

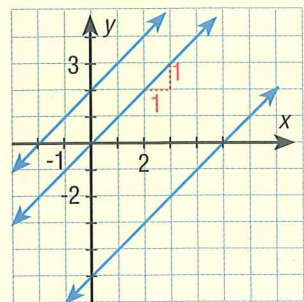
ALGEBRA REFRESHER

Some equations and their graphs belong to families. The equations in the same family all have some common characteristics. Recall that the slope-intercept form of the equation of a line is $y = mx + b$, where m is the slope and b is the y -intercept. To determine slope from a graph of a line,

remember that slope = $\frac{\text{change in } y}{\text{change in } x}$. The y -intercept is the point where the graph intersects the y -axis.

Find the equation of each graph then note the family characteristic.

Example



From the graph, the slope of each line is 1, so $m = 1$ in each case. The y -intercepts are 2, 0, and -5 . Therefore the equations are

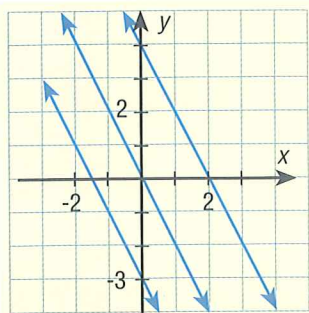
$$y = x + 2$$

$$y = x$$

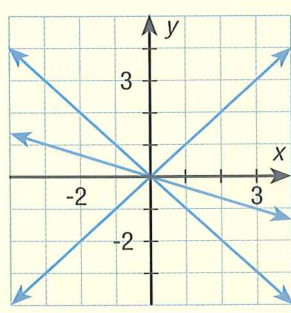
$$y = x - 5$$

The family characteristic is that they all have the same slope.

1.



2.



Graph the equations and note the family characteristics.

Example $y = x^2 - 3x$
 $y = -x^2 + 3x$

The second is the reflection of the first in the x -axis. Note that

$$-(x^2 - 3x) = x^2 + 3x$$

3. $y = x^2$

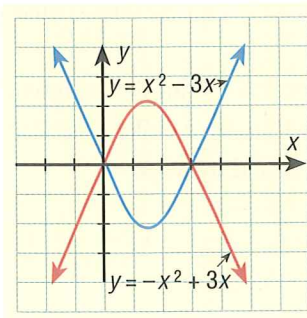
$$y = 3x^2$$

$$y = 0.5x^2$$

4. $y = x^2$

$$y = x^2 + 2$$

$$y = x^2 - 3$$



Travel Plans



AMERICANS LIKE TO TRAVEL, ESPECIALLY AT VACATION time. We visit relatives, beaches, mountains, and cities. We play and watch all sorts of games and sports. We visit places that were important in our nation's history and marvel at the natural beauty of different parts of the country. There really is a lot to see and do. For some, getting away from home and the everyday routine is in itself reason to travel.

In any case, travel is a big business. The travel and tourism industry is happy to cater to our needs and desires. Places to stay, amusements, souvenirs, good things to eat – these and much more call out to us from brochures, from roadside signs, and in all kinds of advertising.

But travel is not free. Whether reasonable or expensive, it always costs money. In this chapter we consider some travel costs. We work with Betty and her family, reading maps, figuring distances, and calculating the costs of automobile travel.

