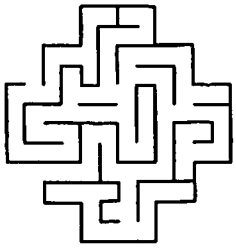
Name _____ Date _____

Three Kinds of Variables



In a scientific investigation there are three kinds of variables. A *manipulated variable* (sometimes called the independent variable) is a factor or condition that is intentionally changed by an investigator in an experiment. A *responding or dependent variable* is a factor or condition that might be affected as a result of that change. A variable that is not changed is called a *controlled variable*. Consider the example below.

A student wanted to test how the mass of a paper airplane affected the distance it would fly. Paper clips were added before each test flight. As each paper clip was added, the plane was tested to determine how far it would fly. The mass of the plane (number of paper clips added) was the manipulated variable. The responding variable was the distance flown. A controlled variable in the experiment was the fact that the same plane was used for each trial.

For each experiment below, specify the manipulated, responding, and controlled variables.

- Two groups of students were tested to compare their speed working math problems. Each group was given the same problems. One group used calculators and the other group computed without calculators.

  Manipulated variable _____

  Responding variable _____

  Controlled variable _____

- Students of different ages were given the same puzzle to assemble. The puzzle assembly time was measured.

  Manipulated variable _____

  Responding variable _____

  Controlled variable _____

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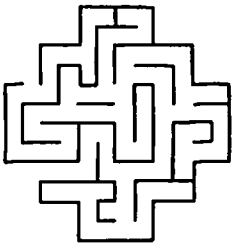

- A study was done to find if different tire treads affect the braking distance of a car.

  Manipulated variable _____

  Responding variable _____

  Controlled variable _____

There can be several controlled variables. If an experiment is to be useful, only one variable at a time can be manipulated intentionally. All other variables must be controlled throughout all parts of the experiment. If more than one variable is altered, the results of an experiment cannot be interpreted with any validity.

Here is some practice with experiments having more than one controlled variable.

- An experiment was performed to determine how the amount of coffee grounds could affect the taste of coffee. The same kind of coffee, the same percolator, the same amount and type of water, the same perking time, and the same electrical source were used.

  Manipulated variable _____

  Responding variable _____

  Controlled variable _____

  Controlled variable _____

  Controlled variable _____

- A study was done with an electromagnet system made from a battery and wire wrapped around a nail. Different sizes of nails were used and the number of paper clips that the electromagnet could pick up was measured.

  Manipulated variable _____

  Responding variable _____

  Controlled variable _____

  Controlled variable _____

  Controlled variable _____