

1-1

Discretionary and Essential Expenses

### Exercises

- For most people, the cost of a subscription to streaming music services is definitely a discretionary expense. Marshal researched subscription costs and found the following rates for streaming services:  

\$10/mo., \$6/mo., \$33/year, \$3/mo., \$5/mo., \$10/mo., \$10/mo., \$4/mo., \$12/mo., \$60/year

  - In order to analyze the data, the subscription rates must cover the same time period. Change the yearly rates to monthly rates.  

**\$33/year = \$2.75/mo. and \$60/year = \$5/mo.**
  - What is the mean monthly subscription fee? Round your answer to the nearest cent.  

**\$6.78**
  - What is the median monthly subscription fee?  

**\$5.50**
  - What is the mode monthly membership fee?  

**\$10**
- Carla is a carpenter. She wants to purchase new high-quality tools for her business. She found the following prices for the exact same set of tools from various sellers:  

\$6,700   \$7,450   \$8,000   \$7,600   \$7,450   \$8,200   \$7,210

  - What is the mean price? Round your answer to the nearest cent.  

**\$7,515.71**
  - What is the median price?  

**\$7,450**
  - What is the mode price?  

**\$7,450**
- According to the Bureau of Economic Analysis, the monthly percentage change of disposable income in the United States over the course of a year from February to February was reported as follows:  

0.3%   0%   0.6%   0.5%   0.5%   0.4%   0.3%   0.2%   0.3%   0.2%   0.3%   0.4%   0.2%

  - What was the mean percent change over this period? Round your answer to the nearest hundredth of a percent.  

**0.32%**
  - What was the median percent change over this period.  

**0.3%**
  - From January to February of the second year, a 0.2% change in disposable income was reported. If the January amount was 12.43 billion dollars, what would the February amount be? Round your answer to two decimal places.  

**12.45 billion dollars.**

4. In their brochure, AutoNation Career School estimated the average discretionary personal expenses for a student attending to be \$2,850. Martin is a student and feels that the amount is too high. He polled his co-students and made a list of their actual school year expenses:
- \$2,500   \$2,600   \$3,000   \$3,200   \$2,700   \$2,900   \$2,850
- a. What is the mean of these students’ personal expenses? Round your answer to the nearest cent.  
**\$2,821.43**
- b. How does that average compare with the estimate?  
**Slightly lower**
- c. What would Martin’s actual personal expenses for that school year have to be so that his amount and his co-students’ amounts together would have an average of \$2,850?  
**\$3,050**

Use the following table to answer questions 5–8.

Monthly Cell Phone Bills											
Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
$x_1$	$x_2$	$x_3$	$x_4$	$x_5$	$x_6$	$x_7$	$x_8$	$x_9$	$x_{10}$	$x_{11}$	$x_{12}$
\$83	\$86	\$78	\$82	\$95	\$87	\$90	\$76	\$88	\$82	\$83	\$71

5. Write the formula for the mean cell phone bill for the entire year using sigma notation and determine that mean. Round your answer to the nearest cent.
- $$\bar{x} = \frac{1}{12} \sum_{i=1}^{12} x_i = \$83.42$$
6. Write the formula for the mean cell phone bill for the last six months of the year using sigma notation and determine that mean. Round your answer to the nearest cent.
- $$\bar{x} = \frac{1}{6} \sum_{i=7}^{12} x_i = \$81.67$$
7. Write the formula for the mean cell phone bill from March to September using sigma notation and determine that mean. Round your answer to the nearest cent.
- $$\bar{x} = \frac{1}{7} \sum_{i=3}^9 x_i = \$85.14$$
8. Write the sigma notation mean formula for the 3 consecutive month period that would have the highest mean of the year.
- $$\bar{x} = \frac{1}{3} \sum_{i=5}^7 x_i$$

Use the following table to answer questions 9–11.

Janet attends State University and lives in an on-campus dorm suite with 5 friends. They share the cost of the monthly upgraded cable bill for their suite. Below is a listing of the bills for their freshman year.

Monthly Cable Bill								
Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
$x_1$	$x_2$	$x_3$	$x_4$	$x_5$	$x_6$	$x_7$	$x_8$	$x_9$
\$65	\$70	\$84	\$76	\$50	\$80	\$78	\$78	\$67

9. Round the following value  $\frac{1}{9} \sum_{i=1}^9 x_i$  to the nearest dollar.

**\$72**

Interpret the answer in the context of the problem.

