Questions on Topic Two: Summarizing Distributions

Multiple-Choice Questions

Directions: The questions or incomplete statements that follow are each followed by five suggested answers or completions. Choose the response that best answers the question or completes the statement.

1. In the second game of the 1989 World Series between Oakland and San Francisco (played 2 days before the northern California earthquake postponed the series), ten players went hitless, eight players had one hit apiece, and one player (Rickey Henderson) had three hits. What were the mean and median number of hits?

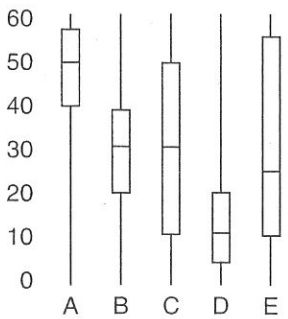
   (A) 11/19, 0
   (B) 11/19, 1
   (C) 1, 1
   (D) 0, 1
   (E) 1, 0

2. Which of the following are true statements?

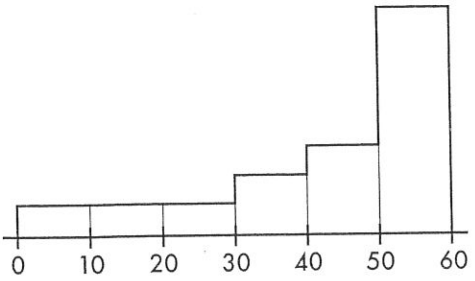
   I. The range of the sample data set is never greater than the range of the population.
   II. The interquartile range is half the distance between the first quartile and the third quartile.
   III. While the range is affected by outliers, the interquartile range is not.

   (A) I only
   (B) II only
   (C) III only
   (D) I and II
   (E) I and III

Problems 3–5 refer to the following five boxplots.

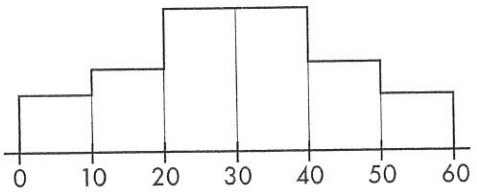


3. To which of the above boxplots does the following histogram correspond?



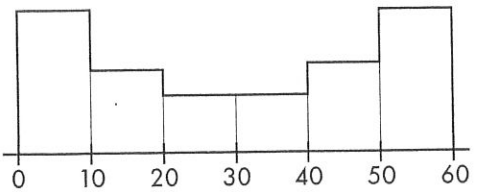
(A) A
(B) B
(C) C
(D) D
(E) E

4. To which of the above boxplots does the following histogram correspond?



(A) A
(B) B
(C) C
(D) D
(E) E

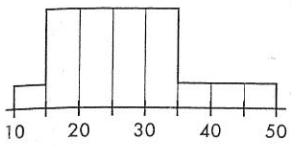
5. To which of the above boxplots does the following histogram correspond?



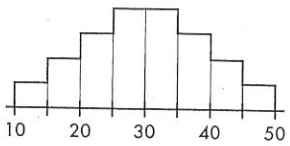
(A) A
(B) B
(C) C
(D) D
(E) E

Problems 6–8 refer to the following five histograms:

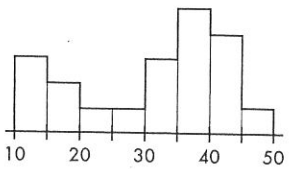
(A)



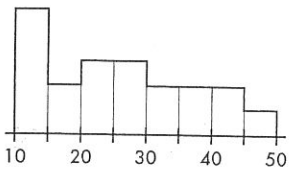
(B)



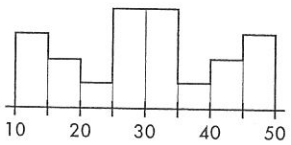
(C)



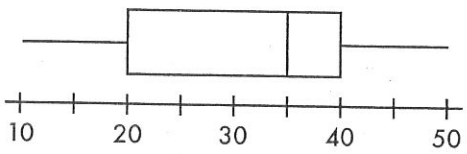
(D)



(E)

