

Instructions: Show all work. Use exact answers unless specifically asked to round. Be sure to complete all parts of each problem.

1. You want to estimate how many fish are in a small pond. Let's suppose you capture $n = 500$ fish, tag them, and then throw them back. After a couple of days, you go back and capture $N = 120$ fish and find $K = 30$ are tagged. Estimate how many fish are in the pond. (5 points)

$$\frac{500}{T} = \frac{30}{120}$$

$$30 T = 60,000 \quad T = 2000$$

2. In the following, name **the main sampling method** used. (2 points each)
- a. To determine the portion of students at a major university who favor the construction of a parking garage, a student senate member surveys students as they leave a lecture hall.

Convenience sample

- b. A university employee is conducting a survey of students in a certain dormitory. He chooses the sample by knocking on every 10th room, starting with the second room.

Systematic sample

- c. A group of people is classified according to age and then a random sample of people from each group is taken.

Stratified sample

- d. To survey the opinions on a possible property tax increase, a research firm randomly draws the addresses of 150 homeowners from a public list of all homeowners.

Simple random

- e. In a poll a certain number of counties are picked at random and then all people from each of the chosen counties are surveyed.

Cluster sampling

3. Describe how the following sampling procedures or problems produce bias in survey results. (3 points each)

- a. Self-selection

Self-selected samples usually have strong beliefs to go out of their way to participate which is not representative

- b. Nonresponse

Creates sample bias because may alter composition of sample; answers may be correlated w/ willingness to answer

c. Convenience sampling

may not be representative if opinions of people you know are like your own

4. Does the herb Echinacea help the common cold? A study by researchers at the University of Wisconsin-Madison published a study in the *Annals of Internal Medicine* that found that Echinacea was no better than a placebo. The researchers randomly assigned 142 college students who recently came down with colds to receive either Echinacea in capsule form or a placebo in capsule form. The students did not know if they were getting the herb or the placebo and took their treatment for 10 days. The researchers reported that there was no statistically significant difference in the duration of the cold between these groups.

a. What is the population for the study? (3 points)

adults w/ a cold

b. What is the sample for the study? (2 points)

142 college students w/ colds

c. Is this a randomized, placebo-controlled experiment? Why or why not? (2 points)

yes. they received Echinacea or a placebo

d. Name the treatments. (3 points)

Echinacea, placebo

e. What is the explanatory variable? (2 points)

treatment

f. What is the response variable? (2 points)

duration of cold (amount of improvement)

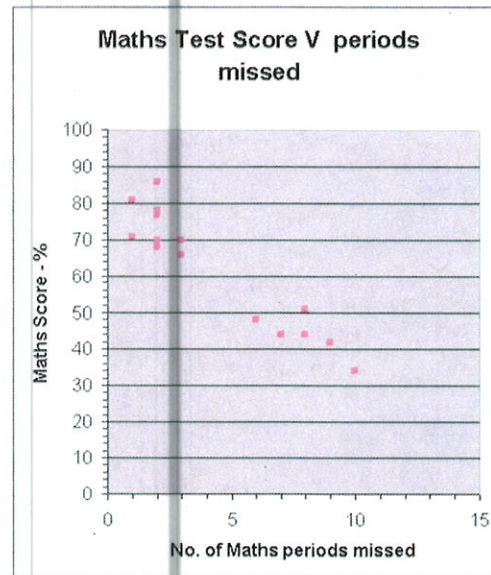
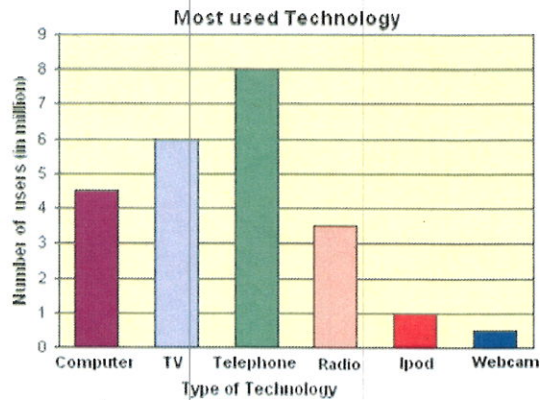
g. Is the experiment a block design? Why or why not? (2 points)

no

h. Is it blind, double blind, or neither? Explain. (3 points)

double blind? at least blind

5. Answer the questions that follow using the two graphs shown.



a. Which type of technology was the most popular? (2 points)

Telephone

b. How many users were included in the technology graph? (2 points)

approx 23.5 million

c. What type of graph is the technology graph? (2 points)

bar graph

d. If we converted the technology graph to a Pareto chart, what order would the categories go in? (3 points)

Telephone, TV, computer, radio, ipod, webcam

e. What type of graph is the math scores graph? (2 points)

scatter plot

f. What happens to math grades if one misses more math classes? What is the trend? (2 points)

grades go down →

g. Do you think the relationship between missed math classes and math test scores is causal? Why or why not? (3 points)

yes it is reasonable to believe that not attending class can negatively affect grades