

STATISTICS CONCEPTS

Identify the population and the sample in each situation.

1. An insurance company wants to monitor the quality of its procedures for handling loss claims from its auto insurance policyholders. Each month the company selects a sample from all auto insurance claims filed that month to examine them for accuracy and promptness.
2. A truckload of apples arrives at an apple juice production plant. The plant's quality control team selects three large buckets of apples from various locations within the truck. These apples are inspected carefully. Based on inspection results, the entire truckload is either accepted or rejected by the plant.
3. Different types of writing can sometimes be distinguished by the lengths of the words used. A student interested in this fact wants to study the lengths of words used by J. K. Rowling in her Harry Potter books. She opens a Harry Potter book at random and records the lengths of the first 250 words on the page.

Determine whether each of the following is a sample survey, census, or experiment.

4. To study the effect of living in public housing on family stability in poverty-level households, researchers obtain a list of all applicants for public housing in Chicago last year. Some applicants were accepted, while others were turned down by the housing authority. The researchers interview both groups and compare them.
5. People who smoke are asked to halve the number of cigarettes consumed each day so that any effect on pulse rate can be measured.
6. The relationship between weights of bears and their lengths is studied by measuring bears that have been anesthetized.
7. The NVHS Student Council is wants to propose changes to the student dress code. In order to guarantee that they are proposing changes desired by the student body, they ask every student in the school to complete a survey.
8. In a physical education class, the effect of exercise on blood pressure is studied by requiring that half of the students walk a mile each day while the other students run a mile each day.

SAMPLING

In Exercises 5–16, identify which of these types of sampling is used: random, stratified, systematic, cluster, or convenience.

5. When she wrote *Women and Love: A Cultural Revolution*, author Shere Hite based conclusions on 4500 responses from 100,000 questionnaires distributed to women.
6. A psychologist at New York University surveys all students from each of 20 randomly selected classes.
7. A sociologist at the College of Charleston selects 12 men and 12 women from each of 4 English classes.
8. Sony selects every 200th compact disk from the assembly line and conducts a thorough test of quality.
9. A tobacco lobbyist writes the name of each U.S. Senator on a separate card, shuffles the cards, and then draws 10 names.

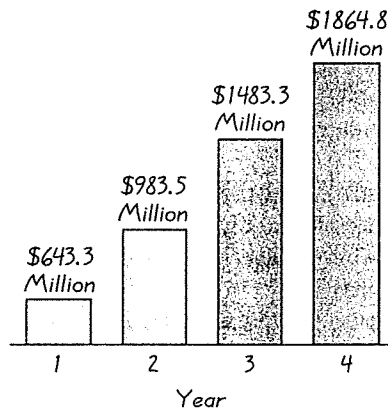
10. The marketing manager for America Online tests a new sales strategy by randomly selecting 250 consumers with less than \$50,000 in gross income and 250 consumers with gross income of at least \$50,000.
11. Planned Parenthood polls 500 men and 500 women about their views concerning the use of contraceptives.
12. A market researcher for American Airlines interviews all passengers on each of 10 randomly selected flights.
13. A medical researcher from Johns Hopkins University interviews all leukemia patients in each of 20 randomly selected hospitals.
14. A reporter for *Business Week* magazine interviews every 50th chief executive officer identified in that magazine's listing of the 1000 companies with the highest stock market values.
15. A reporter for *Business Week* magazine obtains a numbered listing of the 1000 companies with the highest stock market values, then uses a computer to generate 20 random numbers between 1 and 1000, and then interviews the chief executive officers of companies corresponding to these numbers.
16. In conducting research for the Boston evening news, a reporter for NBC interviews 15 people as they leave IRS audits.

