Question ID 457d2f2c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 457d2f2c

A data set of 27 different numbers has a mean of 33 and a median of 33. A new data set is created by adding 7 to each number in the original data set that is greater than the median and subtracting 7 from each number in the original data set that is less than the median. Which of the following measures does NOT have the same value in both the original and new data sets?

A. Median

B. Mean

C. Sum of the numbers

D. Standard deviation

ID: 457d2f2c Answer

Correct Answer: D

Rationale

Choice D is correct. When a data set has an odd number of elements, the median can be found by ordering the values from least to greatest and determining the middle value. Out of the 27 different numbers in this data set, 13 numbers are below the median, one number is exactly 33, and 13 numbers are above the median. When 7 is subtracted from each number below the median and added to each number above the median, the data spread out from the median. Since the median of this data set, 33, is equivalent to the mean of the data set, the data also spread out from the mean. Since standard deviation is a measure of how spread out the data are from the mean, a greater spread from the mean indicates an increased standard deviation.

Choice A is incorrect. All the numbers less than the median decrease and all the numbers greater than the median increase, but the median itself doesn't change. Choices B and C are incorrect. The mean of a data set is found by dividing the sum of the values by the number of values. The net change from subtracting 7 from 13 numbers and adding 7 to 13 numbers is zero. Therefore, neither the mean nor the sum of the numbers changes.
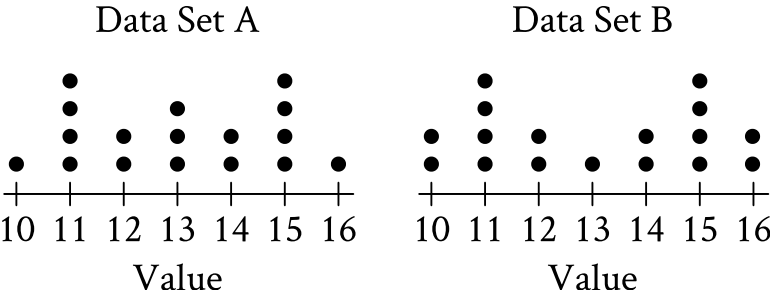
Question Difficulty: Hard

Question ID d65b9a87

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■ ■ ■

ID: d65b9a87

The dot plots represent the distributions of values in data sets A and B.

Data Set A

Data Set B

10 11 12 13 14 15 16

Value

10 11 12 13 14 15 16

Value

Which of the following statements must be true?

I. The median of data set A is equal to the median of data set B.

II. The standard deviation of data set A is equal to the standard deviation of data set B.

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: d65b9a87 Answer

Correct Answer: A

Rationale

Choice A is correct. The median of a data set with an odd number of values that are in ascending or descending order is the middle value of the data set. Since the distribution of the values of both data set A and data set B form symmetric dot plots, and each data set has an odd number of values, it follows that the median is given by the middle value in each of the dot plots. Thus, the median of data set A is 13, and the median of data set B is 13. Therefore, statement I is true. Data set A and data set B have the same frequency for each of the values 11, 12, 14, and 15. Data set A has a frequency of 1 for values 10 and 16, whereas data set B has a frequency of 2 for values 10 and 16. Standard deviation is a measure of the spread of a data set; it is larger when there are more values further from the mean, and smaller when there are more values closer to the mean. Since both distributions are symmetric with an odd number of values, the mean of each data set is equal to its median. Thus, each data set has a mean of 13. Since more of the values in data set A are closer to 13 than data set B, it follows that data set A has a smaller standard deviation than data set B. Thus, statement II is false. Therefore, only statement I must be true.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 1142af44

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 1142af44

Value	Frequency
1	a
2	$2a$
3	$3a$
4	$2a$
5	a

The frequency distribution above summarizes a set of data, where a is a positive integer. How much greater is the mean of the set of data than the median?

