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Math

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Observational Studies and Experiments (key)

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Question ID 9bf4c545

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■□□

ID: 9bf4c545

The members of a city council wanted to assess the opinions of all city residents about converting an open field into a dog park. The council surveyed a sample of 500 city residents who own dogs. The survey showed that the majority of those sampled were in favor of the dog park. Which of the following is true about the city council's survey?

A. It shows that the majority of city residents are in favor of the dog park.

B. The survey sample should have included more residents who are dog owners.

C. The survey sample should have consisted entirely of residents who do not own dogs.

D. The survey sample is biased because it is not representative of all city residents.

ID: 9bf4c545 Answer

Correct Answer: D

Rationale

Choice D is correct. The members of the city council wanted to assess opinions of all city residents. To gather an unbiased sample, the council should have used a random sampling design to select subjects from all city residents. The given survey introduced a sampling bias because the 500 city residents surveyed were all dog owners. This sample is not representative of all city residents because not all city residents are dog owners.

Choice A is incorrect because when the sampling method isn't random, there is no guarantee that the survey results will be reliable; hence, they cannot be generalized to the entire population. Choice B is incorrect because a larger sample of residents who are dog owners would not correct the sampling bias. Choice C is incorrect because a survey sample of entirely non–dog owners would likely have a biased opinion, just as a sample of dog owners would likely have a biased opinion.

Question Difficulty: Easy

Question ID 82dfb646

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■□□

ID: 82dfb646

A market researcher selected 200 people at random from a group of people who indicated that they liked a certain book. The 200 people were shown a movie based on the book and then asked whether they liked or disliked the movie. Of those surveyed, 95% said they disliked the movie. Which of the following inferences can appropriately be drawn from this survey result?

A. At least 95% of people who go see movies will dislike this movie.

B. At least 95% of people who read books will dislike this movie.

C. Most people who dislike this book will like this movie.

D. Most people who like this book will dislike this movie.

ID: 82dfb646 Answer

Correct Answer: D

Rationale

Choice D is correct. The sample was selected from a group of people who indicated that they liked the book. It is inappropriate to generalize the result of the survey beyond the population from which the participants were selected. Choice D is the most appropriate inference from the survey results because it describes a conclusion about people who liked the book, and the results of the survey indicate that most people who like the book disliked the movie.

Choices A, B, and C are incorrect because none of these inferences can be drawn from the survey results. Choices A and B need not be true. The people surveyed all liked the book on which the movie was based, which is not necessarily true of all people who go see movies or all people who read books. Thus, the people surveyed are not representative of all people who go see movies or all people who read books. Therefore, the results of this survey cannot appropriately be extended to at least 95% of people who go see movies or to at least 95% of people who read books. Choice C need not be true because the sample includes only people who liked the book, and so the results do not extend to people who dislike the book.

Question Difficulty: Easy

Question ID 37930b2a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■□

ID: 37930b2a

Residents of a town were surveyed to determine whether they are satisfied with the concession stand at the local park. A random sample of 200 residents was selected. All 200 responded, and 87% said they are satisfied. Based on this information, which of the following statements must be true?

I. Of all the town residents, 87% would say they are satisfied with the concession stand at the local park.

II. If another random sample of 200 residents were surveyed, 87% would say they are satisfied.

A. Neither

B. I only

C. II only

D. I and II

ID: 37930b2a Answer

Correct Answer: A

Rationale

Choice A is correct. The purpose of surveying a random sample of residents is to approximate the percent of the town residents that are satisfied with the concession stand. The sample doesn't necessarily get the same result as surveying every resident of the town, nor would another sample necessarily have identical results. Therefore, although it's possible that either statement I or statement II could prove true by surveying every resident of the town, these statements cannot be proven true solely based on the results of the sample.

Choice B is incorrect because surveying a sample of the town residents may not have the same result as surveying all the town residents. Choices C and D are incorrect because surveying a different sample of residents could yield different results.

Question Difficulty: Medium

Question ID b4f5a7ca

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■□

ID: b4f5a7ca

A survey was conducted using a sample of history professors selected at random from the California State Universities. The professors surveyed were asked to name the publishers of their current texts. What is the largest population to which the results of the survey can be generalized?