Uses and Abuses of Statistics

1. You've been hired to research recognition of the Nike brand name, and you must conduct a telephone survey of 1500 consumers in the United States. What is wrong with using telephone directories as the population from which the sample is drawn?
3. A report sponsored by the Florida Citrus Commission concluded that cholesterol levels can be lowered by eating citrus products. Why might the conclusion be suspect?
4. An employee has an annual salary of \$40,000 but is told that she will be given a 10% cut in pay because of declining company profits. She is also told that next year, she will be given a 10% raise. This doesn't seem too bad because the 10% cut seems to be offset by the 10% raise.
 - a. What is the annual income after the 10% cut?
 - b. Use the annual income from part a to find the annual income after the 10% raise. Did the 10% cut followed by the 10% raise get the employee back to an annual salary of \$40,000?
5. *Glamour* magazine published this survey result: "Seventy-nine percent of those who responded to our August survey say that they believe America has become too lawsuit-happy." The survey question was published in the magazine and readers could respond by mail, fax, or e-mail (Tellus@Glamour.com). How valid is the 79% result?
6. ADT Security Systems advertised that "when you go on vacation, burglars go to work." Their ad stated that "according to FBI statistics, over 26% of home burglaries take place between Memorial Day and Labor Day." What is misleading about this statement?
7. In a study on college campus crimes committed by students high on alcohol or drugs, a mail survey of 1875 students was conducted. A *USA Today* article noted, "Eight percent of the students responding anonymously say they've committed a campus crime. And 62% of that group say they did so under the influence of alcohol or drugs." Assuming that the number of students responding anonymously is 1875, how many actually committed a campus crime while under the influence of alcohol or drugs?

8. A study conducted by the Insurance Institute for Highway Safety found that the Chevrolet Corvette had the highest fatality rate—"5.2 deaths for every 10,000." The car with the lowest fatality rate was the Volvo, with only 0.6 death per 10,000. Does this mean that the Corvette is not as safe as the Volvo?
9. The *Newport Chronicle* claims that pregnant mothers can increase their chances of having healthy babies by eating lobsters. That claim is based on a study showing that babies born to lobster-eating mothers have fewer health problems than babies born to mothers who don't eat lobsters. What is wrong with this claim?

12. In an advertising supplement inserted in *Time*, the increases in expenditures for pollution abatement were shown in a graph similar to the one shown. What is wrong with the figure?



1-3 Exercises B: Beyond the Basics

13. A *New York Times* article noted that the mean life span for 35 male symphony conductors was 73.4 years, in contrast to the mean of 69.5 years for males in the general population. The longer life span was attributed to such factors as fulfillment and motivation. There is a fundamental flaw in concluding that male symphony conductors live longer. What is it?
14. A researcher at the Sloan-Kettering Cancer Research Center was once criticized for falsifying data. Among his data were figures obtained from 6 groups of mice, with 20 individual mice in each group. These values were given for the percentage of successes in each group: 53%, 58%, 63%, 46%, 48%, 67%. What's wrong?
15. Try to identify each of the four major flaws in the following. A daily newspaper ran a survey by asking readers to call in their response to this question: "Do you support the development of atomic weapons that could kill millions of innocent people?" It was reported that 20 readers responded and 87% said "no" while 13% said "yes."

MEASURES OF CENTRAL TENDENCY AND VARIATION

Complete each of the following. Carefully consider whether your calculations pertain to a sample or an entire population. Be sure to follow all instructions as to whether the computations are to be done by hand or by calculator.

1. The Smith family held a family reunion with 500 members of the family attending. Below is a sample of the ages of the people who attended the reunion.

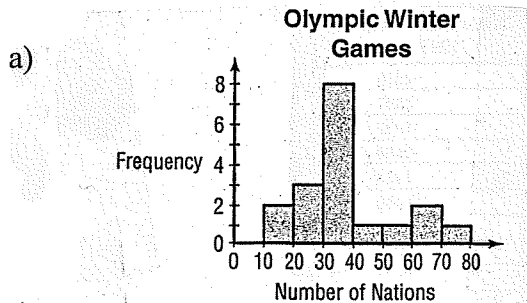
48, 55, 36, 46, 27, 6, 52, 32, 44, 34, 16, 45, 86, 68, 64, 75, 73, 57, 25, 11

Calculate the following by hand.

- a) Create a stem-and-leaf plot of the data.
 - b) Find the mean, median, range, and standard deviation of the sample.
 - c) Which measures are the best measures for this situation—Mean/Standard Deviation or Median/Quartiles?
2. The number of members in the House of Representatives for each state is given below.

