

AP Statistics Multiple Choice Exam: sampling methods and bias

1. A study is conducted to understand the relationship between exercise and stress levels among college students. The researcher observes the students' exercise habits and stress levels over a semester without trying to influence or alter their behavior. What type of study is this?

- A) Experiment
- B) Observational Study
- C) Simple Random Sample

2. A new drug is tested by giving it to 50 patients, while another 50 patients receive a placebo. The patients and the doctors do not know who receives the drug and who receives the placebo. What type of experiment is this?

- A) Double-Blind Experiment
- B) Single-Blind Experiment
- C) Random Assignment

3. In a study, a researcher surveys every 5th student entering the cafeteria to gather data on student meal preferences. What sampling method is being used?

- A) Systematic Sample
- B) Voluntary Response Sample
- C) Stratified Sample

4. A researcher wants to study the effects of two fertilizers on plant growth. They randomly assign 50 plants to receive Fertilizer A and 50 plants to receive Fertilizer B, keeping all other conditions the same. What is the manipulated variable in this study?

- A) Confounding Variable
- B) Factor/Explanatory Variable
- C) Response Variable

5. A teacher randomly selects 5 students from each grade level (freshman, sophomore, junior, and senior) to form a sample. What type of sampling method is this?

- A) Stratified Sample
- B) Cluster Sample
- C) Convenience Sample

6. A company wants to test a new marketing strategy. They randomly divide their customers into two groups: one group receives the new marketing strategy and the other group receives the old one. The company then measures the purchasing

behavior of both groups. What is the group that receives the old marketing strategy called?

- A) Treatment Group
- B) Control Group
- C) Biased Group

7. In a study to determine the effectiveness of a new teaching method, researchers randomly assign students to either the new method or the traditional method. The researchers find that the students using the new method score higher on tests. What type of conclusion can the researchers make due to the random assignment?

- A) They can make an inference about the population.
- B) They can make an inference about cause and effect.
- C) They can make an inference about the sample only.

8. A study finds that participants who believed they were taking a painkiller reported less pain, even though they were actually given a sugar pill. What term describes this phenomenon?

- A) Placebo Effect
- B) Confounding Variable
- C) Random Assignment

9. A student council survey includes the question, "Do you agree that the school should provide healthier food options?" The way this question is phrased may lead to biased responses. What term describes this type of question?

- A) Confounding Variable
- B) Biased Question
- C) Voluntary Response Sample

10. In an experiment, a group of participants is kept under standard conditions without receiving the experimental treatment. What is this group called?

- A) Control Group
- B) Treatment Group
- C) Experimental Group

11. A survey is conducted in which participants can call in to voice their opinions on a topic. What type of sampling method does this represent?

- A) Voluntary Response Sample
- B) Simple Random Sample
- C) Systematic Sample

12. To study job satisfaction, a researcher selects 100 employees by randomly choosing their names from

the entire list of employees. What type of sampling method is this?

- A) Convenience Sample
- B) Simple Random Sample
- C) Cluster Sample

13. A researcher divides a city into several neighborhoods, randomly selects three neighborhoods, and surveys every household within those neighborhoods. What type of sampling method is being used?

- A) Cluster Sample
- B) Stratified Sample
- C) Systematic Sample

14. A researcher wants to test a new diet plan. Participants are randomly assigned to either follow the new diet plan or continue with their usual eating habits. What is the group that follows the new diet plan called?

- A) Control Group
- B) Treatment Group
- C) Confounding Group

15. In a study to determine the relationship between caffeine intake and reaction time, researchers keep

all other factors constant, like sleep and stress levels, for both groups. What aspect of the experimental design does this describe?

- A) Randomization
- B) Control
- C) Replication

16. In a clinical trial for a new medication, researchers give the medication to one group and a placebo to another. Both groups are observed over time to measure differences in health outcomes. What is the variable that is being measured?

- A) Confounding Variable
- B) Response Variable
- C) Explanatory Variable

17. An online poll is conducted where people choose to respond. What type of sampling method does this represent?

- A) Convenience Sample
- B) Voluntary Response Sample
- C) Simple Random Sample

18. A study is conducted to test the effect of different types of music on productivity. The type of music

played is the variable that is manipulated. What term best describes this variable?