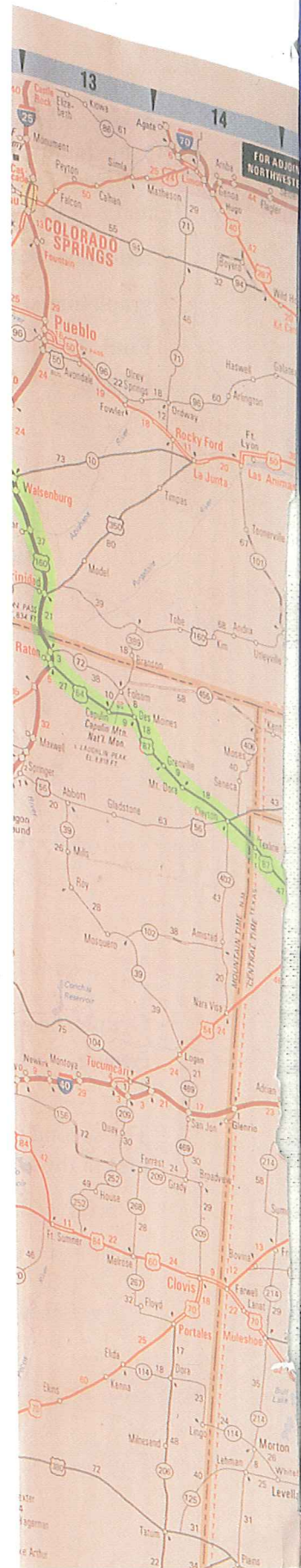
We consider Sylvia and her mother, who travel not only for fun but also because Sylvia's mother is a travel agent and wants first-hand experience about different places. Sylvia helps her mother by using spreadsheets to budget travel costs and a graphing calculator to compare the expenses and earnings from tours.

Reading airline schedules, with the various abbreviations, takes some skill. With Ramón, a college student, we compare the costs of travel by air and by a car.

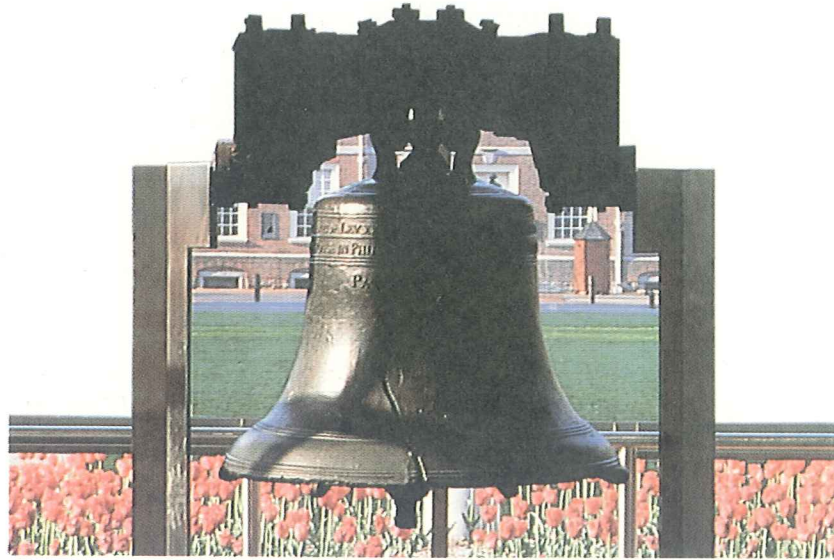
11–1 Making Travel Plans

11–2 Travel Costs: Different Perspectives

11–3 Flying Saves Time and Sometimes Money







Betty likes to travel. She and her family take vacation trips almost every summer. One of her favorite trips was to the West Coast. Betty remembers seeing giant sequoia trees that are the oldest living things on earth, more than 5000 years old. Betty's father bought her a small redwood box and a model truck with tiny redwood logs on the back.

On other trips, Betty saw the Liberty Bell in Philadelphia and stood at the top of the Empire State Building in New York. In Boston she really liked the science museum. She also remembers how her little brother left his teddy bear in a taxicab.

Betty helps her family plan their trips. They usually drive between 300 and 500 miles a day for two days. Then they stay for a few days to relax, see the sights, and visit. They usually take a different way home to see other sights.

Betty's mother teaches history at the high school and frequently knows interesting stories about the people who have lived in the area they are visiting. Betty's father makes up riddles and games for them to play as they drive along. She expects to enjoy the trip this year more than ever.