AL	7	HI	2	MA	10	NM	3	SD	1
AK	1	ID	2	MI	16	NY	31	TN	9
AZ	6	IL	20	MN	8	NC	12	TX	30
AR	4	IN	10	MS	5	ND	1	UT	3
CA	52	IA	5	MO	9	OH	19	VT	1
CO	6	KS	4	MT	1	OK	6	VA	11
CT	6	KY	6	NE	3	OR	5	WA	9
DE	1	LA	7	NV	2	PA	21	WV	3
FL	23	ME	2	NH	2	RI	2	WI	9
GA	11	MD	8	NJ	13	SC	6	WY	1

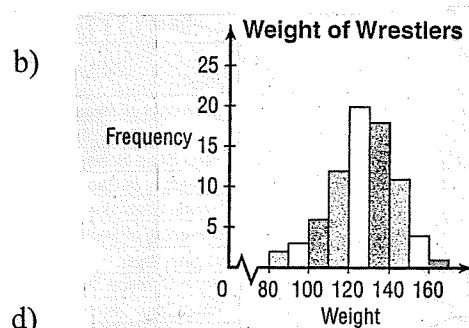
- a) Use your calculator to create a histogram of the data. Scale the x-axis by 5's from 0 to 55. Scale the y-axis by 5's from 0 to 20.
 - b) Use your calculator to find the mean, median, standard deviation, quartiles, and outliers.
 - c) Which measures are the best measures for this situation?
3. Determine which measure of central tendency and variation would be the best to use for each set of data.



c)

stem	leaf
0	6 7 7 7 9
1	3 3 4 4 5 6 7 8 9 9
2	0 0 0 1 1 1 1 1 3 3 8
3	0 1 1 1 2 4 4 6 8
4	1 1 1 2 7

$1|3 = 13$



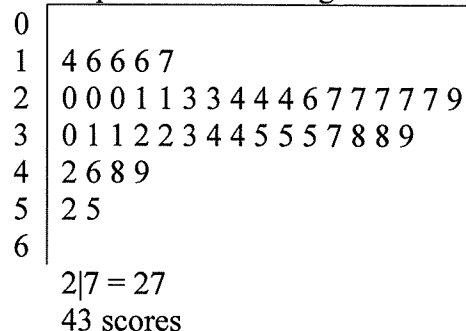
d)

stem	leaf
1	0 5 5 5 5 7 7
2	0 0 0 5 5 5 5 7 8
3	0 0 5 5 5
4	6
5	5

$1|0 = 10$

4. The number of points scored by the winning teams in the first 43 Super Bowls is shown in the stem-and leaf plot below.

Super Bowl Winning Scores



Complete the following by hand:

- Find the median, mode, quartiles, IQR, and outliers.
- Which measures of central tendency and variation are the best measures for this data?
- Construct a box-and-whisker plot of this data by hand.

5. The number of times the first 42 presidents vetoed bills are listed below.

2, 0, 0, 7, 1, 0, 12, 1, 0, 10, 3, 0, 0, 9, 7, 6, 29, 93, 13, 0, 12, 414, 44, 170, 42, 82, 39, 44, 6, 50, 37, 635, 250, 181, 21, 30, 43, 66, 31, 78, 44, 25

Use your calculator to complete the following:

- Find the mean, median, standard deviation, quartiles, and outliers.
- Which measures are the best measures for this data?
- Construct a box-and-whisker plot of this data.

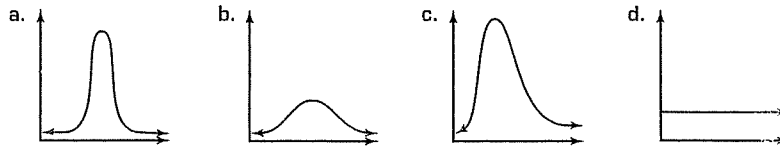
6. The table below shows the median ages of men and women at the time of their first marriage for the decades 1890 through 1990.

- Calculate the mean and standard deviation of the men's ages by hand.
- Use your calculator to create a stacked box-and-whisker plot of both the men's and women's ages on the same scale.
- Using your box-and-whisker plot, draw at least two conclusions about the data.

Year	Men	Women	Year	Men	Women
1890s	26.1	22.0	1950s	22.8	20.3
1900s	25.9	21.9	1960s	22.8	20.3
1910s	25.1	21.6	1970s	23.2	20.8
1920s	24.6	21.2	1980s	24.7	22.0
1930s	24.3	21.3	1990s	26.2	25.1
1940s	24.3	21.5			

THE NORMAL DISTRIBUTION

1. Describe the characteristics of the data which would result in each distribution.



Solve the following problems using the normal distribution table of values.

