

As the Crow Flies Lab

Teacher's Guide

Topic:

Vectors and Projectiles

The following information is provided to the student:

Question:

What is the *as-the-crow-flies* displacement from the Physics room to an assigned location in the school?

Purpose:

To determine the *as-the-crow-flies* displacement from the Physics room to a designated location within the school.

A complete lab write-up includes a Title, a Purpose, a Data section, and a Conclusion. The Data section should include a table of the magnitude and the direction of each of your hallway displacements used to reach your assigned destination. The number (or letter) of the destination should be indicated. This section should also include a trigonometric analysis of the data and a scaled vector diagram analysis; the analyses should be organized, labeled and *follow-able*. All work should be shown for your trigonometric analysis. In the scaled vector diagram: indicate a scale, label the magnitudes of all vectors, place arrowheads on all vectors, draw and label the resultant, identify the measured and scaled-up magnitude of the resultant and identify the direction of the resultant. The Conclusion should respond to the question raised in the Purpose.

Materials Required:

School map; meter stick.

Description of Procedure:

Students are given a map of the school which has about 15 locations marked with a number. Each student lab group is assigned a location. Using a meter stick, students walk through the hallways, measuring out the displacement of each leg of the trip from the physics classroom to the assigned destination. The purpose of the lab is accomplished using both a scaled vector addition diagram and a trigonometric analysis.

Alternative Materials and Procedure:

If school administrator's frown on hallway labs, then construct a map of your room and try the activity as a classroom activity.

Safety Concern:

There is always a higher than usual level of risk associated with working in a science lab. Teachers should be aware of this and take the necessary precautions to insure that the working environment is as safe as possible. Student *horseplay* and off-task behaviors should not be tolerated.

Suggestions, Precautions, Notes:

The Laboratory

1. The principle's office, dean's office, guidance counselor's office or maintenance staff will likely have a map of the school. If it takes a bag of chocolate chip cookies to secure one, then start baking.
2. It is useful to pick locations which are easily identifiable. For instance, all destinations could be a wall clock or a fire alarm or a water fountain or aMark these destinations on the map with the appropriate letters (e.g., use **WC** for a wall clock and **WF** for a water fountain).
3. To help monitor the activity more carefully (and to keep your students further from trouble), pick locations in the building which are on the same floor and in the general vicinity of your classroom.
4. If the hallways in your school do not run north-south and east-west, then re-define these directions so that (for the purpose of this lab) they do.

Auxiliary Materials:

None

Scoring Rubric:

VP2. As the Crow Flies Lab	Score
____ Included, labeled and organized all parts of the lab report.	
____ Data section includes the number/letter of the destination. The magnitude and direction of the N-S and E-W hallway displacements are organized in a table; units are listed. Trigonometric analysis is accurate, organized and <i>follow-able</i> ; all work is shown. The scaled vector diagram indicates a scale and shows vectors added head-to-tail; arrowheads are placed on all vectors; their magnitude is labeled next to the vector; the resultant is drawn and labeled; its magnitude and direction are measured and reported with units; reported value is the result of a measurement. Results seem reasonably accurate.	____/____
____ Conclusion states the resultant displacement from the physics classroom door to the assigned location; reported results from both analyses.	

Connections to The Physics Classroom Tutorial:

The following readings are a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/Class/vectors/u311b.cfm>

<http://www.physicsclassroom.com/Class/vectors/u311c.cfm>

Connections to Minds on Physics Internet Modules:

Sublevels 2-4 of the Vectors and Projectiles module are a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/mop/module.cfm>