- A) Response Variable
- B) Explanatory Variable
- C) Confounding Variable

19. In a study about the effects of sleep on memory, participants are randomly assigned to sleep for either 4, 6, or 8 hours. The researchers then measure their memory performance. What are the specific sleep durations referred to as?

- A) Levels
- B) Factors
- C) Treatments

20. Researchers want to understand the effect of exercise on weight loss. However, the participants' diet during the study also influences weight loss. What is the diet considered in this context?

- A) Confounding Variable
- B) Response Variable
- C) Explanatory Variable

21. A researcher gives 20 students a math test, then teaches them a new concept using a different

method, and gives them a second math test. What type of experimental design is this?

- A) Control Group Design
- B) Matched Pairs Design
- C) Randomized Block Design

22. In a study to see if a new fertilizer affects plant growth, the researchers use the same type of soil, amount of water, and light for all plants in the study. What is this effort to keep other variables the same called?

- A) Control
- B) Replication
- C) Randomization

23. A study is conducted where subjects are randomly assigned to different groups to receive varying doses of a medication. The study is repeated several times with different groups to ensure consistent results. What is this repetition called?

- A) Control
- B) Replication
- C) Random Assignment

24. In a research study, the effect of a new exercise routine on muscle growth is tested. The muscle

growth observed in the participants is the main focus of the study. What term describes the muscle growth?

- A) Explanatory Variable
- B) Response Variable
- C) Confounding Variable

25. An experiment is designed to test the impact of a new educational program on student performance. The program is administered in different schools to students of similar academic levels to minimize differences. What is the grouping based on academic levels referred to as?

- A) Matched Pairs Design
 - B) Randomized Block Design
 - C) Control Group Design
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ANSWER

Certainly! Here are the answers to the 25 questions, along with explanations for each choice provided:

1. A study is conducted to understand the relationship between exercise and stress levels among college students. The researcher observes the students' exercise habits and stress levels over a semester without trying to influence or alter their behavior. What type of study is this?

- A) Experiment: Incorrect. An experiment involves manipulating one or more variables to observe the effect on another variable. In this scenario, the researcher is only observing without intervention.

- B) Observational Study: Correct. The researcher is simply observing and recording data without manipulating any variables.

- C) Simple Random Sample: Incorrect. A simple random sample is a method of selecting participants, not a study design. This scenario describes a type of study, not the sampling method used.

2. A new drug is tested by giving it to 50 patients, while another 50 patients receive a placebo. The patients and the doctors do not know who

receives the drug and who receives the placebo.
What type of experiment is this?

- A) Double-Blind Experiment: Correct. In a double-blind experiment, neither the participants nor the experimenters know who is receiving the treatment, which helps prevent bias.
- B) Single-Blind Experiment: Incorrect. In a single-blind experiment, only the participants are unaware of which treatment they receive.
- C) Random Assignment: Incorrect. Random assignment refers to how participants are allocated to different groups in an experiment, not the blinding process.

3. In a study, a researcher surveys every 5th student entering the cafeteria to gather data on student meal preferences. What sampling method is being used?

- A) Systematic Sample: Correct. Systematic sampling involves selecting every n th individual from a list or population.
- B) Voluntary Response Sample: Incorrect. In a voluntary response sample, participants choose to be part of the survey themselves.
- C) Stratified Sample: Incorrect. A stratified sample divides the population into subgroups and then samples from each subgroup.

4. A researcher wants to study the effects of two fertilizers on plant growth. They randomly assign 50 plants to receive Fertilizer A and 50 plants to receive Fertilizer B, keeping all other conditions the same. What is the manipulated variable in this study?

- A) Confounding Variable: Incorrect. A confounding variable is an external factor that may affect the outcome, but it is not the variable being manipulated.
- B) Factor/Explanatory Variable: Correct. The manipulated variable, or factor, is the type of fertilizer in this experiment.
- C) Response Variable: Incorrect. The response variable is what is measured in the experiment, such as plant growth.

5. A teacher randomly selects 5 students from each grade level (freshman, sophomore, junior, and senior) to form a sample. What type of sampling method is this?

- A) Stratified Sample: Correct. In stratified sampling, the population is divided into subgroups (strata) and a random sample is taken from each subgroup.
- B) Cluster Sample: Incorrect. In cluster sampling, entire clusters are chosen at random, and all

individuals within the selected clusters are included.