2. The lengths of babies born in City Hospital in the last year are normally distributed. The mean length is 20.4 inches, and the standard deviation is 0.8 inches. Trey was 22.3 inches long at birth. What percent (to the nearest tenth) of the babies born at City Hospital were shorter than Trey?
3. The length of time a brand of CD players can be used before needing service is normally distributed. The mean length of time is 60 months, and the standard deviation is 5 months. The manufacturer plans to issue a guarantee that it will replace any CD player that breaks within a certain length of time. If the manufacturer does not want to replace any more than 2% of the CD players, how many months should they limit the guarantee?
4. The mean score on a standardized test was 21 with a standard deviation of 4.5.
(a) If Marco's score was 27, what was his percentile rank?
(b) If Pietra scored at the 42nd percentile, what was her score (to the nearest tenth)?
5. A college professor plans to grade a test on a curve. The mean score on the test is 65, and the standard deviation is 7. The professor wants 15% A's, 20% B's, 30% C's, 20% D's, and 15% F's. Assume the grades are normally distributed.
(a) What is the lowest score for an A?
(b) Find the lowest score to receive a C?
6. A machine is used to fill cans of cola. The amount of cola dispensed into each can varies slightly. Suppose the amount of cola dispensed into the cans is normally distributed.
(a) If at least 95% of the cans must have between 350 and 360 milliliters of cola, find the greatest standard deviation that can be allowed to the nearest hundredth.
(b) What percent of the cans (to the nearest tenth) will have between 353 and 358 milliliters of cola?
7. The number of letters handled daily by a post office is normally distributed with a mean of 20,000 letters and a standard deviation of 1200 letters.
(a) How many days per year does the post office handle more than 22,000 letters?
(b) How many letters does it handle for the middle 50% of the days?
8. Those wanting to participate in a state marathon race must first qualify by running in a regional marathon. The times of the 3000 regional runners are normally distributed with a mean of 198 min 36 sec and a standard deviation of 23 min 12 sec. If there are to be only 600 runners in the state marathon, what is the slowest time that will qualify a regional runner for the state race?

Solve the following problems using your calculator.

9. A company manufactures light bulbs that have a life expectancy that is normally distributed with a mean of 750 hours and a standard deviation of 40 hours. Find the probability that a bulb burns between 728 hours and 784 hours.
10. The heights of 6-year-old girls are normally distributed with a mean of 46 inches and a standard deviation of 2.17 inches. Find the probability that a girl selected at random will have a height less than 44 inches.
11. In a letter to Ann Landers, a wife claimed to give birth to a baby 308 days after a visit from her husband who was in the Navy and stationed on board a ship. Pregnancies are normally distributed with a mean of 268 days and a standard deviation of 15 days. Does the wife have problem?
12. On a SAT exam administered by the CEEB, the mean math score was 475 with a standard deviation of 130. If a scholarship is available to students with scores above the 85th percentile, what is the score need to be eligible for the scholarship?
13. The life an electric drill when used commercially follows a normal distribution with a mean of 8 years and a standard deviation of 1.25 years. The manufacturer will replace free all drills that fail while under warranty. If the manufacturer is willing to replace only 5% of the drills that fail, how long a guarantee should be offered?

CONFIDENCE INTERVALS

Solve each problem. Round standard error of the mean to thousandths and margin of error to hundredths.

- The mean height of a sample of 100 high school seniors is 68 inches with a standard deviation of 4 inches.
 - Find the standard error of the mean.
 - Find the margin of error for 90% confidence.
 - Find a 90% confidence interval for the mean height of the entire population.
- A botanist is studying the effects of a drought on the size of acorns produced by the oak trees. A random sample of 50 acorns reveals a mean diameter of 16.2 millimeters and a standard deviation of 1.4 millimeters.
 - Find the standard error of the mean.
 - Find the margin of error for 80% confidence.
 - Find the interval that has an 80% probability that the true mean lies within the interval.
- The lifetimes of 1600 batteries used in radios are tested. With a 95% level of confidence, the true average life of the batteries is from 746.864 to 753.136 hours.
 - What is the mean life of a battery in the sample?
 - What is the margin of error?
 - Find the standard deviation of the life of the batteries in the sample.
- There is a probability of 0.99 that the average life of a disposable hand-warming package is between 9.7936 and 10.2064 hours. The standard deviation of the sample is 0.8 hours. What is the size of the sample used to determine these values?
- The Brite Light Company wishes to include the average lifetime of its light bulbs in its advertising. One hundred light bulbs are randomly selected and illuminated. The time for each bulb to burn out is recorded. From this sample, the average life is 350 hours with a standard deviation of 45 hours.
 - Find a 99% confidence interval for the mean life of a light bulb.
 - If you want to avoid false advertising charges, what number would you use as the average lifetime of the bulbs? Explain.
- The standard deviation of the blood pressures of 45 women ages 40 to 50 years old is 12. What is the probability that the mean blood pressure of the random sample will differ by more than 3 points from the mean blood pressure reading for all women in that age bracket?
- A Precalculus student wants to estimate the mean number of hours of sleep of students who hold part-time jobs. She knows the distribution is normally distributed with a standard deviation of 2 hours. What size sample would she need to guarantee a margin of error of no more than 15 minutes with 88% confidence?
- A steel manufacturing firm employs 1500 people. During a given year, the mean amount contributed to a charity drive for the homeless was \$25.75 per employee with a standard deviation of \$5.25. What is the probability that a random sample of 100 employees yields a mean between \$25 and \$27?
- Another Precalculus student wants to determine the mean resting pulse rate for athletes. He knows that for many populations the pulse rate is normally distributed with a standard deviation of 10. How many athletes would he need to sample if he wants a 95% confidence interval to have a width of 1?