OBJECTIVES: *In this lesson, we will help Betty to:*

- *Use map-reading skills to plan a trip within the United States.*
- *Use a mileage chart to determine distances.*
- *Determine the cost of driving different distances.*

WHICH WAY TO GO

After deciding where you are going, the next big travel decision is selecting the route, that is, which roads you will take. There are almost always several ways to drive to any given place. Each route has advantages and disadvantages.

If you want to get to your destination in the least amount of time, then you will probably take the big **interstate highways**. These do not have stop lights and with two or three lanes in each direction, traffic generally keeps moving. But sometimes it is more interesting, at least for a time, to take what are called **secondary roads**. These are well-marked federal and state highways that pass through towns and let you see more of what an area is really like. But traveling a distance on secondary roads can make a trip take a very long time.

Betty's family has found that it helps to have an interstate atlas along on any trip. This is a booklet with detailed road maps of every state. The **mileage chart** printed in the atlas gives the distances between many cities. Other mileage distances either are marked on the map or can be estimated on the basis of the map distance and the scale showing miles as distances.

When Betty and her family plan a trip, they have a lot to consider. Betty now helps with some of the driving. They usually switch drivers after one or two hours. When they stop to change drivers, they stretch and sometimes have a snack.

The family has learned to have a destination but also to be flexible when traveling. They sometimes find the most interesting places unexpectedly and stay longer than they had planned. On other occasions they find that a city or attraction is not what they had hoped, and they move along sooner than planned. There are also difficulties beyond their control. Once they had to wait for four hours while the car was repaired. Another time they traveled back roads for two hours to get around rush hour traffic. They have learned to turn problems into adventures and disappointments into opportunities.

Ask Yourself

1. How do you decide which routes to take when traveling?
2. Why would people take secondary roads instead of interstate highways?
3. What are two unexpected events that might change the timing of a trip?

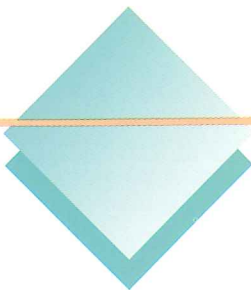
ALGEBRA REVIEW

If $d \div a = g$ and $g \cdot c = t$, find each of the following.

1. g when $d = 500$ and $a = 25$
2. d when $g = 22.5$ and $a = 19.6$
3. a when $d = 300$ and $g = 28$
4. t when $g = 52$ and $c = 1.35$
5. c when $t = 127$ and $g = 105$
6. g when $t = 10.56$
and $c = 1.28$