**\$72 is the average monthly cable bill during their freshman year living in the dorm suite.**

10. Round the following value  $\frac{1}{4} \sum_{i=1}^4 x_i$  to the nearest dollar.

**\$74**

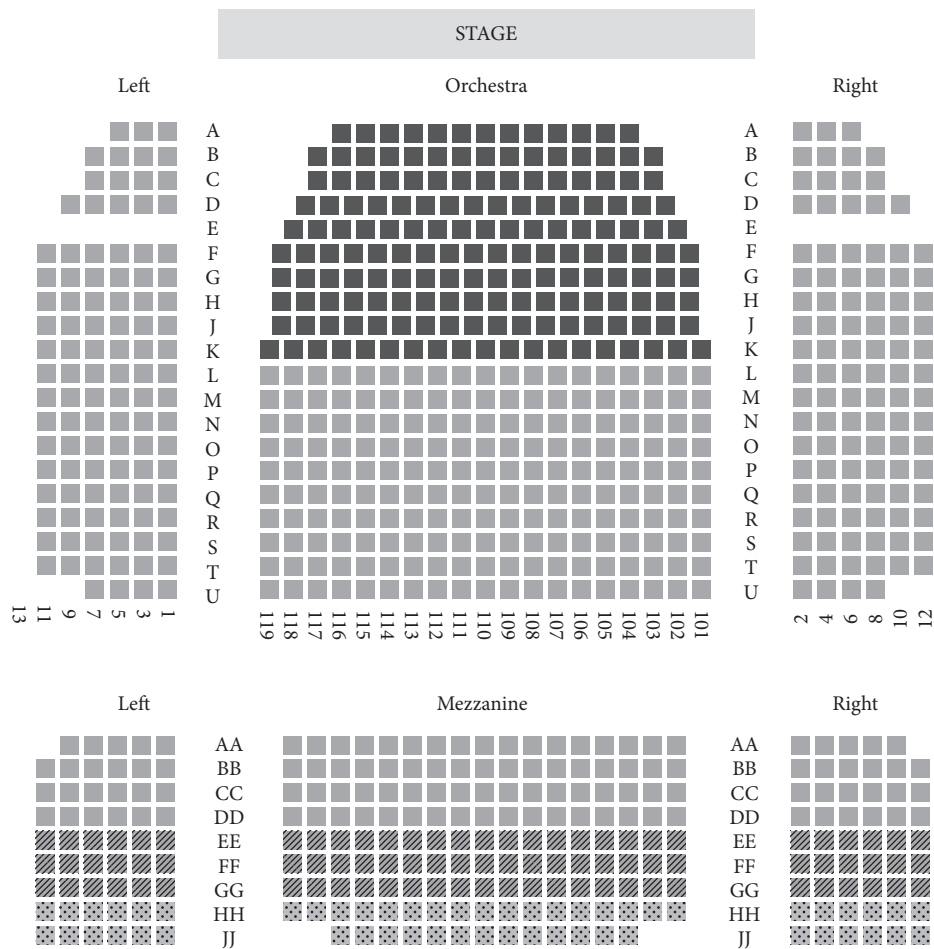
Interpret the answer in the context of the problem.

**\$74 is the average monthly cable bill for the first semester or the first four months of the school year.**

11. Write the sigma notation mean formula for the second semester beginning in February and determine that semester average rounded to the nearest dollar.

$$\bar{x} = \frac{1}{4} \sum_{i=6}^9 x_i \approx \$76$$

12. The New York Premier Theater is hosting a concert at which all proceeds will go to the charity. The seating chart is shown here:



The seating options for the color-coded seats are priced as follows:

- Rear Mezzanine 54 seats, each at \$150
- ▨ Middle Mezzanine 87 seats, each at \$200
- Front Mezzanine and Orchestra 512 seats, each at \$300
- Front and Center Orchestra 167 seats, each at \$500

- a. Construct a frequency distribution with column headings "Seat Type", "Price", and "Number of Seats".

Seat Type	Price	Number of Seats
Rear Mez.	\$150	54
Middle Mez.	\$200	87
Front Mez. & Orchestra	\$300	512
Front/Center Orchestra	\$500	167
- b. If all of the seats were sold for this concert, what would be the total amount to be donated to charity?

**\$262,600**
- c. Determine the mean, median, and mode seat prices. Round to the nearest cent.

**Mean \$320.24; median \$300.00; mode \$300.00**

Name \_\_\_\_\_ Date \_\_\_\_\_

13. Although companies would like consumers to believe that identity theft protection is an essential expense, in reality it is discretionary. A consumer organization compared the monthly costs of similar identity theft protection plans on the market and published the following list:

\$14.99 \$12.75 \$14.99 \$14.99 \$9.99 \$25 \$25 \$10 \$14.99 \$10 \$20 \$10 \$20  
\$14.99 \$10 \$25 \$20 \$12 \$14.99 \$25 \$25 \$20 \$12.75 \$10 \$9.99

- a. Write the formula for the mean in sigma notation and use it to calculate the mean monthly plan price. Round your answer to the nearest cent,

$$\bar{x} = \frac{1}{25} \sum_{i=1}^{25} x_i = \$16.10$$

- b. Construct a frequency distribution for the data.

