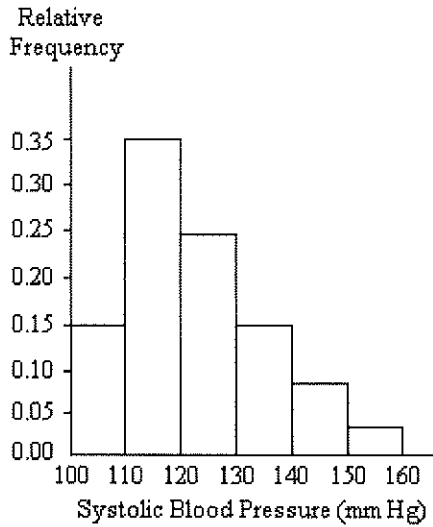




A nurse measured the blood pressure of each person who visited her clinic. Following is a relative-frequency histogram for the systolic blood pressure readings for those people aged between 25 and 40. Use the histogram to answer the question. The blood pressure readings were given to the nearest whole number.



- 4) Given that 800 people were aged between 25 and 40, approximately how many had a systolic blood pressure reading of 140 or higher? 4) \_\_\_\_\_
- A) 88                      B) 11                      C) 8                      D) 52

A graphical display of a data set is given. Identify the overall shape of the distribution as (roughly) bell-shaped, triangular, uniform, reverse J-shaped, J-shaped, right skewed, left skewed, bimodal, or multimodal.

- 5) A stem-and-leaf diagram is given below for the ages of the patients at a hospital. 5) \_\_\_\_\_

0	40
1	42
2	0203
3	015829
4	34517182
5	3626893306363
6	628183362690503675
7	25378953678489367855
8	4608532627890
9	14673

- A) Reverse J-shaped                      B) Right skewed  
 C) J-shaped                      D) Left skewed

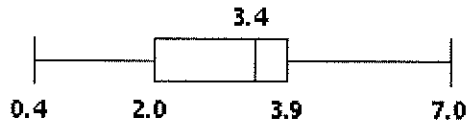
Construct and interpret a boxplot or a modified boxplot as specified.

- 6) The normal monthly precipitation (in inches) for August is listed for 20 different U.S. cities.  
Construct a boxplot for the data.

6) \_\_\_\_\_

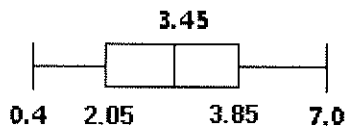
0.4 1.0 1.5 1.6 2.0  
2.2 2.4 2.7 3.4 3.4  
3.5 3.6 3.6 3.7 3.7  
3.9 4.1 4.2 4.2 7.0

A)



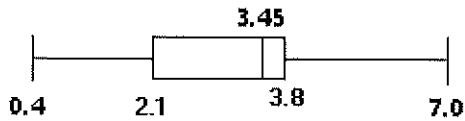
The data is slightly left-skewed.

B)



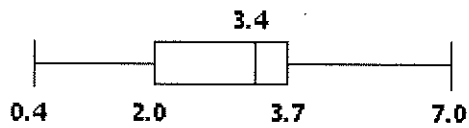
The data is symmetrical. It is a uniform distribution.

C)



The data is slightly left-skewed.

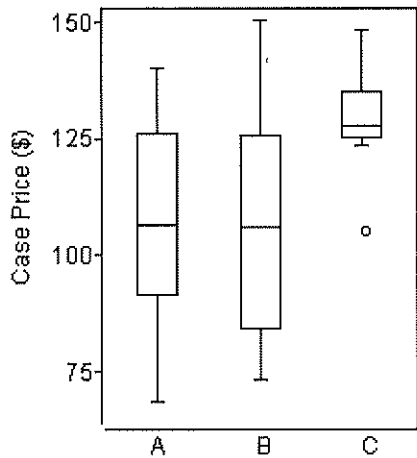
D)



The data is highly left-skewed.

**Solve the problem.**

- 7) The boxplots display case prices (in dollars) of white wines produced by three vineyards in the western United States. Describe these wine prices. 7) \_\_\_\_\_



- A) Vineyards A and B have about the same average price; the boxplots show similar medians and similar IQRs. Vineyard C has consistently higher prices except for one potential outlier, but more variation in pricing as shown by the larger IQR. The distributions for A and B are approximately symmetric, while the distribution for C is right-skewed.
- B) Vineyards A and B have different average prices, but a similar variation. Vineyard C has lower prices except for one potential outlier, and less variation in pricing as shown by the smaller IQR. The distributions for A and B are approximately symmetric, while the distribution for C is right-skewed.
- C) Vineyards A and B have about the same average price; the boxplots show similar medians and similar IQRs. Vineyard C has higher prices except for one potential outlier, and less variation in pricing as shown by the smaller IQR and overall range. All three distributions are roughly symmetric.
- D) Vineyards A and B have about the same average price; the boxplots show similar medians and similar IQRs. Vineyard C has higher prices except for one potential outlier, and a less variation in pricing as shown by the smaller IQR and overall range. Distributions A and B are approximately symmetric, while distribution C is right-skewed.

