

Questions 18 and 19 refer to the following scenario and numerical information.

Eighty runners took part in a cross country race. Their times are summarized in the table below.

Time (minutes)	16	18	20	22	24	26	28	30	32
Cumulative Relative Frequency	0.000	0.0750	0.2625	0.5125	0.7125	0.8250	0.9375	0.9750	1.000

(The cumulative relative frequencies refer to the proportions of runners whose times were less than or equal to the times given.)

18. How many runners had times that were more than 20 minutes and at most 22 minutes?

- (A) 10 (B) 20 (C) 30 (D) 40 (E) 50

Answer

19. Which of the following could be the interquartile range of the times?

- (A) 3 minutes, 50 seconds
(B) 4 minutes, 40 seconds
(C) 8 minutes, 20 seconds
(D) 10 minutes, 30 seconds
(E) 12 minutes, 10 seconds

Answer

20. A random sample of 50 Brand A light bulbs and an independent random sample of 45 Brand B light bulbs were selected, and the lives (in hours) of the bulbs in the samples were measured. The partial computer output below shows the results of a test of $H_0: \mu_A = \mu_B$ versus $H_a: \mu_A \neq \mu_B$.

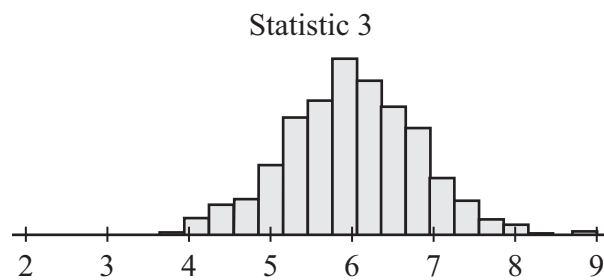
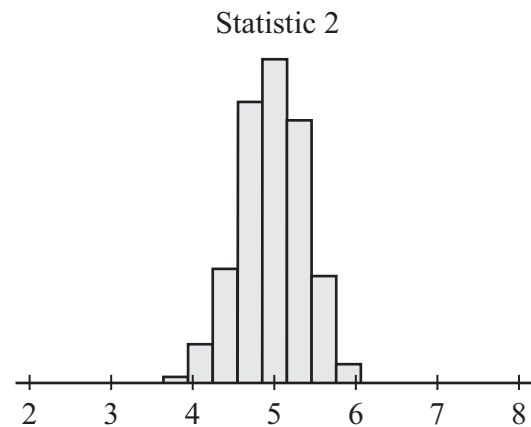
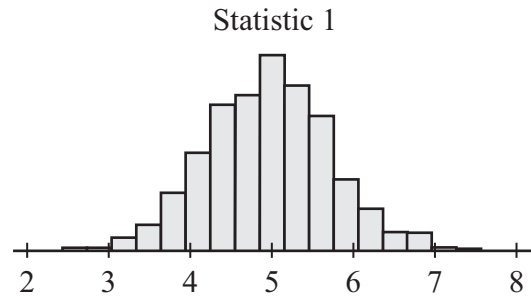
Two-sample T for Brand A vs Brand B				
	N	Mean	StDev	SE Mean
Brand A	50	907.6	60.2	8.5
Brand B	45	890.8	46.0	6.9
Difference = mu (Brand A) - mu (Brand B)				
T-Test of difference = 0 (vs not =):				
T-Value = 1.54 P-Value = 0.127 DF = 90				

Which of the following is NOT true?

- (A) H_0 is not rejected at the 0.05 significance level.
- (B) The value 1.54 is less than the positive critical value of a t distribution with 90 degrees of freedom for a single-tail probability of 0.025.
- (C) A 95% two-sample t confidence interval based on these results would contain zero.
- (D) If the population means were equal, the probability of getting a t statistic whose absolute value is at least 1.54 would be 0.127.
- (E) Given a difference in sample means of 16.8, the probability that the population means are equal is 0.127.

Answer

21. Three statistics, Statistic 1, Statistic 2, and Statistic 3, are to be compared as estimators of a particular population parameter. To estimate the behavior of the statistics, 600 random samples are selected from the population, and the value of each statistic is calculated for each sample. The true value of the population parameter is 5. The distributions of the values of the three statistics are shown in the graphs below.



The three statistics are to be listed in order of preference, with the best statistic first in the list. Which of the following is correct?

- (A) 1, 2, 3 (B) 2, 1, 3 (C) 1, 3, 2 (D) 3, 1, 2 (E) 2, 3, 1

Answer

22. A simple random sample of size 50 is selected from a population, and a measurement is taken for each individual in the sample. These results will be used to test the null hypothesis $H_0: \mu = 8$ versus the alternative hypothesis $H_a: \mu > 8$. A significance level of $\alpha = 0.05$ will be used for the test. Assuming that the true value of the population mean, μ , is greater than 8, which of the following would produce a test that has greater power than the one given above?
- I. Changing the significance level to $\alpha = 0.1$
 - II. Changing the alternative hypothesis to $H_a: \mu \neq 8$
 - III. Increasing the sample size to 100
- (A) I only (B) II only (C) III only (D) I and III (E) II and III

Answer

23. A survey is to be designed in order to estimate some quantities associated with a population. Which of the following is NOT true?
- (A) A census will always be more representative of the population than a sample.
 - (B) How well a sample will represent the population is influenced by the quality of the sampling method used.
 - (C) How well a random sample will represent the population is partly a matter of chance.
 - (D) A simple random sample will always represent the population better than a systematic sample.
 - (E) A convenience sample is unlikely to be representative of the population.

Answer

24. In a particular state, it is known that 40% of daily trips are for shopping or running errands, 30% are for social or recreational purposes, 18% are for commuting to work, and 12% are for other purposes. A survey in one town within the state included 500 daily trips, of which 192 were for shopping or running errands, 133 were for social or recreational purposes, 118 were for commuting to work, and 57 were for other purposes. A hypothesis test is conducted in order to find out whether the pattern of daily trips for the town differs from the pattern for the state as a whole. (The test is based on the assumption that the 500 daily trips in the survey form a random sample of the daily trips for the town.) What is the value of the test statistic?
- (A) 1.59 (B) 5.03 (C) 8.23 (D) 9.31 (E) 11.11

Answer

25. It is known that one-fifth of the vehicles that pass a particular intersection are commercial vehicles, and that the vehicles pass this intersection independently. A student is planning to stand at the intersection and count the vehicles that pass up to and including the first commercial vehicle. Which of the following best describes the distribution of the number of vehicles the student will count?
- (A) Binomial
(B) Chi-square
(C) Geometric
(D) Normal
(E) t

Answer