Monthly Cost	Frequency
9.99	2
10.00	5
12.00	1
12.75	2
14.99	6
20.00	4
25.00	5

- c. Use the frequency distribution to determine the mean. Round to the nearest cent.  
 $(2 * 9.99 + 5 * 10 + 12 + 2 * 12.75 + 6 * 14.99 + 4 * 20 + 5 * 25)/25 = \$16.10$
- d. Use the frequency distribution to determine the median and the mode.  
**median = \$14.99; mode = \$14.99**

# 1-2 Travel Expenses

## Exercises

1. A certain rail company uses a method called demand pricing for setting the prices of their seats. The price per seat starts at a fixed amount. As the train starts to fill up, the prices gradually increase. A consumer watchdog agency selected a random coach car on a train traveling between New York and Philadelphia. They asked each traveler for the price paid for the seat. The following is the result of their survey.

- a. Extend the graph by adding a cumulative frequency column. Calculate the 6 entries for that column and answer the questions below.

Price	Frequency	Cumulative Frequency
\$39	12	<b>12</b>
\$45	17	<b>29</b>
\$55	14	<b>43</b>
\$70	7	<b>50</b>
\$88	5	<b>55</b>
\$107	4	<b>59</b>

- b. How many passengers paid a fare at or below \$45?

**29**

- c. How many passengers paid a fare at or above \$70?

**16**

- d. How many passengers paid a fare that was at least \$45 and at most \$88?

**43**

2. Use the table in problem 1 to answer these questions.

- a. Add a relative frequency column. Calculate the relative frequencies. Round each to the nearest thousandth.

**Relative Frequency**

**0.203**

**0.288**

**0.237**

**0.119**

**0.085**

**0.068**

- b. Which ticket prices have a relative frequency greater than 0.2 and less than 0.3?

**\$39, \$45, \$55**

- c. Interpret the relative frequency for the \$88 ticket price in terms of a percent.

**8.5% of the passengers polled in this train car paid \$88 for their ticket.**

Name \_\_\_\_\_ Date \_\_\_\_\_

3. Many people travel to Florida to visit the popular theme parks there. The table below lists yearly attendance at one of those parks for 6 consecutive years.

Year	Attendance in millions
2009	17.3
2010	16.97
2011	17.14
2012	17.54
2013	18.59
2014	19.33

Use the table to answer the questions below.

- a. Add a "Relative Frequency" column to the table and determine all of the entries in that column. Round your entries to three decimal places.
- b. Add a "Cumulative Frequency" column to the table and determine all of the entries in that column. Express your answer in millions to two decimal places.
- c. Add a "Relative Cumulative Frequency" column to the table and determine all of the entries in that column. Round your entries to three decimal places.

Rel. Freq.	Cum. Freq.	Rel. Cum. Freq.
0.162	17.3M	0.162
0.159	34.27M	0.321
0.160	51.41M	0.481
0.164	68.95M	0.645
0.174	87.54M	0.819
0.181	106.87M	1.000

- d. What was the average monthly number of visitors in millions attending this theme park over this 6-year period? Round to the nearest tenth of a million.  
**17.8M**
- e. What was the median number of park visitors?  
**17.42M**
- f. Use your completed chart. What percent of the total number of visitors attended in 2014?  
**18.1%**
- g. Use your chart. Approximately what percent of all people entering the park did so in 2009, 2010, and 2011 combined? Where would you find this information in your chart?  
**48.1%. In the relative cumulative frequency column along the 2011 row.**

4. Jim lives in San Francisco and attends school at a university in New York City. He wants to travel home for his sister’s wedding next month and has researched round trip airfares. The table lists all available itineraries with fares below \$400.

RT Fares	Frequency	Rel. Freq.	Cum. Freq.	Re. Cum. Freq.
\$326	2	0.024	2	0.024
\$336	10	0.119	12	0.143
\$340	2	0.024	14	0.167
\$344	4	b.	18	0.214
\$350	5	0.060	23	f.
\$357	9	0.107	d.	0.381
\$366	15	0.179	47	0.560
\$371	3	0.036	50	0.595
\$376	2	c.	52	0.619
\$379	6	0.071	58	g.
\$384	17	0.202	e.	0.893
\$392	9	0.107	84	1.000
Total	a.			