For four numbers a , b , c , and d ,

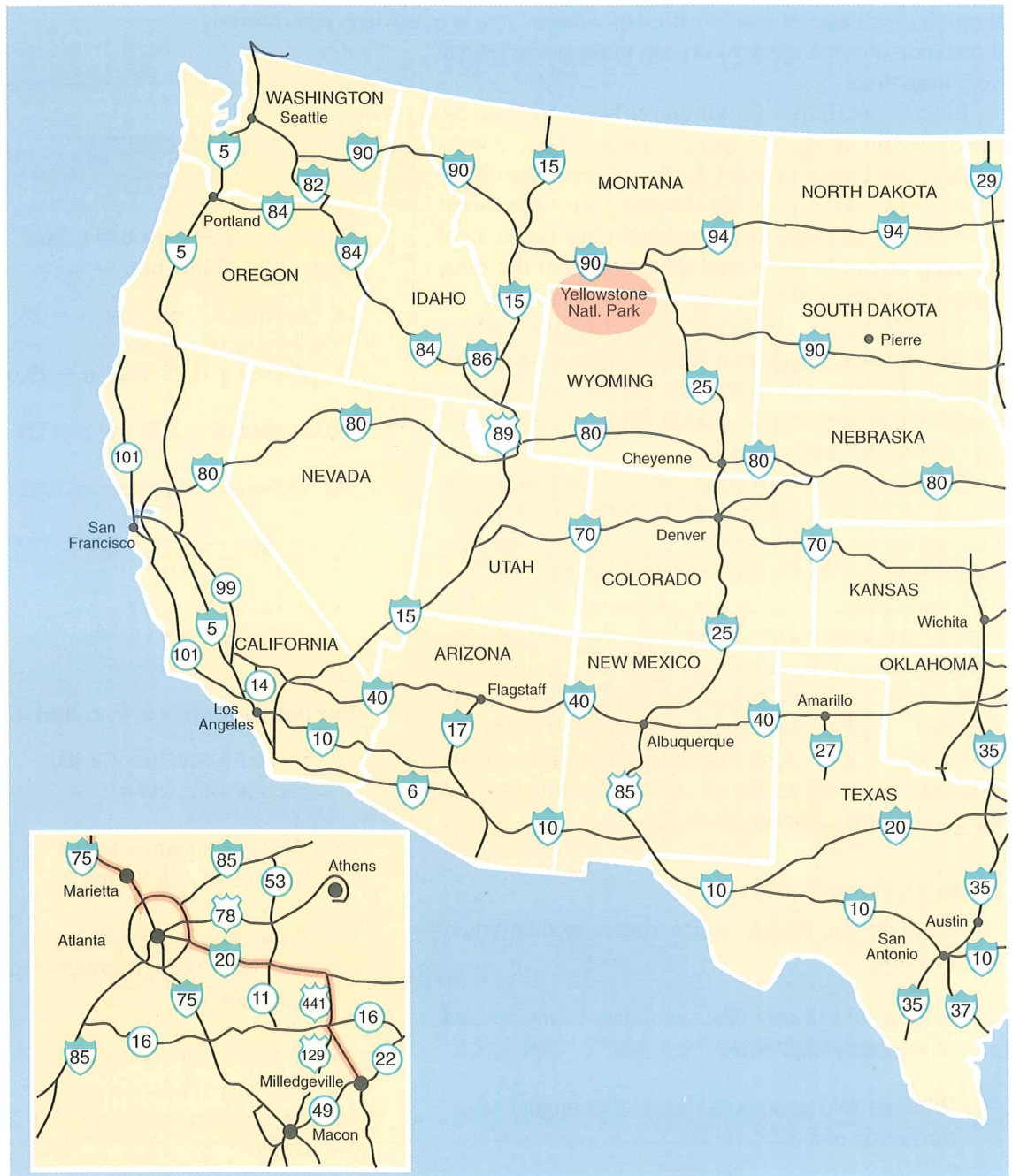
7. Write an equation for the average of a and b .
8. Write an equation for the average of a , b , c , and d .
9. If the average of a , b , and c is d , what is the average of a , b , c , and d ?
10. If the average of a and b is 10, the average of c and d is 12, find the average of a , b , c , and d .



SHARPEN YOUR SKILLS

SKILL 1

EXAMPLE 1 Betty and her family have decided to drive from their home in Indianapolis, Indiana, to visit their cousins in Milledgeville, Georgia.



QUESTION What highways can they take to drive from Indianapolis to Milledgeville?

SOLUTION

The map below shows the interstate highways in the United States. The route that they will take is highlighted: first, south on 65 through Louisville to Nashville; then southeast on 24 to Chattanooga and then 75 to Atlanta. The trip from Atlanta to Milledgeville is highlighted on the inset map of the area around Atlanta. They first take Interstate 20 east and then 441, a secondary road, south.



EXAMPLE 2 The mileage chart shows the distances between many major cities.

QUESTION How far is it from Indianapolis, Indiana, to Atlanta, Georgia?

SOLUTION

To answer the question, we use the mileage chart. Atlanta is the third city down the left-hand column. We read across the Atlanta row to the Indianapolis column. The cell where this row and column intersect shows the mileage between the two cities: 493 miles.