- C) Convenience Sample: Incorrect. A convenience sample involves choosing individuals who are easiest to reach.

6. A company wants to test a new marketing strategy. They randomly divide their customers into two groups: one group receives the new marketing strategy and the other group receives the old one. The company then measures the purchasing behavior of both groups. What is the group that receives the old marketing strategy called?

- A) Treatment Group: Incorrect. The treatment group receives the new marketing strategy being tested.

- B) Control Group: Correct. The control group is used as a baseline and does not receive the experimental treatment.

- C) Biased Group: Incorrect. "Biased group" is not a standard term in experimental design.

7. In a study to determine the effectiveness of a new teaching method, researchers randomly assign students to either the new method or the traditional method. The researchers find that the students using the new method score higher on

tests. What type of conclusion can the researchers make due to the random assignment?

- A) They can make an inference about the population: Incorrect. Random assignment allows for inference about cause and effect, not the population.
- B) They can make an inference about cause and effect: Correct. Random assignment helps establish a cause-and-effect relationship between the teaching method and test scores.
- C) They can make an inference about the sample only: Incorrect. Random assignment allows researchers to generalize beyond the sample.

8. A study finds that participants who believed they were taking a painkiller reported less pain, even though they were actually given a sugar pill. What term describes this phenomenon?

- A) Placebo Effect: Correct. The placebo effect occurs when participants experience a perceived improvement due to their belief in the treatment, not the treatment itself.
- B) Confounding Variable: Incorrect. A confounding variable is an external factor that might affect the results, not the psychological effect of belief in treatment.

- C) Random Assignment: Incorrect. Random assignment is a method of assigning participants to groups, not a description of an effect in the experiment.

9. A student council survey includes the question, "Do you agree that the school should provide healthier food options?" The way this question is phrased may lead to biased responses. What term describes this type of question?

- A) Confounding Variable: Incorrect. Confounding variables are factors that interfere with the relationship between the explanatory and response variables.

- B) Biased Question: Correct. This question is leading and suggests a preferred response, making it a biased question.

- C) Voluntary Response Sample: Incorrect. A voluntary response sample involves participants who choose to respond on their own.

10. In an experiment, a group of participants is kept under standard conditions without receiving the experimental treatment. What is this group called?

- A) Control Group: Correct. The control group does not receive the treatment and serves as a baseline for comparison.

- B) Treatment Group: Incorrect. The treatment group receives the experimental treatment.
- C) Experimental Group: Incorrect. The experimental group includes all participants in the study, not specifically those not receiving the treatment.

11. A survey is conducted in which participants can call in to voice their opinions on a topic. What type of sampling method does this represent?

- A) Voluntary Response Sample: Correct. In a voluntary response sample, participants choose to participate, often leading to bias.
- B) Simple Random Sample: Incorrect. A simple random sample requires that every individual has an equal chance of being selected.
- C) Systematic Sample: Incorrect. A systematic sample involves selecting every n th individual.

12. To study job satisfaction, a researcher selects 100 employees by randomly choosing their names from the entire list of employees. What type of sampling method is this?

- A) Convenience Sample: Incorrect. A convenience sample selects individuals based on ease of access, not randomly.

- B) Simple Random Sample: Correct. Every individual in the population has an equal chance of being selected, which describes a simple random sample.
- C) Cluster Sample: Incorrect. In cluster sampling, the population is divided into clusters, and some clusters are randomly selected.

13. A researcher divides a city into several neighborhoods, randomly selects three neighborhoods, and surveys every household within those neighborhoods. What type of sampling method is being used?

- A) Cluster Sample: Correct. In cluster sampling, entire clusters (neighborhoods) are randomly selected, and all individuals within the selected clusters are included.
- B) Stratified Sample: Incorrect. In stratified sampling, individuals are randomly selected from each subgroup, not entire groups.
- C) Systematic Sample: Incorrect. Systematic sampling involves selecting every n th individual.

14. A researcher wants to test a new diet plan. Participants are randomly assigned to either follow the new diet plan or continue with their usual eating habits. What is the group that follows the new diet plan called?