A. All professors in the United States

B. All history professors in the United States

C. All history professors at all California State Universities

D. All professors at all California State Universities

ID: b4f5a7ca Answer

Correct Answer: C

Rationale

Choice C is correct. Selecting a sample at random when conducting a survey allows the results to be generalized to the population from which the sample was selected, but not beyond this population. In this situation, the population that the sample was selected from is history professors from the California State Universities. Therefore, the largest population to which the results of the survey can be generalized is all history professors at all California State Universities.

Choices A, B, and D are incorrect. Since the sample was selected at random from history professors from the California State Universities, the results of the survey can't be generalized to all professors in the United States, all history professors in the United States, or all professors at all California State Universities. All three of these populations may use different texts and therefore may name different publishers.

Question Difficulty: Medium

Question ID 642519d7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■□

ID: 642519d7

A polling agency recently surveyed 1,000 adults who were selected at random from a large city and asked each of the adults, “Are you satisfied with the quality of air in the city?” Of those surveyed, 78 percent responded that they were satisfied with the quality of air in the city. Based on the results of the survey, which of the following statements must be true?

1. Of all adults in the city, 78 percent are satisfied with the quality of air in the city.
2. If another 1,000 adults selected at random from the city were surveyed, 78 percent of them would report they are satisfied with the quality of air in the city.
3. If 1,000 adults selected at random from a different city were surveyed, 78 percent of them would report they are satisfied with the quality of air in the city.

A. None

B. II only

C. I and II only

D. I and III only

ID: 642519d7 Answer

Correct Answer: A

Rationale

Choice A is correct. Statement I need not be true. The fact that 78% of the 1,000 adults who were surveyed responded that they were satisfied with the air quality in the city does not mean that the exact same percentage of all adults in the city will be satisfied with the air quality in the city. Statement II need not be true because random samples, even when they are of the same size, are not necessarily identical with regard to percentages of people in them who have a certain opinion. Statement III need not be true for the same reason that statement II need not be true: results from different samples can vary. The variation may be even bigger for this sample since it would be selected from a different city. Therefore, none of the statements must be true.

Choices B, C, and D are incorrect because none of the statements must be true.

Question Difficulty: Medium

Question ID 1ea09200

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■■

ID: 1ea09200

A sample of 40 fourth-grade students was selected at random from a certain school. The 40 students completed a survey about the morning announcements, and 32 thought the announcements were helpful. Which of the following is the largest population to which the results of the survey can be applied?

A. The 40 students who were surveyed

B. All fourth-grade students at the school

C. All students at the school

D. All fourth-grade students in the county in which the school is located

ID: 1ea09200 Answer

Correct Answer: B

Rationale

Choice B is correct. Selecting a sample of a reasonable size at random to use for a survey allows the results from that survey to be applied to the population from which the sample was selected, but not beyond this population. In this case, the population from which the sample was selected is all fourth-grade students at a certain school. Therefore, the results of the survey can be applied to all fourth-grade students at the school.

Choice A is incorrect. The results of the survey can be applied to the 40 students who were surveyed. However, this isn't the largest group to which the results of the survey can be applied. Choices C and D are incorrect. Since the sample was selected at random from among the fourth-grade students at a certain school, the results of the survey can't be applied to other students at the school or to other fourth-grade students who weren't represented in the survey results. Students in other grades in the school or other fourth-grade students in the country may feel differently about announcements than the fourth-grade students at the school.

Question Difficulty: Hard

Question ID 7d68096f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■■

ID: 7d68096f

A trivia tournament organizer wanted to study the relationship between the number of points a team scores in a trivia round and the number of hours that a team practices each week. For the study, the organizer selected 55 teams at random from all trivia teams in a certain tournament. The table displays the information for the 40 teams in the sample that practiced for at least 3 hours per week.

Hours practiced	Number of points per round		
	6 to 13 points	14 or more points	Total
3 to 5 hours	6	4	10
More than 5 hours	4	26	30
Total	10	30	40

Which of the following is the largest population to which the results of the study can be generalized?

A. All trivia teams in the tournament that scored 14 or more points in the round

B. The 55 trivia teams in the sample

C. The 40 trivia teams in the sample that practiced for at least 3 hours per week

D. All trivia teams in the tournament

ID: 7d68096f Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the organizer selected 55 teams at random from all trivia teams in the tournament. A table is also given displaying the information for the 40 teams in the sample that practiced for at least 3 hours per week. Selecting a sample of a reasonable size at random to use for a survey allows the results from that survey to be applied to the population from which the sample was selected, but not beyond this population. Thus, only the sampling method information is necessary to determine the largest population to which the results of the study can be generalized. Since the organizer selected the sample at random from all trivia teams in the tournament, the largest population to which the results of the study can be generalized is all trivia teams in the tournament.