HYPOTHESIS TESTING

1. State the null and alternative hypothesis for each of the following:
 - a) You are investigating a complaint that “special delivery mail takes too much time” to be delivered.
 - b) You want to show that people find the new design for a recliner chair is more comfortable than the old design.
 - c) You are trying to show that cigarette smoke has an effect on the quality of a person’s life.
 - d) You are testing a new formula for hair conditioner, hoping to show it is effective on “split ends”.
2. Determine the options for the H_o and the H_a in symbols using $<$, $>$, or \neq if each statement is what you believe to be true. State the alternative hypothesis H_a for the statement given and then write the null hypothesis H_o (in symbols) that would be used for a hypothesis test related to each of these statements:
 - a) The mean weight of college football players is more than 210 lb.
 - b) The mean strength of welds by a new process is different from 570 lb per unit area, the mean strength of welds by the old process.
 - c) The mean hourly wage for a child-care giver is greater than \$9.00.
3. Assume that z is the test statistic, and calculate the value of z^* for each of the following:
 - a) $H_o : \mu = 18.2, \sigma = 3.7, n = 140, \bar{x} = 18.93$
 - b) $H_o : \mu = 81, \sigma = 13.3, n = 50, \bar{x} = 79.6$
4. The calculated p -value for a hypothesis test is 0.084. What decision about the null hypothesis would occur if:
 - a) the hypothesis test is completed at the 0.05 level of significance
 - b) the hypothesis test is completed at the 0.10 level of significance
5. Calculate the p -value for each of the following:
 - a) $H_o : \mu = 105$ vs. $H_a : \mu > 105, z^* = -0.85$
 - b) $H_o : \mu = 13.4$ vs. $H_a : \mu \neq 13.4, z^* = 1.17$
 - c) $H_o : \mu = 8.56$ vs. $H_a : \mu > 8.56, z^* = -2.11$