**Find the range for the given data set.**

- 8) Rich Borne is currently taking Chemistry 101. On the five laboratory assignments for the quarter, he got the following scores. 8) \_\_\_\_\_

26 37 13 46 52

- A) 39                      B) 13                      C) 52                      D) 11

**Estimate the probability of the event.**

- 9) A frequency distribution on employment information from Alpha Corporation follows.. Find the probability that an employee has been with the company 10 years or less. 9) \_\_\_\_\_

<u>Years Employed</u>	<u>No. of Employees</u>
1-5	5
6-10	10
11-15	25
16-20	10
21-25	5
26-30	3

- A) 0.741                      B) 0.735                      C) 0.294                      D) 0.259

**List the outcomes comprising the specified event.**

- 10) In a competition, two people will be selected from four finalists to receive the first and second prizes. The prize winners will be selected by drawing names from a hat. The names of the four finalists are Jim, George, Helen, and Maggie. The possible outcomes can be represented as follows. 10) \_\_\_\_\_

JG JH JM GJ GH GM  
HJ HG HM MJ MG MH

Here, for example, JG represents the outcome that Jim receives the first prize and George receives the second prize. The events A and B are defined as follows.

A = event that Helen gets first prize  
B = event that George gets a prize

List the outcomes that comprise the event (A or B).

- A) JG, JH, GJ, GH, GM, HJ, HG, HM, MG, MH  
B) JG, GJ, GH, GM, HJ, HG, HM, MG  
C) HG  
D) JG, GJ, GH, GM, HJ, HM, MG

- 11) Three board members for a nonprofit organization will be selected from a group of five people. The board members will be selected by drawing names from a hat. The names of the five possible board members are Allison, Betty, Charlie, Dave, and Emily. The possible outcomes can be represented as follows. 11) \_\_\_\_\_

ABC ABD ABE ACD ACE  
ADE BCD BCE BDE CDE

Here, for example, ABC represents the outcome that Allison, Betty, and Charlie are selected to be on the board. List the outcomes that comprise the following event.

- A = event that Betty and Emily are selected  
A) ABC, ABD, ABE, ACE, ADE, BCD, BCE, BDE, CDE  
B) BE  
C) ABE, BCE  
D) ABE, BCE, BDE

**Find the indicated probability.**

- 12) A 6-sided die is rolled. What is the probability of rolling a number less than 5? 12) \_\_\_\_\_
- A)  $\frac{1}{6}$                       B) 4                      C)  $\frac{2}{3}$                       D)  $\frac{5}{6}$

**Find the indicated probability by using the complementation rule.**

- 13) The probability that Luis will pass his statistics test is 0.44. Find the probability that he will fail his statistics test. 13) \_\_\_\_\_
- A) 2.27                      B) 0.22                      C) 0.56                      D) 0.79

**Find the specified probability.**

- 14) Use the special addition rule and the following probability distribution to determine  $P(6 < X \leq 8)$ . 14) \_\_\_\_\_
- |        |      |      |      |      |      |      |      |
|--------|------|------|------|------|------|------|------|
| x      | 5    | 6    | 7    | 8    | 9    | 10   | 11   |
| P(X=x) | 0.05 | 0.05 | 0.20 | 0.15 | 0.15 | 0.10 | 0.30 |
- A) 0.40                      B) 0.35                      C) 0.45                      D) 1.00

**Find the mean of the random variable.**

- 15) The random variable X is the number of golf balls ordered by customers at a pro shop. Its probability distribution is given in the table. Round the answer to two decimal places when necessary. 15) \_\_\_\_\_
- |        |      |      |      |      |      |
|--------|------|------|------|------|------|
| x      | 3    | 6    | 9    | 12   | 15   |
| P(X=x) | 0.14 | 0.07 | 0.36 | 0.33 | 0.10 |
- A) 7.98                      B) 9.54                      C) 6.87                      D) 9

**Find the indicated probability or percentage for the normally distributed variable.**

- 16) The volumes of soda in quart soda bottles are normally distributed with a mean of 32.3 oz and a standard deviation of 1.2 oz. What is the probability that the volume of soda in a randomly selected bottle will be less than 32 oz? 16) \_\_\_\_\_
- A) 0.0987                      B) 0.4013                      C) 0.5987                      D) 0.3821



Find the confidence interval specified. Assume that the population is normally distributed.