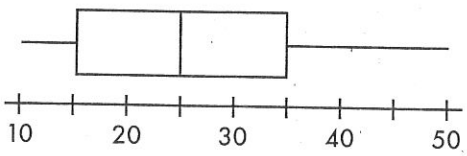


6. To which of the above histograms does the following boxplot correspond?



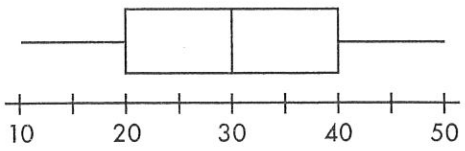
(A) A
(B) B
(C) C
(D) D
(E) E

7. To which of the above histograms does the following boxplot correspond?



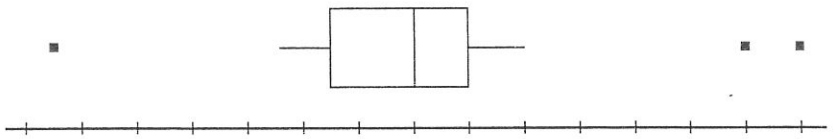
(A) A
(B) B
(C) C
(D) D
(E) E

8. To which of the above histograms does the following boxplot correspond?



(A) A
(B) B
(C) C
(D) D
(E) E

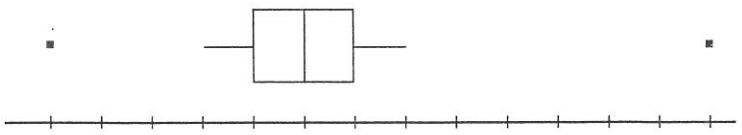
9. Below is a boxplot of CO_2 levels (in grams per kilometer) for a sampling of 2008 vehicles.



Suppose follow-up testing determines that the low outlier should be 10 grams per kilometer less and the two high outliers should each be 5 grams per kilometer greater. What effect, if any, will these changes have on the mean and median CO_2 levels?

(A) Both the mean and median will be unchanged.
(B) The median will be unchanged, but the mean will increase.
(C) The median will be unchanged, but the mean will decrease.
(D) The mean will be unchanged, but the median will increase.
(E) Both the mean and median will change.

10. Below is a boxplot of yearly tuition and fees of all four year colleges and universities in a Western state. The low outlier is from a private university that gives full scholarships to all accepted students, while the high outlier is from a private college catering to the very rich.



Removing both outliers will effect what changes, if any, on the mean and median costs for this state's four year institutions of higher learning?

(A) Both the mean and the median will be unchanged.
(B) The median will be unchanged, but the mean will increase.
(C) The median will be unchanged, but the mean will decrease.
(D) The mean will be unchanged, but the median will increase.
(E) Both the mean and median will change.

11. Suppose the average score on a national test is 500 with a standard deviation of 100. If each score is increased by 25, what are the new mean and standard deviation?

(A) 500, 100
(B) 500, 125
(C) 525, 100
(D) 525, 105
(E) 525, 125

12. Suppose the average score on a national test is 500 with a standard deviation of 100. If each score is increased by 25%, what are the new mean and standard deviation?

(A) 500, 100
(B) 525, 100
(C) 625, 100
(D) 625, 105
(E) 625, 125

13. If quartiles $Q_1 = 20$ and $Q_3 = 30$, which of the following must be true?

I. The median is 25.
II. The mean is between 20 and 30.
III. The standard deviation is at most 10.

(A) I only
(B) II only
(C) III only
(D) All are true.
(E) None are true.

14. A 1995 poll by the Program for International Policy asked respondents what percentage of the U.S. budget they thought went to foreign aid. The mean response was 18%, and the median was 15%. (The actual amount is less than 1%.) What do these responses indicate about the likely shape of the distribution of all the responses?

(A) The distribution is skewed to the left.
(B) The distribution is skewed to the right.
(C) The distribution is symmetric around 16.5%.
(D) The distribution is bell-shaped with a standard deviation of 3%.
(E) The distribution is uniform between 15% and 18%.

15. Assuming that batting averages have a bell-shaped distribution, arrange in ascending order:

I. An average with a z-score of -1.
II. An average with a percentile rank of 20%.
III. An average at the first quartile, Q_1.