6. The null hypothesis, $H_o : \mu = 48$ was tested against the alternative hypothesis, $H_a : \mu > 48$. A sample of 75 resulted in a calculated p -value of 0.102. If $\sigma = 3.5$, find the value of the sample mean, \bar{x} .
7. An article titled "Comparisons of Mathematical Competencies and Attitude of Elementary Education Majors with Established Norms of a General College Population" reported the mean score on a test of mathematical competency for 165 elementary education majors to be 32.63. Test the null hypothesis that μ , the mean score for the population of elementary education majors, is 35.70 (the established norm of the general college population) versus the alternative hypothesis that $\mu < 35.70$. Assume $\sigma = 6.73$.
- Describe the parameter of interest.
 - State the null and alternative hypothesis.
 - Calculate the value for z^* and find the p -value.
 - State your decision and conclusion using $p < 0.001$.
8. When the workers for a major automobile manufacturer go on strike, there are repercussions throughout the rest of the economy; in particular, the dealers who sell the cars and trucks feel the pinch. Dealers like to maintain a two-month supply to give their customers adequate selection, but when the manufacturer cannot deliver the vehicles inventories dwindle. The June 1997 days' supply of Chevrolet S-10 pickup trucks was 106 vehicles, but shortly after the United Auto Workers strike in Flint, Michigan, the June 1998 days' supply of these trucks had dropped to a mean of 38 and a standard deviation of 16. Suppose one month after the strike was settled, 150 dealers are sampled and the S-10 inventories yielded a mean days' supply of 41 trucks. Based on this new evidence, complete the hypothesis test of $H_o : \mu = 38$ versus $H_a : \mu > 38$ at the 0.02 level of significance.
- Define the parameter.
 - State the null and alternative hypotheses.
 - Specify the hypothesis test criteria.
 - Present the sample evidence.
 - Find the p -value.
 - Determine the results.
9. Who says that the more you spend on a wristwatch, the more accurate the watch will be? Some say that nowadays you can buy a quartz watch for less than \$25 that runs just as accurately as watches that cost four times as much. Suppose the average accuracy for all watches being sold today, irrespective of price, is within 19.8 seconds per month with a standard deviation of 9.1 seconds. A random sample of 36 quartz watches priced as less than \$25 is taken, and their accuracy check reveals a sample mean error of 22.7 seconds per month. Based on this evidence, complete the hypothesis test of $H_o : \mu = 20$ versus $H_a : \mu > 20$ at the 0.05 level of significance.
- Define the parameter.
 - State the null and alternative hypotheses.
 - Specify the hypothesis test criteria.
 - Present the sample evidence.
 - Find the p -value.
 - Determine the results.

STATISTICS CONCEPTS ANSWERS

1. Population: All auto insurance claims filed in a month at an insurance company
Sample: the sample of claims selected
2. Population: All apples in the truckload
Sample: three large buckets of apples selected
3. Population: All the words in the selected Harry Potter book
Sample: the first 250 words of the book
4. sample survey
5. experiment
6. sample survey
7. census
8. experiment

SAMPLING HANDOUT ANSWERS

- | | | |
|---------------|----------------|-----------------|
| 6. cluster | 10. stratified | 14. systematic |
| 7. stratified | 11. stratified | 15. random |
| 8. systematic | 12. cluster | 16. convenience |
| 9. random | 13. cluster | |

ABUSES OF STATISTICS ANSWERS

Section 1-3

1. People with unlisted numbers and people without telephones are excluded.
3. A study sponsored by the citrus industry is much more likely to reach conclusions favorable to that industry.
5. Because the respondents are self-selected, the survey results are not likely to be valid at all.
7. 62% of 8% of 1875 is only 93.
9. Mothers who eat lobsters tend to be wealthier and can afford better health care.
11. A maker of shoe polish has an obvious interest in the importance of the product and there are many ways in which this could affect the survey results.
13. J. Douglas Carroll wrote in a letter to the editor of the *New York Times* that the mean of 69.5 for all males is measured from birth, whereas males don't become conductors until they have already survived for about 30 years. When this is taken into account, the mean of 73.4 years is not significant.
15. The wording of the question is biased and tends to encourage negative responses. The sample size of 20 is too small. Survey respondents are self-selected instead of being selected by the newspaper. If 20 readers respond, the percentages should be multiples of 5; 87% and 13% are not possible results.
4. a) 36,000 b) \$39,600; No
6. could mean June-Sept or Sept-May
8. No. There are probably more Volvo's on the road than Corvettes. Therefore, one death in a Corvette would weigh more heavily
12. The bars are not drawn to scale. Year 4 should only be about 3 times as tall as Year 1.

MEASURES OF CENTRAL TENDENCY & VARIATION ANSWERS

1. a)

0	6
1	1 6
2	5 7
3	2 4 6
4	4 5 6 8
5	2 5 7
6	4 8
7	3 5
8	6

b) $\bar{X} = 45$; $M = 45.5$; Range = 80; $S = 21.97$

c) Mean/Standard deviation (The data is centrally distributed.)

2. a)



b) $\mu = 8.7$; $M = 6$; $\sigma = 9.45$;

$Q_1 = 2$; $Q_3 = 10$; Outliers = 23, 30, 31, 52

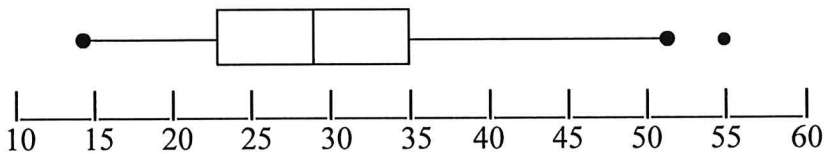
c) Median/Quartiles (The data is skewed to the right.)