A. 0

B. 1

C. 2

D. 3

ID: 1142af44 Answer

Correct Answer: A

Rationale

Choice A is correct. Since the frequencies of values less than the middle value, 3, are the same as the frequencies of the values greater than 3, the set of data has a symmetric distribution. When a set of data has a symmetric distribution, the mean and median values are equal. Therefore, the mean is 0 greater than the median.

Choices B, C, and D are incorrect and may result from misinterpreting the set of data.

Question Difficulty: Hard

Question ID 651d83bb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■ ■ ■

ID: 651d83bb

Two different teams consisting of 10 members each ran in a race. Each member's completion time of the race was recorded. The mean of the completion times for each team was calculated and is shown below.

Team A: 3.41 minutes

Team B: 3.79 minutes

Which of the following MUST be true?

1. Every member of team A completed the race in less time than any member of team B.
2. The median time it took the members of team B to complete the race is greater than the median time it took the members of team A to complete the race.
3. There is at least one member of team B who took more time to complete the race than some member of team A.

A. III only

B. I and III only

C. II and III only

D. I, II, and III

ID: 651d83bb Answer

Correct Answer: A

Rationale

Choice A is correct. Since the average time for the 10 members of team A is 3.41 minutes, the sum of the 10 times for team A is equal to $(10)(3.41) = 34.1$ minutes. Since the average time for the 10 members of team B is 3.79 minutes, the sum of the 10 times for team B is equal to $(10)(3.79) = 37.9$ minutes. Since the sum of the 10 times for team B is greater than the sum of the 10 times for team A, it must be true that at least one of the times for team B must be greater than one of the times for team A. Thus, statement III is true. However, it's possible that at least some of the times for team A were greater than some of the times for team B. For example, all of team A's times could be 3.41 minutes, and team B could have 1 time of 3.34 minutes and 9 times of 3.84 minutes. Thus, statement I need not be true. It's also possible that the median of the times for team B is less than the median of the times for team A. For example, all of team A's times could be 3.41 minutes, and team B could have 6 times of 3.37 minutes and 4 times of 4.42 minutes; then the median of team B's times would be 3.37 minutes and the median of team A's times would be 3.41 minutes. Thus, statement II need not be true.

Choices B, C, and D are incorrect because neither statement I nor statement II must be true.

Question Difficulty: Hard

Question ID 1e8ccffd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 1e8ccffd

The mean score of 8 players in a basketball game was 14.5 points. If the highest individual score is removed, the mean score of the remaining 7 players becomes 12 points. What was the highest score?

A. 20

B. 24

C. 32

D. 36

ID: 1e8ccffd Answer

Correct Answer: C

Rationale

Choice C is correct. If the mean score of 8 players is 14.5, then the total of all 8 scores is $14.5 \times 8 = 116$. If the mean of 7 scores is 12, then the total of all 7 scores is $12 \times 7 = 84$. Since the set of 7 scores was made by removing the highest score of the set of 8 scores, then the difference between the total of all 8 scores and the total of all 7 scores is equal to the removed score: $116 - 84 = 32$.

Choice A is incorrect because if 20 is removed from the group of 8 scores, then the mean score of the remaining 7 players is $\frac{(14.5 \times 8) - 20}{7}$ is approximately 13.71, not 12. Choice B is incorrect because if 24 is removed from the group of 8 scores, then the mean score of the remaining 7 players is $\frac{(14.5 \times 8) - 24}{7}$ is approximately 13.14, not 12. Choice D is incorrect because if 36 is removed from the group of 8 scores, then the mean score of the remaining 7 players is $\frac{(14.5 \times 8) - 36}{7}$ or approximately 11.43, not 12.

Question Difficulty: Hard

Question ID bf47ad54

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■ ■ ■

ID: bf47ad54

Each of the following frequency tables represents a data set. Which data set has the greatest mean?

A.

Value	Frequency
70	4
80	5
90	6
100	7

B.

Value	Frequency
70	6
80	6
90	6
100	6

C.

Value	Frequency
70	7
80	6
90	6
100	7

D.