- 23) A sociologist develops a test to measure attitudes about public transportation, and 27 randomly selected subjects are given the test. Their mean score is 76.2 and their standard deviation is 21.4. Construct the 95% confidence interval for the mean score of all such subjects. 23) \_\_\_\_\_
- A) 67.7 to 84.7                      B) 69.2 to 83.2                      C) 64.2 to 88.2                      D) 74.6 to 77.8

A hypothesis test is to be performed. Determine the null and alternative hypotheses.

- 24) A health insurer has determined that the "reasonable and customary" fee for a certain medical procedure is \$1200. They suspect that the average fee charged by one particular clinic for this procedure is higher than \$1200. The insurer wants to perform a hypothesis test to determine whether their suspicion is correct. 24) \_\_\_\_\_
- A)  $H_0 : \mu > \$1200$                       B)  $H_0 : \mu = \$1200$   
    $H_a : \mu = \$1200$                        $H_a : \mu < \$1200$   
C)  $H_0 : \mu = \$1200$                       D)  $H_0 : \mu = \$1200$   
    $H_a : \mu \geq \$1200$                        $H_a : \mu > \$1200$

For the given hypothesis test, explain the meaning of a Type I error, a Type II error, or a correct decision as specified.

- 25) A manufacturer claims that the mean amount of juice in its 16 ounce bottles is 16.1 ounces. A consumer advocacy group wants to perform a hypothesis test to determine whether the mean amount is actually less than this. The hypotheses are: 25) \_\_\_\_\_
- $H_0 : \mu = 16.1$  ounces  
 $H_a : \mu < 16.1$  ounces

where  $\mu$  is the mean amount of juice in the manufacturer's 16 ounce bottles. Explain the meaning of a Type I error.

- A) A Type I error would occur if, in fact,  $\mu < 16.1$  ounces, but the results of the sampling fail to lead to that conclusion.  
B) A Type I error would occur if, in fact,  $\mu = 16.1$  ounces, but the results of the sampling do not lead to rejection of that fact.  
C) A Type I error would occur if, in fact,  $\mu = 16.1$  ounces, but the results of the sampling lead to the conclusion that  $\mu < 16.1$  ounces.  
D) A Type I error would occur if, in fact,  $\mu < 16.1$  ounces, but the results of the sampling lead to the conclusion that  $\mu > 16.1$  ounces.



26) A health insurer has determined that the "reasonable and customary" fee for a certain medical procedure is \$1200. They suspect that the mean fee charged by one particular clinic for this procedure is higher than \$1200. The insurer wants to perform a hypothesis test to determine whether their suspicion is correct. The hypotheses are:

$$H_0 : \mu = \$1200$$

$$H_a : \mu > \$1200$$

where  $\mu$  is the mean amount charged by the clinic for this procedure. Explain the meaning of a correct decision.

- A) A correct decision would occur if, in fact,  $\mu > \$1200$  and the results of the sampling do not lead to rejection of the null hypothesis that  $\mu = \$1200$ .
- B) A correct decision would occur if, in fact,  $\mu = \$1200$ , and the results of the sampling do not lead to rejection of that fact; or if, in fact,  $\mu > \$1200$  and the results of the sampling lead to that conclusion.
- C) A correct decision would occur if, in fact,  $\mu = \$1200$ , and the results of the sampling lead to rejection of the null hypothesis; or if, in fact,  $\mu > \$1200$  and the results of the sampling lead to that conclusion.
- D) A correct decision would occur if, in fact,  $\mu = \$1200$ , and the results of the sampling do not lead to rejection of that fact; or if, in fact,  $\mu > \$1200$  and the results of the sampling do not lead to rejection of the null hypothesis that  $\mu = \$1200$ .

27) In the past, the mean running time for a certain type of flashlight battery has been 8.9 hours. The manufacturer has introduced a change in the production method and wants to perform a hypothesis test to determine whether the mean running time has increased as a result. The hypotheses are:

$$H_0 : \mu = 8.9 \text{ hours}$$

$$H_a : \mu > 8.9 \text{ hours}$$

where  $\mu$  is the mean running time of the new batteries . Explain the meaning of a Type II error.