United States Mileage Chart

	Atlanta, GA	Boston, MA	Cheyenne, WY	Chicago, IL	Cincinnati, OH	Cleveland, OH	Dallas, TX	Denver, CO	Des Moines, IA	Detroit, MI	Indianapolis, IN	Kansas City, MO	Louisville, KY	Memphis, TN	Milwaukee, WI	Minneapolis, MN	New Orleans, LA	Omaha, NE	Philadelphia, PA	Pittsburgh, PA
Albuquerque, NM	1381	2172	517	1281	1372	1560	638	417	977	1525	1266	782	1301	1010	1319	1190	1134	858	1899	1619
Amarillo, TX	1097	1897	511	1043	1096	1285	358	423	742	1269	991	547	1019	726	1084	975	850	643	1624	1344
Atlanta, GA		1037	1442	674	440	672	795	1398	870	699	493	798	382	371	761	1068	479	986	741	687
Austin, TX	919	1911	994	1110	1083	1327	193	906	877	1315	1037	682	982	615	1184	1129	517	837	1615	1367
Birmingham, AL	150	1165	1347	642	465	709	645	1286	787	724	475	697	364	246	728	1006	342	898	869	741
Boston, MA	1037		1907	963	840	628	1748	1949	1280	695	906	1391	941	1296	1050	1368	1507	1412	296	561
Charleston, SC	289	929	1722	877	603	730	1072	1678	1150	842	696	1078	591	660	964	1282	720	1266	633	666
Cheyenne, WY	1442	1907		954	1174	1279	869	100	627	1211	1068	650	1161	1101	987	788	1361	495	1678	1390
Chicago, IL	674	963	954		287	335	917	996	327	266	181	499	292	530	87	405	912	459	738	452
Cleveland, OH	672	628	1279	335	244		1159	1321	652	170	294	779	101	468	374	692	786	693	567	287
Columbus, OH	533	735	1235	308	108	139	1028	1229	618	192	171	656	209	576	395	713	894	750	462	182
Dallas, TX	795	1748	869	917	920	1159		781	684	1143	865	489	819	452	991	936	496	644	1452	1204
Denver, CO	1398	1949	100	996	1164	1321	781		669	1253	1058	600	1120	1040	1029	841	1273	537	1691	1411
Des Moines, IA	870	1280	627	327	571	652	684	669		584	465	195	566	599	361	252	978	132	1051	763
Detroit, MI	699	695	1211	266	259	170	1143	1253	584		278	743	360	713	353	671	1045	716	573	287
Flagstaff, AZ	1704	2495	757	1604	1695	1883	961	657	1300	1848	1589	1105	1624	1333	1642	1481	1457	1171	2222	1942
Harrisburg, PA	700	373	1579	639	468	314	1383	1592	952	474	534	1019	569	931	726	1044	1142	1084	102	189
Indianapolis, IN	493	906	1068	181	106	294	865	1058	465	278		485	111	435	268	586	796	587	633	353
Jackson, MS	391	1406	1257	742	655	899	404	1169	809	914	646	644	554	212	824	1036	178	845	1110	939
Kansas City, MO	798	1391	650	499	591	779	489	600	195	743	485		520	451	537	447	806	201	1118	838
Knoxville, TN	193	911	1372	527	253	485	837	1328	800	512	346	728	241	385	614	932	596	916	615	511
Louisville, KY	382	941	1161	292	101	345	819	1120	566	360	111	520		367	379	697	685	687	668	388
Mackinaw City, MI	935	916	1291	387	495	439	1261	1341	673	284	460	864	562	880	368	508	1247	805	842	556
Miami, FL	655	1504	2097	1329	1095	1264	1300	2037	1525	1352	1148	1448	1037	997	1416	1723	856	1641	1208	1200
Minneapolis, MN	1068	1368	788	405	692	740	936	841	252	671	586	447	697	826	332		1214	357	1143	857
New Orleans, LA	479	1507	1361	912	786	1030	496	1273	978	1045	796	806	685	390	994	1214		1007	1211	1070
Norfolk, VA	540	558	1764	831	604	508	1329	1758	1141	666	700	1162	642	877	918	1236	1019	1273	263	384
Pierre, SD	1361	1726	434	763	1050	1098	943	518	492	1029	944	592	1055	1043	690	394	1394	391	1501	1215
Pittsburgh, PA	687	561	1390	452	287	129	1204	1411	763	287	353	838	388	752	539	857	1070	895	288	
Portland, ME	1139	106	1986	1042	942	707	1850	2028	1359	775	1001	1486	1043	1398	1129	1447	1609	1491	398	663
Portland, OR	2601	3046	1159	2083	2333	2418	2009	1238	1786	2349	2227	1809	2320	2259	2010	1678	2505	1654	2821	2535
San Antonio, TX	983	1988	1027	1187	1160	1404	270	939	954	1392	1114	759	1059	692	1261	1206	550	914	1692	1444
San Francisco, CA	2496	3095	1188	2142	2362	2467	1753	1235	1815	2399	2256	1835	2349	2125	2175	1940	2249	1683	2866	2578
Seattle, WA	2618	2976	1228	2013	2300	2348	2078	1307	1749	2279	2194	1839	2305	2290	1940	1608	2574	1638	2751	2465
Tulsa, OK	772	1537	765	683	736	925	257	681	443	909	631	248	659	401	757	695	647	387	1264	984
Washington, DC	608	429	1611	671	481	346	1319	1616	984	506	558	1043	582	867	758	1075	1078	1116	133	221
Wichita, KS	903	1587	583	696	787	975	365	509	392	940	681	197	710	532	734	644	815	298	1314	1034