Value	Frequency
70	8
80	5
90	5
100	8

Correct Answer: A

Rationale

Choice A is correct. The tables in choices B, C, and D each represent a data set where the values 80 and 90 have the same frequency and the values 70 and 100 have the same frequency. It follows that each of these data sets is symmetric around the value halfway between 80 and 90, or 85. When a data set is symmetric around a value, that value is the mean of the data set. Therefore, the data sets represented by the tables in choices B, C, and D each have a mean of 85. The table in choice A represents a data set where the value 90 has a greater frequency than the value 80 and the value 100 has a greater frequency than the value 70. It follows that this data set has a mean greater than 85. Therefore, of the given choices, choice A represents the data set with the greatest mean.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 4ff597db

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 4ff597db

The mean amount of time that the 20 employees of a construction company have worked for the company is 6.7 years. After one of the employees leaves the company, the mean amount of time that the remaining employees have worked for the company is reduced to 6.25 years. How many years did the employee who left the company work for the company?

A. 0.45

B. 2.30

C. 9.00

D. 15.25

ID: 4ff597db Answer

Correct Answer: D

Rationale

Choice D is correct. The mean amount of time that the 20 employees worked for the company is 6.7 years. This means that the total number of years all 20 employees worked for the company is (6.7)(20) = 134 years. After the employee left, the mean amount of time that the remaining 19 employees worked for the company is 6.25 years. Therefore, the total number of years all 19 employees worked for the company is (6.25)(19) = 118.75 years. It follows that the number of years that the employee who left had worked for the company is 134 − 118.75 = 15.25 years.

Choice A is incorrect; this is the change in the mean, which isn't the same as the amount of time worked by the employee who left. Choice B is incorrect and likely results from making the assumption that there were still 20 employees, rather than 19, at the company after the employee left and then subtracting the original mean of 6.7 from that result. Choice C is incorrect and likely results from making the assumption that there were still 20 employees, rather than 19, at the company after the employee left.

Question Difficulty: Hard

Question ID 98958ae8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■ ■ ■

ID: 98958ae8

Data set A consists of the heights of 75 objects and has a mean of 25 meters. Data set B consists of the heights of 50 objects and has a mean of 65 meters. Data set C consists of the heights of the 125 objects from data sets A and B. What is the mean, in meters, of data set C?

ID: 98958ae8 Answer

Correct Answer: 41

Rationale

The correct answer is 41. The mean of a data set is computed by dividing the sum of the values in the data set by the number of values in the data set. It's given that data set A consists of the heights of 75 objects and has a mean of 25 meters. This can be represented by the equation $\frac{x}{75} = 25$, where x represents the sum of the heights of the objects, in meters, in data set A. Multiplying both sides of this equation by 75 yields $x = 75 \cdot 25$, or $x = 1,875$ meters. Therefore, the sum of the heights of the objects in data set A is $1,875$ meters. It's also given that data set B consists of the heights of 50 objects and has a mean of 65 meters. This can be represented by the equation $\frac{y}{50} = 65$, where y represents the sum of the heights of the objects, in meters, in data set B. Multiplying both sides of this equation by 50 yields $y = 50 \cdot 65$, or $y = 3,250$ meters. Therefore, the sum of the heights of the objects in data set B is $3,250$ meters. Since it's given that data set C consists of the heights of the 125 objects from data sets A and B, it follows that the mean of data set C is the sum of the heights of the objects, in meters, in data sets A and B divided by the number of objects represented in data sets A and B, or $\frac{1,875 + 3,250}{125}$, which is equivalent to 41 meters. Therefore, the mean, in meters, of data set C is 41.

Question Difficulty: Hard

Question ID 391ae4b2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■ ■ ■

ID: 391ae4b2

Data set F consists of 55 integers between 170 and 290. Data set G consists of all the integers in data set F as well as the integer 10. Which of the following must be less for data set F than for data set G?