- A) Control Group: Incorrect. The control group follows the usual eating habits, not the new diet plan.
- B) Treatment Group: Correct. The treatment group receives the experimental treatment, which in this case is the new diet plan.
- C) Confounding Group: Incorrect. "Confounding group" is not a standard term in experimental design.

15. In a study to determine the relationship between caffeine intake and reaction time, researchers keep all other factors constant, like sleep and stress levels, for both groups. What aspect of the experimental design does this describe?

- A) Randomization: Incorrect. Randomization involves randomly assigning participants to groups, not controlling external variables.
- B) Control: Correct. Control involves keeping all other variables constant except for the one being studied.
- C) Replication: Incorrect. Replication involves repeating the experiment to ensure consistent results.

16. In a clinical trial for a new medication, researchers give the medication to one group and a placebo to another. Both groups are observed over time to measure differences in health outcomes. What is the variable that is being measured?

- A) Confounding Variable: Incorrect. A confounding variable is an external factor that might affect the relationship between the explanatory and response variables but is not the variable being measured.

- B) Response Variable: Correct. The response variable is the outcome that is being measured in an experiment, in this case, the health outcomes of the participants.

- C) Explanatory Variable: Incorrect. The explanatory variable is the one being manipulated to observe its effect on the response variable, which would be the medication in this scenario.

17. An online poll is conducted where people choose to respond. What type of sampling method does this represent?

- A) Convenience Sample: Incorrect. A convenience sample is one where individuals are chosen based on ease of access, not self-selection.

- B) Voluntary Response Sample: Correct. In a voluntary response sample, individuals select themselves to participate, often leading to bias as those with strong opinions are more likely to respond.
- C) Simple Random Sample: Incorrect. A simple random sample requires that every individual in the population has an equal chance of being selected, not self-selection.

18. A study is conducted to test the effect of different types of music on productivity. The type of music played is the variable that is manipulated. What term best describes this variable?

- A) Response Variable: Incorrect. The response variable is the outcome being measured, not the one being manipulated.
- B) Explanatory Variable: Correct. The explanatory variable is the variable that is manipulated to observe its effect on the response variable, which in this case is the type of music.
- C) Confounding Variable: Incorrect. A confounding variable is an outside influence that can affect the relationship between the explanatory and response variables.

19. In a study about the effects of sleep on memory, participants are randomly assigned to sleep for either 4, 6, or 8 hours. The researchers then measure their memory performance. What are the specific sleep durations referred to as?

- A) Levels: Correct. Levels are the specific values or conditions of the factor being tested, which in this case are the different amounts of sleep (4, 6, or 8 hours).

- B) Factors: Incorrect. The factor is the overall variable that is being manipulated, which in this case is sleep.

- C) Treatments: Incorrect. Treatments are the conditions applied to the experimental units. While the levels can be considered treatments, the specific term here is "levels."

20. Researchers want to understand the effect of exercise on weight loss. However, the participants' diet during the study also influences weight loss. What is the diet considered in this context?

- A) Confounding Variable: Correct. A confounding variable is an outside influence that affects both the explanatory and response variables, potentially skewing the results.

- B) Response Variable: Incorrect. The response variable is the outcome measured in the experiment, such as weight loss.

- C) Explanatory Variable: Incorrect. The explanatory variable is the one being manipulated to study its effect, in this case, exercise.

21. A researcher gives 20 students a math test, then teaches them a new concept using a different method, and gives them a second math test. What type of experimental design is this?

- A) Control Group Design: Incorrect. A control group design involves a group that does not receive the treatment for comparison.

- B) Matched Pairs Design: Correct. In a matched pairs design, participants are paired based on similar characteristics, or in this case, each student serves as their own control by comparing their performance before and after the treatment.

- C) Randomized Block Design: Incorrect. A randomized block design involves grouping participants into blocks based on certain characteristics and then randomly assigning treatments within those blocks.

22. In a study to see if a new fertilizer affects plant growth, the researchers use the same type of soil, amount of water, and light for all plants in the study. What is this effort to keep other variables the same called?

- A) Control: Correct. Control refers to keeping all variables except the explanatory variable constant to ensure that the results are due to the treatment alone.
- B) Replication: Incorrect. Replication involves repeating the experiment on many subjects to ensure consistency.
- C) Randomization: Incorrect. Randomization is the process of randomly assigning subjects to treatment groups.