(A) I, II, III
(B) III, I, II
(C) II, I, III
(D) II, III, I
(E) III, II, I

16. Which of the following are true statements?

I. If the sample has variance zero, the variance of the population is also zero.
II. If the population has variance zero, the variance of the sample is also zero.
III. If the sample has variance zero, the sample mean and the sample median are equal.

(A) I and II
(B) I and III
(C) II and III
(D) I, II, and III
(E) None of the above gives the complete set of true responses.

17. When there are multiple gaps and clusters, which of the following is the best choice to give an overall picture of a distribution?

(A) Mean and standard deviation
(B) Median and interquartile range
(C) Boxplot with its five-number summary
(D) Stemplot or histogram
(E) None of the above are really helpful in showing gaps and clusters.

18. Suppose the starting salaries of a graduating class are as follows:

Number of Students	Starting Salary ($)
10	15,000
17	20,000
25	25,000
38	30,000
27	35,000
21	40,000
12	45,000

What is the mean starting salary?

(A) $30,000
(B) $30,533
(C) $32,500
(D) $32,533
(E) $35,000

19. When a set of data has suspect outliers, which of the following are preferred measures of central tendency and of variability?

(A) mean and standard deviation
(B) mean and variance
(C) mean and range
(D) median and range
(E) median and interquartile range

20. If the standard deviation of a set of observations is 0, you can conclude

(A) that there is no relationship between the observations.
(B) that the average value is 0.
(C) that all observations are the same value.
(D) that a mistake in arithmetic has been made.
(E) none of the above.

21. A teacher is teaching two AP Statistics classes. On the final exam, the 20 students in the first class averaged 92 while the 25 students in the second class averaged only 83. If the teacher combines the classes, what will the average final exam score be?

(A) 87
(B) 87.5
(C) 88
(D) None of the above
(E) More information is needed to make this calculation.

22. The 60 longest rivers in the world have lengths distributed as follows:

Length (mi):	1000–1499	1500–1999	2000–2499	2500–2999	3000–3499	3500–3999	4000–4499
Number of rivers:	21	22	4	8	2	2	1

(The Nile is the longest with a length of 4145 miles, and the Amazon is the second longest at 3900 miles.)

Which of the following best describes these data?

(A) Skewed distribution, mean greater than median
(B) Skewed distribution, median greater than mean
(C) Symmetric distribution, mean greater than median
(D) Symmetric distribution, median greater than mean
(E) Symmetric distribution with outliers on high end

23. In 1993 the seven states with the fewest business bankruptcies were Vermont (900), Alaska (1000), North Dakota (1100), Wyoming (1300), South Dakota (1400), Hawaii (1500), and Delaware (1600).

    Which of the following are reasonable conclusions about the distribution of bankruptcies throughout the 50 states in 1993?

    I. The total number of bankruptcies in the United States in 1993 was approximately 50(1300) = 65,000.
    II. Because of these low values, the distribution was skewed to the left.
    III. The range of the distribution was approximately 50(1600 – 1000) = 30,000.

    (A) I only
    (B) II only
    (C) III only
    (D) All are reasonable.
    (E) None are reasonable.

24. Suppose 10% of a data set lie between 40 and 60. If 5 is first added to each value in the set and then each result is doubled, which of the following is true?

    (A) 10% of the resulting data will lie between 85 and 125.
    (B) 10% of the resulting data will lie between 90 and 130.
    (C) 15% of the resulting data will lie between 80 and 120.
    (D) 20% of the resulting data will lie between 45 and 65.
    (E) 30% of the resulting data will lie between 85 and 125.

25. A stemplot for the 1988 per capita personal income (in hundreds of dollars) for the 50 states is

11	0	7									
12	6	2	7	8	2	7	5	7	8	5	0
13	3	7	7								
14	9	7	8	1	6						
15	0	9	0	5	2	5	0	4	4		
16	4	5	9	4	8	2	8	6			
17	7	6	4	6							
18	9										
19	5	3	0	3							
20	7										
21	9										
22	8										

    Which of the following best describes these data?

