The dentists in a dental clinic would like to determine if there is a difference between the number of new cavities in people who eat an apple a day and in people who eat less than one apple a week. They are going to conduct a study with 50 people in each group.

Fifty clinic patients who report that they routinely eat an apple a day and 50 clinic patients who report that they eat less than one apple a week will be identified. The dentists will examine the patients and their records to determine the number of new cavities the patients have had over the past two years. They will then compare the number of new cavities in the two groups.

a. Why is this an observational study and not an experiment?

b. Explain the concept of confounding in the context of this study. Include an example of a possible confounding variable.

c. If the mean number of new cavities for those who ate an apple a day was statistically significantly smaller than the mean number of new cavities for those who ate less than one apple a week, could one conclude that the lower number of cavities can be attributed to eating an apple a day? Explain.
Solution
This problem has three parts.

a. The student can appeal to any of three reasons in judging this study not an experiment:

1. There is no random assignment of subjects to treatments;
2. There are no treatments imposed;
3. Existing data is being used.

b. Two variables are confounded if their effect on the number of new cavities cannot be distinguished from one another. The student must mention not only that the confounding variables may affect the outcome but that they have differential effects within the two groups. For instance: confounding would occur if patients who eat an apple a day differ from those who eat less than one apple a week on some variable that is related to dental health. In this example, diet or general level of health are examples of what might be confounding variables. For example, it is possible that people who eat an apple a day are more nutrition conscious and have a more healthy diet in general that those who eat one or fewer apples per week, and this might explain the observed difference in dental health.

c. No, because it is not an experiment and cause-and-effect conclusions cannot be drawn from an observational study.

OR

No, because there are possible confounding variables.