SKILL 3

EXAMPLE 3 Betty estimates that the driving distance from Atlanta to Milledgeville is 115 miles. The family car gets an average of 20 miles per gallon of gas. They expect to pay about \$1.35 a gallon for gas while on the trip.

QUESTION How much should they budget for gas between Indianapolis and Milledgeville?

SOLUTION

The total distance d is the distance from Indianapolis to Atlanta plus the distance from Atlanta to Milledgeville

$$493 + 115 = 608 \text{ miles}$$

To find the number of gallons of gas to be used, divide the total distance by the average miles per gallon.

$$g = \frac{d}{a} \quad \begin{array}{l} \text{where } d = \text{total distance in miles} \\ a = \text{average miles per gallon} \\ g = \text{number of gallons needed} \end{array}$$

$$g = \frac{608}{20} = 30.4 \text{ gallons}$$

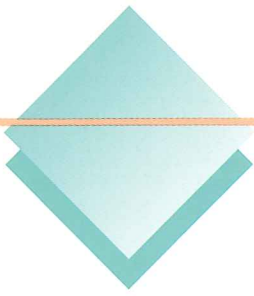
Next, we find the total cost.

$$t = gc \quad \begin{array}{l} \text{where } g = \text{number of gallons} \\ c = \text{average cost per gallon} \\ t = \text{total cost for gas} \end{array}$$

$$t = 30.4(1.35) = 41.04$$

They should budget about \$41 for gas.





TRY YOUR SKILLS

1. Use the map on pages 502–503 to find the quickest and most direct route to drive from New Orleans, Louisiana, to Jacksonville, Florida.



2. Use the map on pages 502–503 to find the fastest and most direct route to drive from Columbia, South Carolina, to Birmingham, Alabama.
3. Use the mileage chart on page 504 to find the distance from Milwaukee, Wisconsin, to Portland, Oregon.
4. Use the mileage chart on page 504 to find the distance from Chicago, Illinois, to Cleveland, Ohio.
5. If you drive 387 miles and get an average of 21.5 miles per gallon of gas, how many gallons of gas do you use?
6. If you used 24 gallons of gas and got an average of 18.5 miles per gallon of gas, how many miles did you drive?
7. If you use 29.6 gallons of gas and pay an average of \$1.39 a gallon, what is the total cost of the gas?
8. If you purchase 13.8 gallons of gas at a total cost of \$15.85, what is the average price per gallon?
9. Write an equation for finding gallons of gas when you know total miles and miles per gallon. Explain what each variable in the equation stands for.