- A) A Type II error would occur if, in fact,  $\mu = 8.9$  hours, but the results of the sampling lead to the conclusion that  $\mu > 8.9$  hours.
- B) A Type II error would occur if, in fact,  $\mu > 8.9$  hours, but the results of the sampling fail to lead to that conclusion.
- C) A Type II error would occur if, in fact,  $\mu > 8.9$  hours, but the results of the sampling lead to the conclusion that  $\mu < 8.9$  hours.
- D) A Type II error would occur if, in fact,  $\mu = 8.9$  hours, but the results of the sampling do not lead to rejection of that fact.

**Classify the conclusion of the hypothesis test as a Type I error, a Type II error, or a correct decision.**

- 28) At one school, in 2005, the average amount of time that tenth-graders spent watching television each week was 21.6 hours. The principal introduced a campaign to encourage the students to watch less television. One year later, in 2006, the principal performed a hypothesis test to determine whether the average amount of time spent watching television per week had decreased. The hypotheses were: 28) \_\_\_\_\_

$$H_0 : \mu = 21 \text{ hours}$$

$$H_a : \mu < 21 \text{ hours}$$

where  $\mu$  is the mean amount of time, in 2006, that tenth-graders spend watching television each week.

Suppose that the results of the sampling lead to nonrejection of the null hypothesis. Classify that conclusion as a Type I error, a Type II error, or a correct decision, if in fact the mean amount of time,  $\mu$ , spent watching television had not decreased.

- A) Type I error                                      B) Type II error                                      C) Correct decision

**The significance level and P-value of a hypothesis test are given. Decide whether the null hypothesis should be rejected.**

- 29)  $\alpha = 0.10$ , P-value = 0.16 29) \_\_\_\_\_  
A) Reject the null hypothesis.                                      B) Do not reject the null hypothesis.

- 30)  $\alpha = 0.05$ , P-value = 0.014 30) \_\_\_\_\_  
A) Reject the null hypothesis.                                      B) Do not reject the null hypothesis.

**Determine the null and alternative hypotheses for the proposed hypothesis test.**

- 31) A researcher is interested in determining whether men who have completed a postgraduate degree (master's or Phd) have greater earning potential than those who have completed a Bachelor's degree only. She will perform a hypothesis test to determine whether the mean salary of men who have completed a postgraduate degree is greater than the mean salary of men with a Bachelor's degree only. 31) \_\_\_\_\_

A) Let  $\mu_1$  denote the mean salary of men with a postgraduate degree and let  $\mu_2$  denote the mean salary of men with a Bachelor's degree only. The null and alternative hypotheses are  $H_0: \mu_1 = \mu_2$  and  $H_a: \mu_1 > \mu_2$ .

B) Let  $\bar{x}_1$  denote the mean salary of men with a postgraduate degree and let  $\bar{x}_2$  denote the mean salary of men with a Bachelor's degree only. The null and alternative hypotheses are  $H_0: \bar{x}_1 = \bar{x}_2$  and  $H_a: \bar{x}_1 > \bar{x}_2$ .

C) Let  $\mu_1$  denote the mean salary of men with a postgraduate degree and let  $\mu_2$  denote the mean salary of men with a Bachelor's degree only. The null and alternative hypotheses are  $H_0: \mu_1 > \mu_2$  and  $H_a: \mu_1 < \mu_2$ .

D) Let  $\mu_1$  denote the mean salary of men with a postgraduate degree and let  $\mu_2$  denote the mean salary of men with a Bachelor's degree only. The null and alternative hypotheses are  $H_0: \mu_1 = \mu_2$  and  $H_a: \mu_1 < \mu_2$ .

Classify the proposed hypothesis test as Two tailed, Left tailed, or Right tailed.

- 32) A pharmaceutical company wants to determine whether its new antianxiety medication has any effect on resting pulse rate. They will use a paired sample to determine whether the mean resting pulse rate for adults not taking the antianxiety medication differs from the mean resting pulse rate for adults who are taking the antianxiety medication. 32) \_\_\_\_\_
- A) Two tailed                      B) Left tailed                      C) Right tailed

The number of successes and the sample size are given for a simple random sample from a population. Determine the sample proportion,  $\hat{p}$ .

- 33)  $x = 33, n = 40$  33) \_\_\_\_\_
- A)  $\hat{p} = 0.785$                       B)  $\hat{p} = 0.825$                       C)  $\hat{p} = 0.725$                       D)  $\hat{p} = 0.835$

Provide an appropriate response.