 I. The mean

 II. The median

A. I only

B. II only

C. I and II

D. Neither I nor II

ID: 391ae4b2 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that data set F consists of 55 integers between 170 and 290 and data set G consists of all the integers in data set F as well as the integer 10. Since the integer 10 is less than all the integers in data set F, the mean of data set G must be less than the mean of data set F. Thus, the mean of data set F isn't less than the mean of data set G. When a data set is in ascending order, the median is between the two middle values when there is an even number of values and the median is the middle value when there is an odd number of values. It follows that the median of data set F is either greater than or equal to the median of data set G. Therefore, the median of data set F isn't less than the median of data set G. Thus, neither the mean nor the median must be less for data set F than for data set G.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 9d935bd8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	∎∎∎

ID: 9d935bd8

Percent of Residents Who Earned a Bachelor's Degree or Higher

State	Percent of residents
State A	21.9%
State B	27.9%
State C	25.9%
State D	19.5%
State E	30.1%
State F	36.4%
State G	35.5%

A survey was given to residents of all 50 states asking if they had earned a bachelor's degree or higher. The results from 7 of the states are given in the table above. The median percent of residents who earned a bachelor's degree or higher for all 50 states was 26.95%. What is the difference between the median percent of residents who earned a bachelor's degree or higher for these 7 states and the median for all 50 states?

A. 0.05%

B. 0.95%

C. 1.22%

D. 7.45%

ID: 9d935bd8 Answer

Correct Answer: B

Rationale

Choice B is correct. The median of a set of numbers is the middle value of the set values when ordered from least to greatest. If the percents in the table are ordered from least to greatest, the middle value is 27.9%. The difference between 27.9% and 26.95% is 0.95%.

Choice A is incorrect and may be the result of calculation errors or not finding the median of the data in the table correctly. Choice C is incorrect and may be the result of finding the mean instead of the median. Choice D is incorrect and may be the result of using the middle value of the unordered list.

Question Difficulty: Hard

Question ID 54d93874

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■■■

ID: 54d93874

	Masses (kilograms)					
Andrew	2.4	2.5	3.6	3.1	2.5	2.7
Maria	x	3.1	2.7	2.9	3.3	2.8

Andrew and Maria each collected six rocks, and the masses of the rocks are shown in the table above. The mean of the masses of the rocks Maria collected is 0.1 kilogram greater than the mean of the masses of the rocks Andrew collected. What is the value of x ?

ID: 54d93874 Answer

Rationale

The correct answer is 2.6. Since the mean of a set of numbers can be found by adding the numbers together and dividing by how many numbers there are in the set, the mean mass, in kilograms, of the rocks Andrew collected is $\frac{2.4+2.5+3.6+3.1+2.5+2.7}{6} = \frac{16.8}{6}$, or 2.8. Since the mean mass of the rocks Maria collected is 0.1 kilogram greater than the mean mass of rocks Andrew collected, the mean mass of the rocks Maria collected is $2.8+0.1=2.9$ kilograms. The value of x can be found by writing an equation for finding the mean: $\frac{x+3.1+2.7+2.9+3.3+2.8}{6}=2.9$.

Solving this equation gives $x=2.6$. Note that 2.6 and 13/5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 94237701

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	■ ■ ■

For a certain computer game, individuals receive an integer score that ranges from 2 through 10. The table below shows the frequency distribution of the scores of the 9 players in group A and the 11 players in group B.

Score	Score Frequencies	
	Group A	Group B
2	1	0
3	1	0
4	2	0
5	1	4
6	3	2
7	0	0
8	0	2
9	1	1
10	0	2
Total	9	11

The median of the scores for group B is how much greater than the median of the scores for group A?

Rationale

The correct answer is 1. When there are an odd number of values in a data set, the median of the data set is the middle number when the data values are ordered from least to greatest. The scores for group A, ordered from least to greatest, are 2, 3, 4, 4, 5, 6, 6, 6, and 9. The median of the scores for group A is therefore 5. The scores for group B, ordered from least to

greatest, are 5, 5, 5, 5, 6, 6, 8, 8, 9, 10, and 10. The median of the scores for group B is therefore 6. The median score for group B is $6 - 5 = 1$ more than the median score for group A.

Question Difficulty: Hard