Question ID 4c774b00

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

ID: 4c774b00

Ages of 20 Students Enrolled in a College Class

Age	Frequency
18	6
19	5
20	4
21	2
22	1
23	1
30	1

The table above shows the distribution of ages of the 20 students enrolled in a college class. Which of the following gives the correct order of the mean, median, and mode of the ages?

A. mode < median < mean

B. mode < mean < median

C. median < mode < mean

D. mean < mode < median

ID: 4c774b00 Answer

Correct Answer: A

Rationale

Choice A is correct. The mode is the data value with the highest frequency. So for the data shown, the mode is 18. The median is the middle data value when the data values are sorted from least to greatest. Since there are 20 ages ordered, the median is the average of the two middle values, the 10th and 11th, which for these data are both 19. Therefore, the median is 19. The mean is the sum of the data values divided by the number of the data values. So for these data, the mean is

$$\frac{(18\times6)+(19\times5)+(20\times4)+(21\times2)+(22\times1)+(23\times1)+(30\times1)}{20}=20$$

Since the mode is 18, the median is 19, and the mean is 20, $\text{mode} < \text{median} < \text{mean}$.

Choices B and D are incorrect because the mean is greater than the median. Choice C is incorrect because the median is greater than the mode.

Alternate approach: After determining the mode, 18, and the median, 19, it remains to determine whether the mean is less than 19 or more than 19. Because the mean is a balancing point, there is as much deviation below the mean as above the mean. It is possible to compare the data to 19 to determine the balance of deviation above and below the mean. There is a total deviation of only 6 below 19 (the 6 values of 18); however, the data value 30 alone deviates by 11 above 19. Thus the mean must be greater than 19.

Question Difficulty: Medium

Question ID 3f2ee20a

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

ID: 3f2ee20a

The results of two independent surveys are shown in the table below.

Men's Height

Group	Sample size	Mean (centimeters)	Standard deviation (centimeters)
A	2,500	186	12.5
B	2,500	186	19.1

Which statement is true based on the table?

A. The Group A data set was identical to the Group B data set.

B. Group B contained the tallest participant.

C. The heights of the men in Group B had a larger spread than the heights of the men in Group A.

D. The median height of Group B is larger than the median height of Group A.

ID: 3f2ee20a Answer

Correct Answer: C

Rationale

Choice C is correct. Standard deviation is a measure of spread, so data sets with larger standard deviations tend to have larger spread. The standard deviation of the heights of the men in Group B is larger than the standard deviation of the heights of the men in Group A. Therefore, the heights of the men in Group B had a larger spread than the heights of the men in Group A.

Choice A is incorrect. If two data sets are identical, they will have equivalent means and equivalent standard deviations. Since the two data sets have different standard deviations, they cannot be identical. Choice B is incorrect. Without knowing the maximum value for each data set, it's impossible to know which group contained the tallest participant. Choice D is incorrect. Since the means of the two groups are equivalent, the medians could also be the same or could be different, but it's impossible to tell from the given information.

Question Difficulty: Medium

Question ID d0efc1dd

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

ID: d0efc1dd

15, 14, 18, 17, *x*

The mean and the median of the five numbers above are equal. Which of the following is NOT a possible value of *x* ?

A. 6

B. 11

C. 16

D. 21

ID: d0efc1dd Answer

Correct Answer: A

Rationale

Choice A is correct. If x is 6, then the five numbers in the given list are 15, 14, 18, 17, 6. The mean of these five numbers is the sum of all the values divided by the number of values, or $\frac{15+14+18+17+6}{5}=\frac{70}{5}=14$.

The median of these five numbers can be found by ordering the numbers from least to greatest and determining the middle value. When ordered from least to greatest, the numbers in the given list are 6, 14, 15, 17, 18, and the middle value is 15. Since the mean is 14 and the median is 15, the mean and median aren't equal when x is 6.

Choices B, C, and D are incorrect. If any of these values is substituted for x, the mean and median of the data set would be equal.