- 34) A magazine poll of unemployed men in the U.S. stated "22% of those polled suffer from clinical depression; the margin of error for the poll is plus or minus 6 percentage points." How would you interpret this statement? Assume that the margin of error is associated with a 95% confidence interval. 34) \_\_\_\_\_
- A) We can be 95% confident that the percentage of all unemployed men in the U.S. who suffer from clinical depression is somewhere between 16% and 28%.
- B) A confidence interval for the percentage of all unemployed men in the U.S. who suffer from clinical depression is 17% to 27%. There is a 6% chance that this interval does not include the population proportion,  $p$ .
- C) The percentage of all unemployed men in the U.S. who suffer from clinical depression is 22%. The chance that this estimate is incorrect is 6%.
- D) There is a 95% chance that the percentage of all unemployed men in the U.S. who suffer from clinical depression is somewhere between 16% and 28%.

- 35) A researcher is interested in estimating the proportion of voters who favor a tax on e-commerce. Based on a sample of 250 people, she obtains the following 99% confidence interval for the population proportion  $p$ : 35) \_\_\_\_\_

$$0.113 < p < 0.171$$

Which of the statements below is a valid interpretation of this confidence interval?

- A) If 100 different samples of size 250 were selected and, based on each sample, a confidence interval were constructed, exactly 99 of these confidence intervals would contain the true value of  $p$ .
- B) If many different samples of size 250 were selected and, based on each sample, a confidence interval were constructed, 99% of the time the true value of  $p$  would lie between 0.113 and 0.171.
- C) There is a 99% chance that the true value of  $p$  lies between 0.113 and 0.171.
- D) If many different samples of size 250 were selected and, based on each sample, a confidence interval were constructed, in the long run 99% of the confidence intervals would contain the true value of  $p$ .

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

36) Maria constructed the frequency distribution shown below. The data represent the heights of 60 randomly selected women. (8 points) 36) \_\_\_\_\_

<u>Height</u>	<u>Frequency</u>
54-under 60	7
60-under 61	1
61-under 62	3
62-under 63	5
63-under 64	7
64-under 65	7
65-under 66	6
66-under 72	24

She concluded from her frequency distribution that the heights 66, 67, 68, 69, 70, and 71 inches are the most common for women. What is wrong with her conclusion? How is her frequency distribution misleading and how could the table be improved?

**Find the *sample mean* and *sample standard deviation* for the given data. Round your final answer to one more decimal place than that used for the observations. (14 points)**

37) Christine is currently taking college astronomy. The instructor often gives quizzes. On the past seven quizzes, Christine got the following scores. 37) \_\_\_\_\_

32 17 25 21 20

**Find the indicated probability or percentage for the sampling error. (10 points)**

- 38) The amount of coffee that a filling machine puts into an 8-ounce jar is normally distributed with a mean of 8.2 ounces and a standard deviation of 0.18 ounce. Determine the percentage of samples of size 16 that will have mean amounts of coffee within 0.1 ounce of the population mean of 8.2 ounces.

38) \_\_\_\_\_

**Find the confidence interval specified. (10 points)**

- 39) A random sample of 88 light bulbs had a mean life of  $\bar{x} = 517$  hours. Assume that  $\sigma = 39$  hours. Construct a 90% confidence interval for the mean life,  $\mu$ , of all light bulbs of this type and determine whether 500 hours would be a plausible value for  $\mu$ .

39) \_\_\_\_\_

**Provide an appropriate response. (6 points)**

- 40) Mary wishes to estimate the mean height of women aged 18-24. She picks a sample of 100 women aged between 18 and 24 and constructs a 99% confidence interval for the population mean. If she were to repeat this procedure 200 times in total, she would obtain 200 different confidence intervals. How many of these intervals would you expect to contain the population mean,  $\mu$ ? Explain your thinking.

40) \_\_\_\_\_

**Preliminary data analyses indicate that it is reasonable to use a t-test to carry out the specified hypothesis test.**

**(12 points)**

- 41) A manufacturer makes ball bearings that are supposed to have a mean weight of 30 g. A retailer suspects that the mean weight is actually less than 30 g. The mean weight for a random sample of 16 ball bearings is 28.6 g with a standard deviation of 4.4 g. At the 5% significance level, test the claim that the mean is less than 30 g. 41) \_\_\_\_\_

**Provide an appropriate response.**

- 42) Suppose that you wish to perform a hypothesis test for a population mean using the critical value method. The test is right-tailed. Suppose that the population standard deviation is unknown. The correct procedure to use is the t-test. If you mistakenly use the standard normal table to obtain the critical value, will the value that you obtain be larger or smaller than the correct value? Does the mistaken use of the normal table make it more or less likely that the null hypothesis will be rejected? 42) \_\_\_\_\_