EXERCISE YOUR SKILLS

1. What are three factors that might affect your travel plans?
2. What are some advantages of traveling by car?
3. Why should you use a map to plan before you begin a car trip?

Use the maps provided in the lesson to find a direct route for each trip.

4. Norfolk, Virginia, to Valdosta, Georgia
5. Macon, Georgia, to Boston, Massachusetts
6. Miami, Florida, to Savannah, Georgia
7. Dallas, Texas, to Nashville, Tennessee
8. Use maps to find a direct route from where you live to Macon, Georgia.

Use the mileage chart in the lesson or the one in the Reference Section of the book to find the following distances.

9. Tulsa, Oklahoma, to Denver, Colorado
10. Albuquerque, New Mexico, to Cheyenne, Wyoming
11. Mackinaw City, Michigan, to Boston, Massachusetts
12. Flagstaff, Arizona, to Cleveland, Ohio
13. Minneapolis, Minnesota, to Tulsa, Oklahoma
14. Pierre, South Dakota, to Dallas, Texas

Find the cost of driving the following distances with the miles per gallon and the cost of gasoline as shown. Round each number of gallons to the nearest tenth and each cost to the nearest cent.

	Miles	Miles per Gallon	Number of Gallons	Cost per Gallon	Total Cost
15.	540	20.5		\$1.29	
16.	2110	17.3		1.19	
17.	750	26.4		1.24	
18.	1235	22.6		1.15	
19.	1827	19.7		1.35	
20.	926	27.5		1.27	

A family from Philadelphia, Pennsylvania, plans a 9-day vacation. Their destination is Nashville, Tennessee, but they plan to stay overnight three times on the way and twice on their return trip. Work in groups of two or three to do the following exercises. Use information from travel magazines and talk with experienced travelers, as needed, to help you answer the following.

21. Plan the trip, indicating the miles to be covered each day, where they would stay each night, and what things they might do and see along the way.

KEY TERMS

interstate highways
secondary roads
mileage chart

22. Plan the trip back using a different route but also indicating distances, places of interest, and where they would stay overnight.
23. Assuming that they drive an average of about 80 miles a day while in the Nashville area, make an estimate of their total miles for the trip.
24. Estimate miles per gallon and cost per gallon, and on the basis of these estimates, determine an approximate cost for gasoline for the trip.

MIXED REVIEW

1. With \$778.22 in your checking account you write a check for \$105.89 to Grocery Mart for your weekly groceries. Show how you would enter this check in your check register.

Your credit account balance from the first of the month through the 12th was \$1298. You made a payment of \$325 on the 13th. You made no further charges or payments for the remaining 17 days of the month. The monthly finance charge is 1.5%.

2. What was your average daily balance?
3. What was the finance charge for the month?

The following table shows the Consumer Price Index for selected years between 1984 and 1992. The prices given in Exercises 4–6 are for 1984. Find the approximate cost that you might expect to pay for each item in 1992.

CONSUMER PRICE INDEX (1984–1992)					
Year	All Items	Food	Shelter	Apparel	Medical Care
1984	100	100	100	100	100
1985	107.6	105.6	107.7	105	113.5
1986	109.6	109	115.8	105.9	122
1987	113.6	113.5	121.3	110.6	130.1
1988	118.3	118.2	127	115.4	138.6
1989	124	125.1	132.8	118.6	149.3
1990	130.7	132.4	140	124.1	162.8
1991	136.2	135.8	146.3	128.8	177
1992	140.7	138.3	152.2	131	189.4

4. a \$100,000 house
5. \$250 in clothes
6. \$2500 in medical care

Use the Tax Table in the Reference Section to find the tax owed by each of the following taxpayers.

7. a single person with taxable income of \$35,900
8. a married couple, filing jointly, with taxable income of \$48,548