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1. Consider the table below describing a data set of individuals who have registered to volunteer at a public school. Which of the choices below lists categorical variables?

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Name	Year born	Phone number	Number of siblings	Annual income
Jenny	1975	8929223	0	60,000
Ted	1984	8675309	3	22,500
...	...	...	...	...

○ name and number of siblings

○ annual income and phone number

◉ phone number and name

○ number of siblings and year born

✓ Correct

This question refers to the following learning objective(s):

Identify variables as numerical and categorical.

- If variable is numerical, further classify as continuous or discrete based on whether or not the variable can take on an infinite number of values or only non-negative whole numbers, respectively.
- If variable is categorical, determine if it is ordinal based on whether or not the levels have a natural ordering.

Phone numbers are categorical – even though the phone number data are made up of numbers, the numeric value of the observations is meaningless. For example, we can't do arithmetic operations with these values. The numbers are simply placeholders.

2. A study is designed to test the effect of type of light on exam performance of students. 180 students are randomly assigned to three classrooms: one that is dimly lit, another with yellow lighting, and a third with white fluorescent lighting, and given the same exam. Which of the following correctly identifies the variables used in the study as explanatory and response?

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○ explanatory: dimly lit, yellow, white fluorescent

response: exam performance

○ explanatory: exam performance

response: type of light (categorical with 3 levels)

◉ explanatory: type of light (categorical with 3 levels)

response: exam performance

○ explanatory: exam performance

response: dimly lit, yellow, white fluorescent

✓ Correct

This question refers to the following learning objective(s):

Identify the explanatory variable in a pair of variables as the variable suspected of affecting the other, however note that labeling variables as explanatory and response does not guarantee that the relationship between the two is actually causal, even if there is an association identified between the two variables.
We are interested in the effect of type of light on exam performance, therefore type of light is the explanatory variable and exam performance is the response variable. Type of light is a categorical variable that can take on three possible values (dimly lit, yellow light, white light). These possible values are called levels.

3. Past research suggests that students who study with fewer distractions (internet, cell phone, etc.) tend to get higher grades. Which of the following is the best scenario for being able to generalize this finding to the population of all students?

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○ A survey is emailed to all registered students, and the results are based on the sample of returned surveys.

◉ A student list for the college is obtained and students are randomly selected from the list, and all selected students participate in the study.

○ Sample only includes students who are in classes that the researcher teaches.

○ The students participate in the study after seeing signs about the survey posted around campus.

✓ Correct

This question refers to the following learning objective(s):

Classify a study as observational or experimental, and determine whether the study's results can be generalized to the population and whether they suggest correlation or causation.
- If random sampling has been employed in data collection, the results should be generalizable to the target population.

- If random assignment has been employed in study design, the results suggest causality.

Random sampling allows us to generalize our results to the population at large, and this set up describes simple random sampling.

4. A school district is considering whether it will no longer allow students to park at school after two recent accidents where students were severely injured. As a first step, they survey parents of high school students by mail, asking them whether or not the parents would object to this policy change. Of 5,799 surveys that go out, 1,209 are returned. Of these 1,209 surveys that were completed, 926 agreed with the policy change and 283 disagreed. Which of the following statements is the most plausible?

   ○ The survey is unlikely to have any bias because all parents were mailed a survey.
   ◉ It is possible that 80% of the parents of high school students disagree with the policy change.
   ○ The school district has strong support from parents to move forward with the policy approval.

   ✓ Correct
   This question refers to the following learning objective(s):

   Question confounding variables and sources of bias in a given study.

   It is possible that all who did not return surveys actually disagree with the policy change.

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5. For your political science class, you'd like to take a survey from a sample of all the Catholic Church members in your town. Your town is divided into 17 neighborhoods, each with similar socio-economic status distribution and ethnic diversity, and each contains a Catholic Church. Rather than trying to obtain a list of all members of all these churches, you decide to pick 3 churches at random. For these churches, you'll ask to get a list of all current members and contact 100 members at random. What kind of design have you used?

   ○ quota sampling
   ○ systematic sampling
   ◉ multistage sampling
   ○ simple random sampling
   ○ stratified sampling

   ✓ Correct
   This question refers to the following learning objective(s):

   Distinguish between simple random, stratified, and cluster sampling, and recognize the benefits and drawbacks of choosing one sampling scheme over another.
   First we pick 3 out of 17 clusters at random, and then we sample from within these clusters.

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6. Which of the following is not one of the four principles of experimental design?

   ○ replicate
   ◉ cluster
   ○ control
   ○ block

   ✓ Correct

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7. Which of the following is one of the four principles of experimental design?

   ○ stratify
   ○ cluster
   ◉ control

   ✓ Correct
   The four principles of experimental design are control, randomize, replicate, and block.

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