3. a) Median/Quartiles b) Mean/Standard deviation c) Mean/Standard deviation d) Median/Quartiles

4. a) $M = 29$; Mode = 27; LQ = 23; UQ = 35; IQR = 12; Outliers = 55

b) Median/Quartiles; The data is skewed.

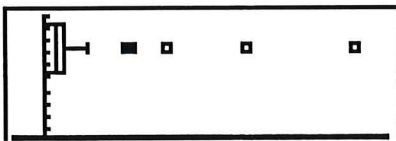
c)



5. a) $\mu = 60.4$; $M = 23$; $\sigma = 118.6$; $Q_1 = 3$; $Q_3 = 44$; Outliers = 170, 181, 250, 414, 635

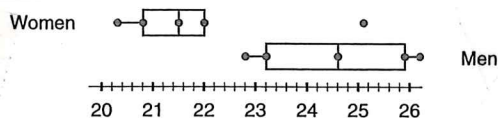
b) Median/Quartiles

c)



6. a) $\bar{X} = 24.5$; $\sigma = 1.18$

b)



c) Possible answers: i) Men marry at a later age than women. ii) Until the 1990s, there was not variation in the ages at which women married. iii) The age at which men married varies more than women.

NORMAL DISTRIBUTION ANSWERS

- (a) a normal distribution with a small standard deviation
(b) a normal distribution with a large standard deviation
(c) a distribution where values greater than the mean are more spread out than values less than the mean
(d) a distribution where all values occur with the same frequency
- 99.1%
- 50 months
- (a) 91st percentile (b) 20.1
- (a) 72 (b) 62
- (a) 2.55 mL (b) 66.3%
- (a) ≈ 17 days (b) 19,196-20,804 letters
- 179 min 7 sec
- 0.511
- 0.178
- yes; The probability that she delivered a baby 308 days after her husband's visit is 0.0038.
- 610
- 5.94 years or approximately 6 years

CONFIDENCE INTERVAL ANSWERS

- a) 0.4 b) ± 0.66 c) 67.34—68.66 inches
- a) 0.198 b) 0.25 c) 15.95—16.45 millimeters
- a) 750 hours b) 3.136 hours c) 64
- 100
- a) 338.39—361.61 b) 338; There would only be a 0.5% chance of it being lower.
- 0.093
- 156
- 0.915
- 1537

HYPOTHESIS TESTING ANSWERS

1. a) H_o : Special delivery does not take too much time. H_a : Special delivery takes too much time.
b) H_o : New design is not more comfortable. H_a : New design is more comfortable.
c) H_o : Cigarette smoke has no effect. H_a : Cigarette smoke has an effect.
d) H_o : Hair conditioner is not effective. H_a : Hair Conditioner is effective.
2. a) H_o : $\mu = (\leq) 210$ lb vs. H_a : $\mu > 210$
b) H_o : $\mu = 570$ lb/unit vs. H_a : $\mu \neq 570$
c) H_o : $\mu = \$9.00$ (\leq) vs. H_a : $\mu > \$9.00$
3. a) 2.33
b) -0.74
4. a) Fail to reject H_o b) Reject H_o
5. a) 0.1977 b) 0.2420 c) 0.0174
6. a) 48.5
7. a) mean test score
b) H_o : $\mu = 35.70$ (\geq) vs. H_a : $\mu < 35.70$
c) -5.86, $P(z < -5.86) \approx +0.0000$
d) Reject H_o
8. a) # of trucks dealers have in stock
b) H_o : $\mu = 38$ (\leq) vs. H_a : $\mu > 38$
c) Normal distribution: $p < 0.02$
d) $n = 150$; $\mu = 38$; $\bar{x} = 41$; $\sigma = 16$; $\sigma_{\bar{x}} = 1.306$; $z^* = 2.30$
e) $p = 0.0107$
f) Reject H_o :
9. a) mean number of seconds in error per month
b) H_o : $\mu = 20$ (\leq) vs. H_a : $\mu > 20$
c) Normal distribution, $p < 0.05$
d) $n = 36$; $\mu = 19.8$; $\bar{x} = 22.7$; $\sigma = 9.1$; $\sigma_{\bar{x}} = 1.517$; $z^* = 1.91$
e) $p = 0.0281$
f) Reject H_o :