Question Difficulty: Medium

Question ID 07f2829b

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

ID: 07f2829b

International Tourist Arrivals, in millions

Country	2012	2013
France	83.0	84.7
United States	66.7	69.8
Spain	57.5	60.7
China	57.7	55.7
Italy	46.4	47.7
Turkey	35.7	37.8
Germany	30.4	31.5
United Kingdom	26.3	32.2
Russia	24.7	28.4

The table above shows the number of international tourist arrivals, rounded to the nearest tenth of a million, to the top nine tourist destinations in both 2012 and 2013. Based on the information given in the table, how much greater, in millions, was the median number of international tourist arrivals to the top nine tourist destinations in 2013 than the median number in 2012, to the nearest tenth of a million?

ID: 07f2829b Answer

Rationale

The correct answer is 1.3. The median number of tourists is found by ordering the number of tourists from least to greatest and determining the middle value from this list. When the number of tourists in 2012 is ordered from least to greatest, the middle value, or the fifth number, is 46.4 million. When the number of tourists in 2013 is ordered from least to greatest, the middle value, or the fifth number, is 47.7 million. The

difference between these two medians is $47.7 \text{ million} - 46.4 \text{ million} = 1.3 \text{ million}$. Note that 1.3 and 13/10 are examples of ways to enter a correct answer.

Question Difficulty: Medium

Question ID 7b65bb28

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

ID: 7b65bb28

Station 1	Station 2	Station 3	Station 4	Station 5
$3.699	$3.609	$3.729	$3.679	$3.729

In the table above, Melissa recorded the price of one gallon of regular gas from five different local gas stations on the same day. What is the median of the gas prices Melissa recorded?

A. $3.679

B. $3.689

C. $3.699

D. $3.729

ID: 7b65bb28 Answer

Correct Answer: C

Rationale

Choice C is correct. The median of a data set is the middle value when the data is in ascending or descending order. In ascending order, the gas prices are $3.609, $3.679, $3.699, $3.729, and $3.729. The middle number of this list is 3.699, so it follows that $3.699 is the median gas price.

Choice A is incorrect. When the gas prices are listed in ascending order, this value isn't the middle number. Choice B is incorrect. This value represents the mean gas price. Choice D is incorrect. This value represents both the mode and the maximum gas price.

Question Difficulty: Medium

Question ID be00d896

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

ID: be00d896

For which of the following data sets is the mean greater than the median?

A. 5, 5, 5, 5, 5, 5, 5, 5, 5

B. 0, 10, 20, 30, 40, 50, 60, 70, 80

C. 2, 4, 8, 16, 32, 64, 128, 256, 512

D. 7, 107, 107, 207, 207, 207, 307, 307, 307

ID: be00d896 Answer

Correct Answer: C

Rationale

Choice C is correct. If the values in a data set are ordered from least to greatest, the median of the data set will be the middle value. Since each data set in the choices is ordered and contains exactly 9 data values, the 5th value in each is the median. It follows that the median of the data set in choice C is 32. The sum of the positive differences between 32 and each of the values that are less than 32 is significantly smaller than the sum of the positive differences between 32 and each of the values that are greater than 32. If 32 were the mean, these sums would have been equal to each other. Therefore, the mean of this data set must be greater than 32. This can also be confirmed by calculating the mean as the sum of the values divided by the number of values in the data set: $\frac{2 + 4 + 8 + 16 + 32 + 64 + 128 + 256 + 512}{9} = 113\frac{5}{9}$.

Choices A and B are incorrect. Each of the data sets in these choices is symmetric with respect to its median, so the mean and the median for each of these choices are equivalent. Choice D is incorrect. The median of this data set is 207. Since the sum of the positive differences between 207 and each of the values less than 207 is greater than the sum of the positive differences between 207 and each value greater than 207 in this data set, the mean must be less than the median.

Question Difficulty: Medium

Question ID 5c3c2e3c

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

ID: 5c3c2e3c

The weights, in pounds, for 15 horses in a stable were reported, and the mean, median, range, and standard deviation for the data were found. The horse with the lowest reported weight was found to actually weigh 10 pounds less than its reported weight. What value remains unchanged if the four values are reported using the corrected weight?

A. Mean

B. Median

C. Range

D. Standard deviation

ID: 5c3c2e3c Answer

Correct Answer: B

Rationale

Choice B is correct. The median weight is found by ordering the horses' weights from least to greatest and then determining the middle value from this list of weights. Decreasing the value for the horse with the lowest weight doesn't affect the median since it's still the lowest value.