Use the table to determine the missing values a–g.

**a. 84, b. 0.048, c. 0.024, d. 32, e. 75, f. 0.274, g. 0.690**

5. Four car rental prices were quoted for a 1-day rental. The frequencies are listed. Let  $Y$  represent the frequency of the \$83 price quote. Use the information shown in the chart to write algebraic expressions for the entries labeled a–e.

1-day Car Rental	Frequency	Relative Frequency	Cumulative Frequency	Relative Cumulative Frequency
\$65	4			
\$72	2	b. $\frac{2}{9+Y}$		
\$83	$Y$	c. $\frac{Y}{9+Y}$		
\$100	3		d. $9 + Y$	e. $\frac{9+Y}{9+Y}$
Total	a. $9 + Y$			



6. Tesa lives in a major city. Her employer pays for her round trip taxicab fare from home to work each day. She must keep receipts for each trip and turn them in at the end of each month for reimbursement. The fares are based on distance and time so they change each day due to traffic, construction, weather, and other factors. Below is an ordered list of her round-trip fares for the 23 workdays in August.

23.00   23.00   24.25   24.25   24.25   24.25   24.25   24.75  
25.50   25.50   25.50   25.50   25.50   25.50   25.60   25.75  
25.80   25.80   25.80   25.90   25.90   25.95   25.95

- a. Find the percentile rank for a fare of \$25.50. Interpret your results.  
**Approx. 61%. Approximately 61% of fares listed are at or below \$25.50.**
- b. Find the percentile rank for a fare of \$25.90. Interpret your results.  
**91%. Approximately 91% of the fares listed are at, or below, \$25.90.**
- c. Based on your answers to parts a and b of this problem, which fare would have a percentile rank of about 70%?  
**\$25.75**
7. The table below lists all train fares quoted from Washington, DC, to Philadelphia, PA, on a given day.

- a. Write an algebraic expression for the percentile rank of \$42.

$$\frac{100a}{a + b + c + d + e + f}$$

- b. Write an algebraic expression for the percentile rank of \$48.

$$\frac{100(a + b)}{a + b + c + d + e + f}$$

- c. Write an algebraic expression for the percentile rank of \$55.

$$\frac{100(a + b + c)}{a + b + c + d + e + f}$$

- d. Write an algebraic expression for the percentile rank of \$68.

$$\frac{100(a + b + c + d)}{a + b + c + d + e + f}$$

- e. Write an algebraic expression for the percentile rank of \$90.

$$\frac{100(a + b + c + d + e)}{a + b + c + d + e + f}$$

- f. Write an algebraic expression for the percentile rank of \$109.

$$\frac{100(a + b + c + d + e + f)}{a + b + c + d + e + f}$$

Cost to Airport	Frequency
\$42	a
\$48	b
\$55	c
\$68	d
\$90	e
\$109	f

# 1-3 Entertainment Expenses

## Exercises

1. Following are the prices of 12 tickets listed on the *Ticket Racket* ticket broker site for a Bruce Springsteen concert.

\$75, 120, 120, 145, 150, 150, 150, 175, 175, 200, 225, 275

Round your answers to the nearest hundredth.

- |   |  |
|---|--|
| a. What is the mean ticket price?<br><b>\$163.33</b>        | b. What is the median ticket price?<br><b>\$150</b>  |
| c. What is the mode ticket price?<br><b>\$150</b>           | d. What is the range?<br><b>\$200</b>                |
| e. What is the variance?<br><b>2,526.39 dollars squared</b> | f. What is the standard deviation?<br><b>\$50.26</b> |
2. The variance of a distribution is 50. What is the standard deviation, rounded to the nearest thousandth?  
**7.071**
3. The following is a list of Relay for Life donations given by several community businesses in the Maple Glen High School vicinity.  
\$10, \$50, \$100, \$100, \$100, \$120, \$120, \$125, \$150, \$150, \$250.  
Round your answers to the nearest hundredth.
- |   |  |
|---|--|
| a. What is the mean donation amount?<br><b>\$115.91</b>     | b. What is the range?<br><b>\$240</b>                |
| c. What is the variance?<br><b>3,339.68 dollars squared</b> | d. What is the standard deviation?<br><b>\$57.79</b> |
4. Airline fares can vary greatly, even from the same carrier within the same day. The following are fares from New York to Burbank, CA, over the past week.  
\$430, \$567, \$334, \$701, \$424, \$555, \$890, \$455, \$450, \$1,122  
What is the standard deviation for this distribution? Round your answers to the nearest dollar.  
**\$233.14**
5. The distribution of cell phone bills for families in Smithtown North High School has mean \$183 and standard deviation 11. At Smithtown South High School, the mean is \$181 and the standard deviation is 21. Which distribution is more spread out?  
**Smithtown South.**

Name \_\_\_\_\_ Date \_\_\_\_\_

6. The following is a distribution of the number of individual song downloads made by students in Arlington High School's Acoustic Café Club last year.

