



One-Variable Data Analysis Multiple Choice Practice Problems for AP Statistics

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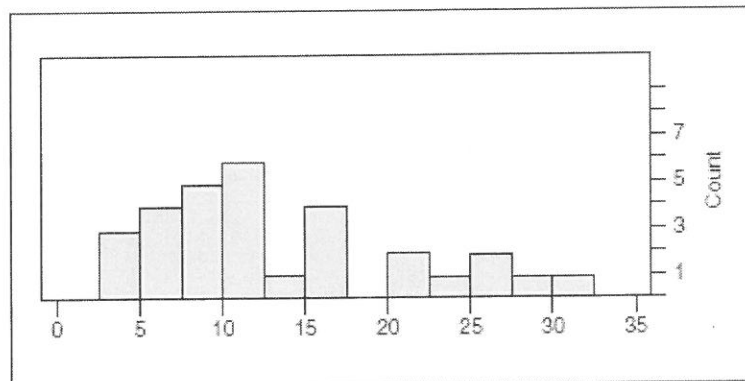
Review the following concepts if necessary:

- [Graphical Analysis for AP Statistics](#)
- [Histogram for AP Statistics](#)
- [Measures of Center for AP Statistics](#)
- [Measures of Spread for AP Statistics](#)
- [Position of a Term in a Distribution for AP Statistics](#)
- [Normal Distribution for AP Statistics](#)

Problems

1. The following list is ordered from smallest to largest: 25, 26, 26, 30, y , y , y , 33, 150. Which of the following statements is (are) true?
 - I. The mean is greater than the median
 - II. The mode is 26
 - III. There are no outliers in the data
 - a. I only
 - b. I and II only
 - c. III only
 - d. I and III only
 - e. II and III only
2. Jenny is 5'10" tall and is worried about her height. The heights of girls in the school are approximately normally distributed with a mean of 5'5" and a standard deviation of 2.6". What is the percentile rank of Jenny's height?
 - a. 59
 - b. 65
 - c. 74
 - d. 92
 - e. 97
3. The mean and standard deviation of a normally distributed dataset are 19 and 4, respectively. 19 is subtracted from every term in the dataset and then the result is divided by 4. Which of the following best describes the resulting distribution?
 - a. It has a mean of 0 and a standard deviation of 1.

- b. It has a mean of 0, a standard deviation of 4, and its shape is normal.
- c. It has a mean of 1 and a standard deviation of 0.
- d. It has a mean of 0, a standard deviation of 1, and its shape is normal.
- e. It has a mean of 0, a standard deviation of 4, and its shape is unknown.
4. The five-number summary for a one-variable dataset is {5, 18, 20, 40, 75}. If you wanted to construct a modified boxplot for the dataset (that is, one that would show outliers if there are any), what would be the maximum possible length of the right side "whisker"?
- 35
 - 33
 - 5
 - 55
 - 53
5. A set of 5,000 scores on a college readiness exam are known to be approximately normally distributed with mean 72 and standard deviation 6. To the nearest integer value, how many scores are there between 63 and 75?
- 0.6247
 - 4,115
 - 3,650
 - 3,123
 - 3,227
6. For the data given in #5 above, suppose you were not told that the scores were approximately normally distributed. What can be said about the number of scores that are less than 58 (to the nearest integer)?
- There are at least 919 scores less than 58.
 - There are at most 919 scores less than 58.
 - There are approximately 919 scores less than 58.
 - There are at most 459 scores less than 58.
 - There are at least 459 scores less than 58.
7. The following histogram pictures the number of students who visited the Career Center each week during the school year.



