Name: _____ Class Period: _____

Understanding Variables

Malcom used his grandmother's recipe to bake a loaf of bread.

Grandma's Favorite Bread

- 1 ½ cups warm water
- 1 package dry yeast
- 1 teaspoons salt
- 2 tablespoons sugar
- 2 tablespoons melted butter
- 3 ½ cups flour

Mix all the ingredients together, and knead well. COver the dough, and let it rise for 2 hours. Put the dough in a greased pan, and bake at 400 degrees F for about 35 minutes.

Unfortunately, Malcolm's bread collapsed while it was cooking. "Shucks!" he thought, "What could have gone wrong?" What could Malcolm change the next time he makes the bread? Two examples are given for you.

He could add more salt
He could take the bread out of the oven sooner

1. _____

2. _____

3. _____

Varying Your Variables

A factor is anything in an experiment that can influence it's outcome. A variable is a factor in an experiment that can be changed. For example, because you can change the amount of salt in the bread recipe, the amount of salt is a variable.

Malcolm's grandmother suggested that he added too little flour or too much liquid. Therefore, Malcom thought about changing one of the following three variables:

- The amount of water
- The amount of melted butter
- The amount of flour

In science class, Malcolm learned to change only one variable at a time. Why is that important?

_____

_____

Scientists strive to perform controlled experiments. A controlled experiment tests only one factor at a time. In a controlled experiment, there is a control group and one or more experimental groups. All of the factors for the control group and the experimental groups are the same except for one. The one factor that is changed is the **independent variable.** The **independent variable** is the thing in an experiment that you change. Because the **independent variable** is the only factor that differs , scientists can be more certain that **independent variable** is the cause of any differences that they observe in the outcome of the experiment.

Malcolm tried reducing the amount of water to 1 cup. Thus, he made the amount of water the **independent variable**. What factors did Malcolm control (were the control variables)? (Hint: There are several of them! Refer to the recipe.)

1. _____
2. _____
3. _____

As it happened, Malcolm chose the right variable to change. With less water, the bread came out perfect. He concluded that only 1 cup of water should be added.

Dependent Variable

The **dependent variable** is the result of your experiment. For instance, when you bake bread, the **dependent variable** is the quality of the loaf of bread. Often a **dependent variable** is something that you have to measure. Following is an example.

Henry and Eliza conducted an experiment using plant fertilizer. They added different amounts of fertilizer to seven pots of bean sprouts. The pots were the same size and had the same type and amount of soil. They were given the same amount of seeds, light, and water. To find out how the fertilizer affected the growth of the sprouts, Henry and Eliza calculated the average height of the bean sprouts, Henry and Eliza calculated the average height of the bean sprouts in each pot. Here are the factors in their experiment:

Independent Variable: _____

Dependent Variable: _____

Controlled Factors: 1. _____ 2. _____ 3. _____

4. _____ 5. _____

Your Turn

Identify the **independent variable**, **controlled variables**, and **dependent variables** in the following examples.

1. In a recent study, middle school students were given a math exam after various amounts of sleep. One group slept 8 hours or more, and the second group slept fewer than 8 hours. The students had similar skills in math. They ate the same meals the previous day. The study results showed that students who slept 9 hours or more scored better on the exam, while students who slept less than 8 hours scored worse.

Independent Variable: _____

Control Variable: _____

Dependent Variable: _____

2. Our science club built a catapult out of craft sticks, glue, and a rubber band. We wanted to determine what size the rubber band was best for launching a gumball across the classroom. If the rubber band was too small, the gumball wouldn't travel very far. If it was too big, it would be too loose to work well. We found that the rubber band with a circumference of 11 cm shoots the gumball the farthest.

Independent Variable: _____

Control Variable: _____

Dependent Variable: _____