12, 11, 21, 43, 23, 51, 19, 22, 88, 60

- a. Find the mean number of downloads per club member.

**35**

- b. If each club member increased their downloads by 6, what happens to the mean?

**It increases by 6 to 41.**

- c. If each club member multiplies their downloads by 3, what happens to the mean?

**It increases to 105.**

- d. Find the median number of downloads per club member.

**22.5**

- e. If each club member increased their downloads by 6, what happens to the median?

**It increases by 6 to 28.5.**

- f. If each club member multiplies their downloads by 3, what happens to the median?

**It increases to 67.5.**

- g. Find the range of the distribution.

**77**

- h. If each club member increased their downloads by 6, what happens to the range?

**Nothing.**

- i. If each club member multiplies their downloads by 3, what happens to the range?

**It increases to 231.**

- j. Find the standard deviation of the original distribution to the nearest thousandth.

**23.715**

- k. If each club member increased their downloads by 6, what happens to the standard deviation?

**Nothing.**

- l. If each club member multiplies their downloads by 3, what happens to the standard deviation?

**It is tripled to become 71.145.**

7. Look at the original data in problem 6. Suppose the number 60 was changed to 600 and the rest of the numbers remained the same.

- a. Would the mean be affected?

**Yes.**

- b. Would the median be affected?

**No.**

- c. Would the range be affected?

**Yes.**

- d. Would the standard deviation be affected?

**Yes.**

8. A high school theater production had an admission price of \$10. During the show, 876 people paid to enter.
  - a. What is the range of the distribution of admission fees?  
**\$0. All paid the same.**
  - b. What is the standard deviation of the distribution of admission fees?  
**\$0**
  - c. If the standard deviation of a distribution is 0, must all of the data be the same number? Explain.  
**Yes. The standard deviation measures spread about the mean and if the spread is 0, the numbers must be the same.**
9. A class of 31 students averaged 82 on a recent exam. Two students were absent and took the exam the next day. The two students averaged 88 on their exam. What was the average for the entire class, including the two students who took the test one day later?  
**82.39.**
10. The number of cars owned by households in the Lakebridge Condominium Complex is shown in the table.

Number of Cars Owned	Frequency, $f$	$x_i f$	$x_i - \bar{x}$	$(x_i - \bar{x})^2$	$(x_i - \bar{x})^2 f$
0	22	c. <b>0</b>	h. <b>-1.3</b>	l. <b>1.69</b>	p. <b>37.18</b>
1	43	d. <b>43</b>	i. <b>-0.3</b>	m. <b>0.09</b>	q. <b>3.87</b>
2	52	e. <b>104</b>	j. <b>0.7</b>	n. <b>0.49</b>	r. <b>25.48</b>
3	3	f. <b>9</b>	k. <b>1.7</b>	o. <b>2.89</b>	s. <b>8.67</b>
TOTAL	$n = 120$	g. <b>156</b>			t. <b>75.2</b>

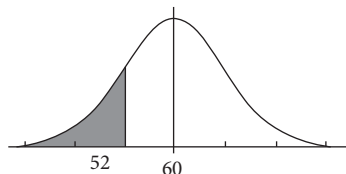
- a. Find the mean number of cars owned per household.  
**1.3**
- b. Fill in the missing entries in the table to the nearest hundredth.
- c. Find the standard deviation of the distribution to the nearest hundredth.  
**0.79**
12. A distribution consists of 30 scores of 10 and 30 scores of 20. Find the ratio of the range to the standard deviation.  
**10:5 or 2:1**
13. Create a distribution of five numbers that has range 10, maximum score 20, and mean 12.  
**Answers vary, but could include 10, 10, 10, 10, 20.**

# 1-4 Vacation Expenses

## Exercises

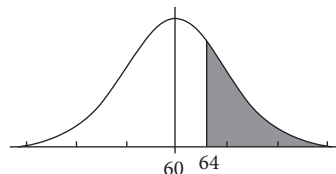
1. A travel agency did a survey and found that the average local family spends \$1,900 on a summer vacation. The distribution is normally distributed with standard deviation \$390.
  - a. What percent of the families took vacations that cost under \$1,500? Round to the nearest percent.  
**15%**
  - b. What percent of the families took vacations that cost over \$2,800? Round to the nearest percent.  
**1%**
  - c. Find the amount a family would have spent to be the 60th percentile. Round to the nearest dollar.  
**\$2.001**
2. A distribution is normal with mean 60 and standard deviation 8. Find the area of each of the following shaded regions to four decimal places.

a.