Choice A is incorrect. The mean is calculated by finding the sum of all the weights of the horses and then dividing by the number of horses. Decreasing one of the weights would decrease the sum and therefore decrease the mean. Choice C is incorrect. Range is the difference between the highest and lowest weights, so decreasing the lowest weight would increase the range. Choice D is incorrect. Standard deviation is calculated based on the mean weight of the horses. Decreasing one of the weights decreases the mean and therefore would affect the standard deviation.

Question Difficulty: Medium

Question ID 9110c120

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

ID: 9110c120

Data set A: 5, 5, 5, 5, 5, 5, 5, 5, 5, 5

Data set B: 5, 5, 5, 5, 5, 5, 5, 5, 5, 100

Which of the following statements about the means and medians of data set A and data set B is true?

A. Only the means are different.

B. Only the medians are different.

C. Both the means and the medians are different.

D. Neither the means nor the medians are different.

ID: 9110c120 Answer

Correct Answer: A

Rationale

Choice A is correct. The mean of a data set is the sum of the values divided by the number of values. The mean of data set A is $\frac{45}{9}$, or 5. The mean of data set B is $\frac{145}{10}$, or 14.5. Thus, the means are different. The median of a data set is the middle value when the values are ordered from least to greatest. The medians of data sets A and B are both 5. Therefore, the medians are the same, so only the means are different.

Choices B, C, and D are incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium

Question ID 881ef5f5

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

ID: 881ef5f5

If *a* is the mean and *b* is the median of nine consecutive integers, what is the value of $|a-b|$?

ID: 881ef5f5 Answer

Rationale

The correct answer is 0. Any nine consecutive integers can be written as $k, k+1, k+2, k+3, k+4, k+5, k+6, k+7, k+8$. The mean of the integers is their sum divided by 9: $\frac{(k+k+1+k+2+...+k+8)}{9} = \frac{(9k+36)}{9}$, which simplifies to $k+4$. So $a = k+4$. Since there is an odd number of integers (nine), the median is the integer in the middle when all the integers are ordered from least to greatest: $k+4$. So $b = k+4$. Therefore, $|a-b| = |(k+4)-(k+4)|$, which is 0.

Question Difficulty: Medium

Question ID 9e2bf782

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

ID: 9e2bf782

A fish hatchery has three tanks for holding fish before they are introduced into the wild. Ten fish weighing less than 5 ounces are placed in tank A. Eleven fish weighing at least 5 ounces but no more than 13 ounces are placed in tank B. Twelve fish weighing more than 13 ounces are placed in tank C. Which of the following could be the median of the weights, in ounces, of these 33 fish?

A. 4.5

B. 8

C. 13.5

D. 15

ID: 9e2bf782 Answer

Correct Answer: B

Rationale

Choice B is correct. The median of a set of numbers is the middle number when the values in the set are ordered from least to greatest. There are 33 fish, so in an ordered list of the weights, the 17th value would be the median weight. The 10 fish in tank A weigh the least, and these 10 weights would be the first 10 values on the ordered list. The 11 fish in tank B have the next set of higher weights, and so would be the 11th through 21st weights in the ordered list, which includes the median weight as the 17th value. The fish in tank B weigh at least 5 ounces but no more than 13 ounces; of the given choices, only 8 ounces falls within this range of values.

Choice A is incorrect. It's given that tank A has ten fish weighing less than 5 ounces. Since there are more than ten fish in tanks B and C combined, the median weight cannot be less than 5 ounces. Choice C and D are incorrect. It's given that tank C has twelve fish weighing more than 13 ounces. There are more than twelve fish in tanks A and B combined, so the median weight can't be more than 13 ounces.

Question Difficulty: Medium

Question ID 8193e8cd

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

ID: 8193e8cd

2, 10, 3, 7, 6

The mean of the list of numbers above is what fraction of the sum of the five numbers?

ID: 8193e8cd Answer

Rationale

The correct answer is $\frac{1}{5}$. The mean of the list of numbers is found by dividing the sum of the numbers by the number of values in the list. Since there are 5 numbers in the list, the mean is $\frac{1}{5}$ of the sum of the numbers.

Note that 1/5 and .2 are examples of ways to enter a correct answer.

Question Difficulty: Medium