time, and a map to determine direction.
   2. The student should be able to construct a data table to record the measurements for this activity.
   3. The student should be able to calculate the total distance of the trek taken through the halls, as well as the total displacement.
   4. The student should be able to use distance, displacement, and time data to find the average speed and velocity for the trip.
   5. When doing the calculations in (4) the student should be able to apply the rules of significant digits.
   6. The student should be able to use the sine, cosine, and tangent functions to find values in a right triangle. This is needed for one part of number (3).

(D) Conclusions and Analysis Questions
   1. On the school map clearly mark the path you took.
   2. What was the total distance covered during your trip through the halls?
   3. On a separate sheet of paper make a sketch (that is to scale) of your trek.
   4. From the sketch (Q3), determine the total displacement from the starting point to the finishing point.
   5. Mathematically determine the total displacement during the trip.
   6. Determine the percent difference between the two values.
   7. What was the average speed for the whole trip?
   8. What was the average velocity for the whole trip?
   9. During which part of the trip was the average speed the greatest? Explain.
   10. In your own words, explain the difference between
       (a) scalar and vector
       (b) distance and displacement
       (c) speed and velocity
PROCEDURAL COMMENTS

Following are some general rules to which you must adhere when you plan your trip through the halls. The trip will be planned on a diagram of the school’s floor plan. The diagram you will be given is not a scale drawing, so you will not be able to make measurements directly on the map. However, you will be able to label each leg of the trip on your map. Eventually a copy of the map will be attached in your lab notebook. Make sure each person in your group has made an accurate, well-labeled copy of the map to attach in their own lab notebook.

You are governed by these criteria:

(a) You must go in an east-west direction at least four times.
(b) You must go in a north-south direction at least four times.
(c) You should not have more than ten legs total
(d) You may not use any steps or the elevator
(e) You must stay in the middle of the halls as much as possible.
(f) Any reports of disturbances to other classes or work places will result in a reduction of your score on the activity.