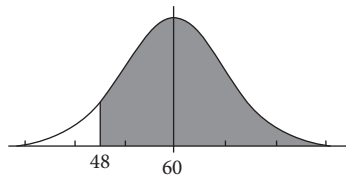
**0.1587**

b.



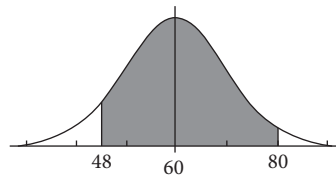
**0.3085**

c.



**0.9332**

d.

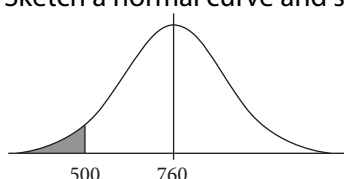


**0.9270**

Name \_\_\_\_\_ Date \_\_\_\_\_

3. A family of two adults and two children on vacation in the United States will pay an average of \$247 per day for food and lodging with a standard deviation of \$60 per day, according to a recent survey by a national travel association.
  - a. Find, to the nearest hundredth, the z-score for \$150 for vacation food and lodging expenses.  
**-1.62**
  - b. If a vacationer had a z-score of 2.1, what were their daily expenses for food and lodging?  
**\$373**
  - c. If the data is normally distributed, find the percent of these vacationers who spent less than \$307 per day.  
**84.13%**
  - d. What is the variance?  
**3,600**
  - e. What is the mean expense for food and lodging for a 7-day vacation?  
**\$1,729**
4. The Vacation Times website rates recreational vehicle campgrounds using integers from 0 to 15. Last year they rated over 1,000 campsites. The ratings were normally distributed with mean 7.6 and standard deviation 1.7.
  - a. How high would a campsite's rating have to be for it to be considered in the top 10% of rated campsites? Round to the nearest hundredth.  
**9.78**
  - b. Find the z-score for a rating of 5. Round to the nearest hundredth.  
**-1.53**
  - c. Find the percentile for a rating of 7.5. Round to the nearest percent.  
**48th percentile.**
  - d. A campsite had a z-score of 2. What was its rating?  
**11**
5. A certain amusement park ride requires riders to be at least 48 inches tall. If the heights of children in a summer camp are normally distributed with mean 52 and standard deviation 2.5, how many of the 140 campers will be allowed on the ride? Round to the nearest integer.  
**132**
6. What z-score on the Normal Curve table has an area of 0.8849 to its left?  
**1.2**
7. What z-score on the Normal Curve table has an area of 0.6808 to its right?  
**-0.47**

8. *Travel Times Journal* found that the average per person cost of a 10-day trip along the Pacific coast, per person, is \$1,015. This includes transportation, food, lodging, and entertainment.
  - a. If the data is normally distributed with standard deviation \$198, find the percent of vacationers who spent less than \$1,200 per day. Round to the nearest hundredth of a percent.  
**82.38%**
  - b. Find the per-day expense for one of these travelers who had a z-score of  $-1.6$ .  
**\$698.20**
  - c. A *Bargain Times Vacation Blog* writer claimed to have done this vacation for a cost of \$710 per person. What percentile is represented by \$710? Round to the nearest hundredth of a percentile.  
**6.18th percentile**
9. The school nurse at West Side Elementary School weighs all of the 230 children by the end of September. She finds that the students' weights are normally distributed with mean 98 and standard deviation 16. After compiling all the data, she realizes that the scale was incorrect—it was reading two pounds over the actual weight. She adjusts the records for all 230 children.
  - a. What is the effect of the correction on the mean?  
**The mean should be lowered 2 pounds.**
  - b. What is the correct mean?  
**96**
  - c. What is the effect of the correction on the standard deviation?  
**Nothing—it remains the same. Because all the scores are translated, the spread about the mean is unchanged.**
10. During a recent summer month, airfares from Miami, FL, to Seattle, WA, were normally distributed with mean \$760 and standard deviation \$136.
  - a. Sketch a normal curve and shade in the interval below \$500.