Choice A is incorrect. The sample was selected at random from all trivia teams in the tournament, not just from the teams that scored an average of 14 or more points per round.

Choice B is incorrect. If a study uses a sample selected at random from a population, the results of the study can be generalized to the population, not just the sample.

Choice C is incorrect. If a study uses a sample selected at random from a population, the results of the study can be generalized to the population, not just a subset of the sample.

Question Difficulty: Hard

Question ID 7ce2830a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■■

ID: 7ce2830a

A psychologist designed and conducted a study to determine whether playing a certain educational game increases middle school students' accuracy in adding fractions. For the study, the psychologist chose a random sample of 35 students from all of the students at one of the middle schools in a large city. The psychologist found that students who played the game showed significant improvement in accuracy when adding fractions. What is the largest group to which the results of the study can be generalized?

A. The 35 students in the sample

B. All students at the school

C. All middle school students in the city

D. All students in the city

ID: 7ce2830a Answer

Correct Answer: B

Rationale

Choice B is correct. The largest group to which the results of a study can be generalized is the population from which the random sample was chosen. In this case, the psychologist chose a random sample from all students at one particular middle school. Therefore, the largest group to which the results can be generalized is all the students at the school.

Choice A is incorrect because this isn't the largest group the results can be generalized to. Choices C and D are incorrect because these groups are larger than the population from which the random sample was chosen. Therefore, the sample isn't representative of these groups.

Question Difficulty: Hard

Question ID aa43b41f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■■

ID: aa43b41f

Near the end of a US cable news show, the host invited viewers to respond to a poll on the show's website that asked, "Do you support the new federal policy discussed during the show?" At the end of the show, the host reported that 28% responded "Yes," and 70% responded "No." Which of the following best explains why the results are unlikely to represent the sentiments of the population of the United States?

A. The percentages do not add up to 100%, so any possible conclusions from the poll are invalid.

B. Those who responded to the poll were not a random sample of the population of the United States.

C. There were not 50% "Yes" responses and 50% "No" responses.

D. The show did not allow viewers enough time to respond to the poll.

ID: aa43b41f Answer

Correct Answer: B

Rationale

Choice B is correct. In order for the poll results from a sample of a population to represent the entire population, the sample must be representative of the population. A sample that is randomly selected from a population is more likely than a sample of the type described to represent the population. In this case, the people who responded were people with access to cable television and websites, which aren't accessible to the entire population. Moreover, the people who responded also chose to watch the show and respond to the poll. The people who made these choices aren't representative of the entire population of the United States because they were not a random sample of the population of the United States.

Choices A, C, and D are incorrect because they present reasons unrelated to whether the sample is representative of the population of the United States.

Question Difficulty: Hard

Question ID 4a422e3e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Evaluating statistical claims: Observational studies and experiments	■■■

ID: 4a422e3e

To determine the mean number of children per household in a community, Tabitha surveyed 20 families at a playground. For the 20 families surveyed, the mean number of children per household was 2.4. Which of the following statements must be true?

A. The mean number of children per household in the community is 2.4.

B. A determination about the mean number of children per household in the community should not be made because the sample size is too small.

C. The sampling method is flawed and may produce a biased estimate of the mean number of children per household in the community.

D. The sampling method is not flawed and is likely to produce an unbiased estimate of the mean number of children per household in the community.

ID: 4a422e3e Answer

Correct Answer: C

Rationale

Choice C is correct. In order to use a sample mean to estimate the mean for a population, the sample must be representative of the population (for example, a simple random sample). In this case, Tabitha surveyed 20 families in a playground. Families in the playground are more likely to have children than other households in the community. Therefore, the sample isn't representative of the population. Hence, the sampling method is flawed and may produce a biased estimate.

Choices A and D are incorrect because they incorrectly assume the sampling method is unbiased. Choice B is incorrect because a sample of size 20 could be large enough to make an estimate if the sample had been representative of all the families in the community.

Question Difficulty: Hard