The shape of this graph could best be described as

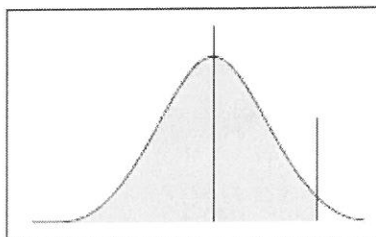
- Mound-shaped and symmetric

- b. Bi-modal
 - c. Skewed to the left
 - d. Uniform
 - e. Skewed to the right
8. Which of the following statements is (are) true?
- I. The median is resistant to extreme values.
 - II. The mean is resistant to extreme values.
 - III. The standard deviation is resistant to extreme values.
- a. I only
 - b. II only
 - c. III only
 - d. II and III only
 - e. I and III only
9. One of the values in a normal distribution is 43 and its z-score is 1.65. If the mean of the distribution is 40, what is the standard deviation of the distribution?
- a. 3
 - b. -1.82
 - c. -0.55
 - d. 1.82
 - e. -0.55
10. Free-response questions on the AP Statistics Exam are graded on 4, 3, 2, 1, or 0 basis. Question #2 on the exam was of moderate difficulty. The average score on question #2 was 2.05 with a standard deviation of 1. To the nearest tenth, what score was achieved by a student who was at the 90th percentile of all students on the test? You may assume that the scores on the question were approximately normally distributed.
- a. 3.5
 - b. 3.3
 - c. 2.9
 - d. 3.7
 - e. 3.1

Solutions

1. The correct answer is (a). I is correct since the mean is pulled in the direction of the large maximum value, 150 (well, large compared to the rest of the numbers in the set). II is not correct because the mode is y —there are three y s and only two 26s. III is not correct because 150 is an outlier (you can't actually compute the upper boundary for an outlier since the third quartile is y , but even if you use a larger value, 33, in place of y , 150 is still an outlier).
2. The correct answer is (e).

$$z = \frac{70 - 65}{2.6} = 1.92 \rightarrow \text{percentile} = 0.9726 \text{ (see drawing below):}$$



(On the TI-83/84, $\text{normalcdf}(-100, 1.92) = \text{normalcdf}(-1000, 70, 65, 206) = 0.9726$ up to rounding error.)

3. The correct answer is (d). The effect on the mean of a dataset of subtracting the same value is to reduce the old mean by that amount (that is, $\mu_{x-k} = \mu_x - k$). Because the original mean was 19, and 19 has been subtracted from every term, the new mean is 0. The effect on the standard deviation of a dataset of dividing each term by the same value is to divide the standard deviation by that value, that is,

$$\sigma_{x/k} = \frac{\sigma_x}{k}$$

Because the old standard deviation was 4, dividing every term by 4 yields a new standard deviation of 1. Note that the process of subtracting the mean from each term and dividing by the standard deviation creates a set of z-scores

$$z_x = \frac{x - \bar{x}}{s}$$

so that any complete set of z-scores has a mean of 0 and a standard deviation of 1. The shape is normal since any linear transformation of a normal distribution will still be normal.

4. The correct answer is (b). The maximum length of a "whisker" in a modified boxplot is $1.5(\text{IQR}) = 1.5(40 - 18) = 33$.
5. The correct (best) answer is (d). Using Table A, the area under a normal curve between 63 and 75 is 0.6247 ($z_{63} = -1.5 \Rightarrow A_1 = 0.0668$, $z_{75} = 0.5 \Rightarrow A_2 = 0.6915 \Rightarrow A_2 - A_1 = 0.6247$). Then $(0.6247)(5,000) = 3123.5$. Using the TI-83/84, $\text{normalcdf}(63, 75, 72, 6) \times 5000 = 3123.3$.
6. The correct answer is (b). Since we do not know that the empirical rule applies, we must use Chebyshev's rule. Since $72 - k(6) = 58$, we find $k = 2.333$. Hence, there are at most $\frac{1}{2.333^2} \% = 18.37\%$ of the scores less than 58. Since there are 5000 scores, there are at most $(0.1837)(5,000) = 919$ scores less than 58. Note that it is unlikely that there are this many scores below 58 (since some of the 919 scores could be more than 2.333 standard deviation above the mean)—it's just the strongest statement we can make.
7. The correct answer is (e). The graph is clearly not symmetric, bi-modal, or uniform. It is skewed to the right since that's the direction of the "tail" of the graph.

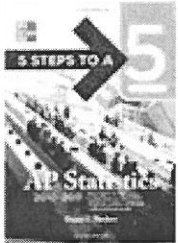
8. The correct answer is (a). The median is resistant to extreme values, and the mean is not (that is, extreme values will exert a strong influence on the numerical value of the mean but not on the median). II and III involve statistics equal to or dependent upon the mean, so neither of them is resistant.

9. The correct answer is (d). $z = 1.65 = \frac{43 - 40}{\sigma} \Rightarrow \sigma = \frac{3}{1.65} = 1.82$.

10. The correct answer is (b). A score at the 90th percentile has a z-score of 1.28.

Thus, $z_x = \frac{x - 2.05}{1} = 1.28 \Rightarrow x = 3.33$.

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