- b. Find the z-score for a fare of \$500.  
**-1.91**
- c. What percent of the airfares were below \$500?  
**2.81%**
- d. The lowest 5% of airfares represents a real bargain. What airfare represents the 5th percentile?  
**\$535.60**
- e. What percent of the airfares were below the median?  
**50%**

# 1-5 Personal Expenses

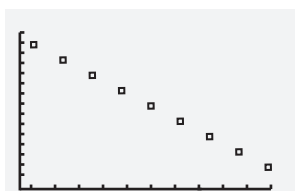
## Exercises

1. Each month you have \$200 automatically deposited from your checking account into a discretionary savings account. Your plan is to leave the money in this account for the next 10 years in order to use the total at that time at your discretion. A scatter plot shows the number of months that have passed and the amount in your discretionary spending account each month. The explanatory  $x$ -variable is the number of months that have passed. The response  $y$ -variable is the amount in your savings account. Is there a positive or negative correlation? Explain.

**Positive. As the months increase, the amount in the account increases.**

2. Determine if the scatter plot below depicts a positive correlation or a negative correlation.

**Negative**



3. Describe each of the following correlation coefficients using the terms strong, moderate, or weak and negative or positive.

a.  $r = -0.19$

**weak negative**

b.  $r = -0.93$

**strong negative**

c.  $r = 0.57$

**moderate positive**

d.  $r = 0.0999$

**weak positive**

e.  $r = -0.97$

**strong negative**

f.  $r = -0.45$

**moderate negative**

4. Lori created a scatter plot where the explanatory variable was the side of a square, and the response variable was the perimeter of the square. Is the data positively or negatively correlated? Explain.

**It is positively correlated. As the side length increases, the perimeter increases.**

5. In each situation of bivariate data there is causation, so the variables can be named explanatory and response variables. Identify each explanatory variable and response variable.

- a. number of days worked, amount earned

**days—explanatory; amount—response**

- b. amount earned in the year, income taxes paid

**amount—explanatory; tax—response**

- c. temperature, number of swimmers at the beach

**temperature—explanatory; number of swimmers—response**

- d. price of a dress, number of dresses sold

**price—explanatory; number sold—response**



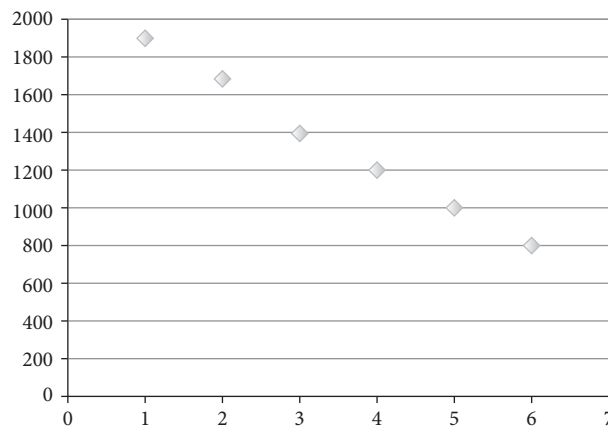
Name \_\_\_\_\_ Date \_\_\_\_\_

6. MoviePlay is an online movie rental service. They have a sliding price list based upon the popularity of the movies. The table below shows the rentals by price category for the month of September. Let  $x$  represent the price and  $y$  represent the number of movies rented at that price.

Price	# of rentals
5.99	800
4.99	1,000
3.99	1,200
2.99	1,380
1.99	1,672
0.99	1,903

- a. Examine the data without drawing a scatter plot. Describe any trends you see.  
**As  $x$  decreases,  $y$  increases.**

- b. Draw a scatter plot. Describe the correlation.  
**As the price increases, sales decrease.**



- c. Based on this information, how many rentals might be anticipated if the company instituted a new price category of \$6.99. Explain your reasoning.  
**Extending the linear pattern, a \$6.99 price would approximately correlate with 600 rentals.**

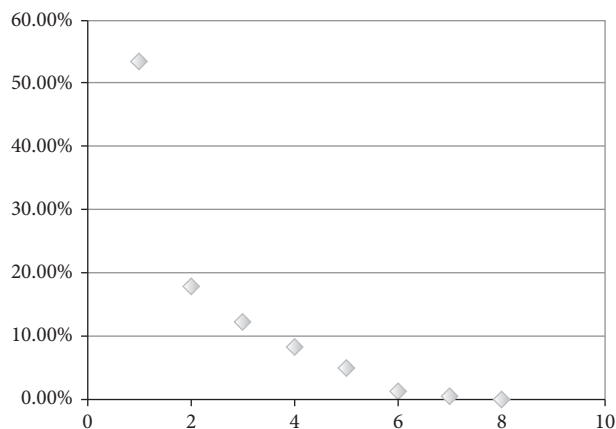
Name \_\_\_\_\_ Date \_\_\_\_\_

7. The table below lists the percentage of households with an income of \$100,000 or more that spent money on fitness-related activities over the course of one year as reported by statista.com.