23. A study is conducted where subjects are randomly assigned to different groups to receive varying doses of a medication. The study is repeated several times with different groups to ensure consistent results. What is this repetition called?

- A) Control: Incorrect. Control involves holding other variables constant, not repeating the study.
- B) Replication: Correct. Replication refers to repeating an experiment to ensure that the results are consistent and not due to random chance.
- C) Random Assignment: Incorrect. Random assignment is the process of randomly assigning subjects to different groups within the experiment.

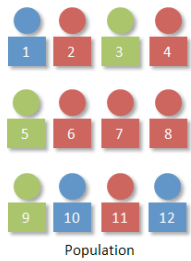
24. In a research study, the effect of a new exercise routine on muscle growth is tested. The muscle growth observed in the participants is the main focus of the study. What term describes the muscle growth?

- A) Explanatory Variable: Incorrect. The explanatory variable is the one being manipulated to observe its effect, in this case, the exercise routine.
- B) Response Variable: Correct. The response variable is the outcome that is measured in the study, which is muscle growth in this case.
- C) Confounding Variable: Incorrect. A confounding variable is an external factor that may affect the relationship between the explanatory and response variables.

25. An experiment is designed to test the impact of a new educational program on student performance. The program is administered in different schools to students of similar academic levels to minimize differences. What is the grouping based on academic levels referred to as?

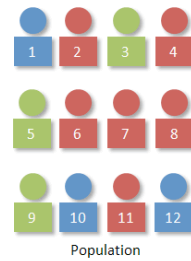
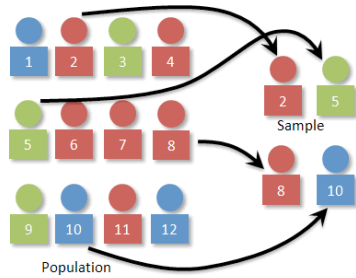
- A) Matched Pairs Design: Incorrect. Matched pairs design involves pairing subjects based on similar characteristics or having each subject serve as their own control.

- B) Randomized Block Design: Correct. A randomized block design involves grouping participants into blocks (in this case, academic levels) and then randomly assigning treatments within those blocks to account for variability.
- C) Control Group Design: Incorrect. A control group design involves having a group that does not receive the treatment for comparison purposes.



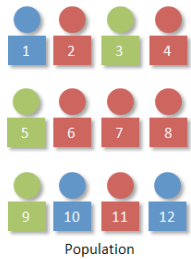
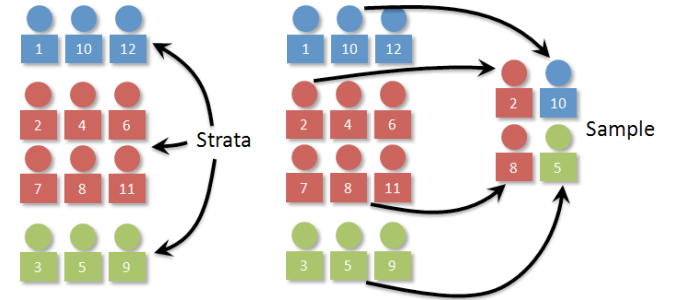
SRS of size 4

•randInt(1, 12, 4) = 10, 2, 8, 5



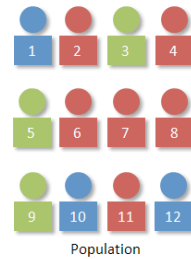
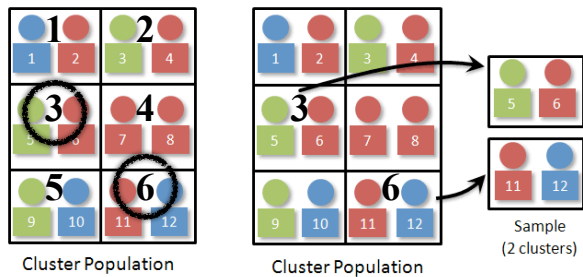
Stratified Sample of size 4

- randInt(1, 3, 1) = 2
- randInt(1, 6, 2) = 5, 1
- randInt(1, 3, 1) = 2



Cluster Sample of size 4

•randInt(1, 6, 2) = 3, 6



Systematic Sample of size 4

4 people in sample ->
4 groups of 3

•randInt(1, 3, 1) = 2