    (A) Skewed distribution, mean greater than median
    (B) Skewed distribution, median greater than mean
    (C) Symmetric distribution, mean greater than median
    (D) Symmetric distribution, median greater than mean
    (E) Symmetric distribution with outliers on high end

26. Which of the following statements are true?

I. If the right and left sides of a histogram are mirror images of each other, the distribution is symmetric.
II. A distribution spread far to the right side is said to be skewed to the right.
III. If a distribution is skewed to the right, its mean is often greater than its median.

(A) I only
(B) I and II
(C) I and III
(D) II and III
(E) None of the above gives the complete set of true responses.

27. Which of the following statements are true?

I. In a stemplot the number of leaves equals the size of the set of data.
II. Both the dotplot and the stemplot are useful in identifying outliers.
III. Histograms do not retain the identity of individual scores; however, dotplots, stemplots, and boxplots all do.

(A) I and II
(B) I and III
(C) II and III
(D) I, II, and III
(E) None of the above gives the complete set of true responses.

28. The 70 highest dams in the world have an average height of 206 meters with a standard deviation of 35 meters. The Hoover and Grand Coulee dams have heights of 221 and 168 meters, respectively. The Russian dams, the Nurek and Charvak, have heights with z-scores of +2.69 and –1.13, respectively. List the dams in order of ascending size.

(A) Charvak, Grand Coulee, Hoover, Nurek
(B) Charvak, Grand Coulee, Nurek, Hoover
(C) Grand Coulee, Charvak, Hoover, Nurek
(D) Grand Coulee, Charvak, Nurek, Hoover
(E) Grand Coulee, Hoover, Charvak, Nurek

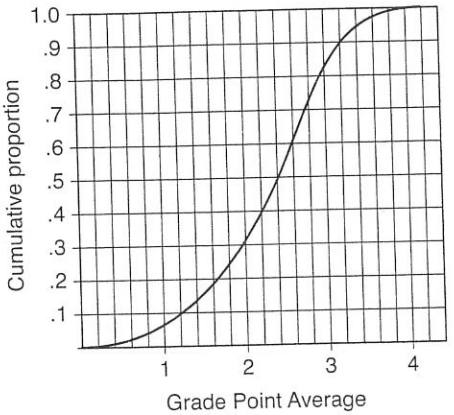
29. According to *Consumer Reports* magazine, the costs per pound of protein for 20 major-brand beef hot dogs are \$14.23, \$21.70, \$14.49, \$20.49, \$14.47, \$15.45, \$25.25, \$24.02, \$18.86, \$18.86, \$30.65, \$25.62, \$8.12, \$12.74, \$14.21, \$13.39, \$22.31, \$19.95, \$22.90, and \$19.78, respectively. If the least expensive is considered the top-ranked, what is the position in terms of a z-score of Thorn Apple Valley beef hot dogs at \$14.23 per pound of protein?

(A) –2.67
(B) –0.85
(C) 0.85
(D) 1.42
(E) 2.67

30. The first 115 Kentucky Derby winners by color of horse were as follows: roan, 1; gray, 4; chestnut, 36; bay, 53; dark bay, 17; and black, 4. (You should "bet on the bay!") Which of the following visual displays is most appropriate?

(A) Bar chart
(B) Histogram
(C) Stemplot
(D) Boxplot
(E) Time plot

For Questions 31 and 32 consider the following: The graph below shows cumulative proportions plotted against grade point averages for a large public high school.



31. What is the median grade point average?

(A) 0.8
(B) 2.0
(C) 2.4
(D) 2.5
(E) 2.6

32. What is the interquartile range?

(A) 1.0
(B) 1.8
(C) 2.4
(D) 2.8
(E) 4.0

Answer Key

1. **A**	8. **E**	15. **A**	22. **A**	29. **B**
2. **E**	9. **A**	16. **C**	23. **E**	30. **A**
3. **A**	10. **C**	17. **D**	24. **B**	31. **C**
4. **B**	11. **C**	18. **B**	25. **A**	32. **A**
5. **C**	12. **E**	19. **E**	26. **E**	
6. **C**	13. **E**	20. **C**	27. **A**	
7. **D**	14. **B**	21. **A**	28. **A**	