Fitness Spending in dollars (d)	Percent of households with an income of \$100,00 or more
0	53.7%
$0 < d < 250$	17.8%
$250 \leq d < 500$	12.5%
$500 \leq d < 1000$	8.4%
$1000 \leq d < 2000$	5%
$2000 \leq d < 3000$	1.5%
$3000 \leq d < 5000$	0.7%
$5000 \leq d < 10,000$	0.2%

- a. Without making a scatter plot, what trend do you see in the data.  
**As the spending interval increases, the percent of households at that interval decreases.**
- b. Draw a scatter plot. Let  $x$  represent the spending interval number ( $x = 1$  when  $d = 0$ ,  $x = 2$  when  $0 < d < 250$ ,  $x = 3$  when  $250 \leq d < 500$  etc.) Describe the correlation.

**Negative correlation**



- c. Based on the trend, scatter plot, and correlation, what might you predict the percentage to be for households that had \$10,000 to \$15,000 fitness-related expenses?  
**The plots show a decrease in the percentages as the intervals increase.**  
**The percentage in this interval might be 0.1% or less.**

8. In Application 6 for section 1-5 in the textbook, you were given the following table about discretionary personal back-to-school personal expenses.

- a. Determine the linear regression equation that best fits the data presented in the table. Let  $x$  represent the year and  $y$  represent the back-to-school spending amount per family. Round numbers to the nearest hundredth.

**$y = 19.61x - 38,830.60$**

- b. Determine the correlation coefficient for the bivariate data. Round to the nearest hundredth. Interpret that correlation coefficient.

**0.89; It shows a strong positive relationship between the year and the spending amount.**

- c. Use the linear regression equation to predict the spending amount in 2016. Round your answer to the nearest cent.

**\$703.16**

Year	Back to School Spending in Dollars per Family
2004	\$483.28
2005	\$443.77
2006	\$527.08
2007	\$563.49
2008	\$594.24
2009	\$548.72
2010	\$606.40
2011	\$603.63
2012	\$688.82
2013	\$634.79
2014	\$669.28
2015	\$630.36

- d. Rather than using the actual year values,  $x$  could have represented the year number where  $x = 1$  represents 2004,  $x = 2$  represents 2005, and so on. Replace the year numbers for  $x$  in your list. Determine the regression line using this bivariate data set. Do you get the same regression equation as in part a?

**$y = 19.61x + 451.60$  The regression equation is not the same.**

- e. What similarities and differences do you see in the two regression equations? Explain.

**The slopes are the same and the y-intercepts are different. The slopes are the same because the slope represented the change in spending over the change in years. In each data set, the change in years was 1.**

- f. Use the second linear regression equation to predict the spending for 2016. What  $x$ -value will you use in this case to represent 2016?

**2016 will be the 13th  $x$ -value in this list. Let  $x = 13$  in the equation  $y = 19.61x + 451.60$ . The predicted spending is \$706.53, which is very close to the predicted amount from the first equation.**

Name \_\_\_\_\_ Date \_\_\_\_\_

9. The Super Bowl is a big money-making and money-spending event. The discretionary spending amounts on Super Bowl weekends are in the billions of dollars. Examine the chart below that lists TV viewer numbers and Super Bowl weekend-related expenses by year.

Year	TV Viewers in millions	Money Spent in billions
2007	93.18	8.71
2008	92.45	9.47
2009	98.73	9.56
2010	106.48	8.87
2011	111	10.15
2012	111.3	11.02
2013	108.4	12.28
2014	111.5	12.37
2015	114.4	14.31
2016	111.9	15.53

- a. Determine the linear regression equation where  $x$  represents the year number ( $x = 1$  represents 2007,  $x = 2$  represents 2008, etc.) and  $y$  represents the money spent. Round all numbers to the nearest thousandth. What is the correlation coefficient? What can you infer from the coefficient?  
 **$y = 0.730x + 7.213$ ; correlation coefficient is 0.943; there is a strong positive correlation. As the years increase, the spending increases.**
- b. Determine the linear regression equation where  $x$  represents the number of TV viewers and  $y$  represents the money spent. Round all numbers to the nearest thousandth. What is the correlation coefficient? What can you infer from the differences between this coefficient and the one found in part a?  
 **$y = 0.203x - 10.242$ ; correlation coefficient is 0.704; there is a strong positive correlation between viewership and dollars spent but not as strong as between year and dollars spent.**