Lesson 9

Adding and Subtracting Decimal Numbers

Problem Solving:
Scatter Plots

Adding and Subtracting Decimal Numbers

How do we add or subtract decimal numbers?

Adding or subtracting decimal numbers is a lot like working with whole numbers. Both operations can involve regrouping. Example 1 shows how we regroup with decimal numbers. It doesn't matter whether we have to regroup whole numbers or decimal numbers, the process is still the same.

Example 1

Add or subtract the decimal numbers.

$\overset{1\ 1}{48.32}$	$\overset{7\ 13}{\cancel{48}.\cancel{3}2}$	$\overset{1}{48.32}$	$\overset{3\ 18}{\cancel{48}.32}$
$+\ 7.81$	$-\ 7.81$	$+\ 9.12$	$-\ 9.12$
56.13	40.51	57.44	39.20

Many of the errors we make when adding or subtracting decimal numbers arise when the numbers are uneven. Lining decimal numbers up by the decimal point is important. There are two ways we do this. One way is to write the numbers so that the decimal points are all in a straight line. We begin by placing the decimal points first in a column, then writing the numbers.

The second method is to make all of the decimal numbers have the same place value. All we do is add zeros to the end of each number. This way they are the same length.

Let's look at both methods:

Example 2

Add the decimal numbers.

Method 1
Line up the decimal points.

$$\begin{array}{r} 4.031 \\ 1.2 \\ +\ 3.55 \\ \hline 8.781 \end{array}$$

Method 2
Add zeros.

$$\begin{array}{r} 4.031 \\ 1.200 \\ +\ 3.550 \\ \hline 8.781 \end{array}$$

Remember that the portion of the decimal number to the right of the decimal point is always less than 1. If we use number sense, we can tell if we have incorrectly lined up the decimal numbers.

Improve Your Skills

A student solved the problem 34.8 − 2.5.

The student's answer

$$\begin{array}{r} 34.8 \\ -\ 2.5 \\ \hline 14.3 \end{array}$$ **ERROR**

The correct answer

$$\begin{array}{r} 34.8 \\ -\ 2.5 \\ \hline 32.3 \end{array}$$ **CORRECT**

Using good number sense, we can tell right away that the student's answer is wrong. If we round the numbers, subtracting 3 from 35 will give us a much larger answer than 14.3.

While this method is a good way to check our work quickly, there are errors that we may not see, especially if we are working with long decimal numbers. When we are not sure about our answer, working the problem again or checking it with a calculator is always a good strategy.

Apply Skills
Turn to ***Interactive Text***, page 24.

Reinforce Understanding
Use the ***mBook Study Guide*** to review lesson concepts.

Problem Solving: Scatter Plots

Vocabulary
scatter plot

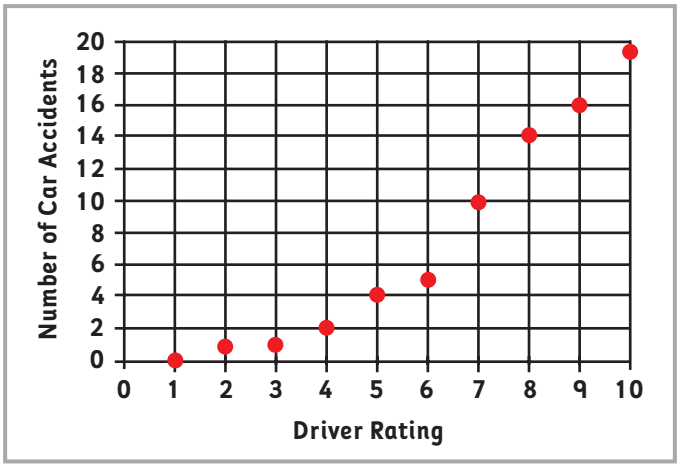
What are scatter plots?

A lot of things in life have an effect on each other. A formal word for these things is variables. Think about driving a car. How dangerously somebody drives a car is one variable. How many accidents somebody has over a period of time is another variable. It's likely that the more dangerously a person drives, the more likely they are to have a car accident. There is a relationship between these two variables.

One way to show this relationship is to use a **scatter plot**. We start with a list of numbers that show the relationship between two activities or events. Let's say we rate how dangerous someone drives by using the numbers 1 through 10. A rating of 1 is a very safe driver and a 10 is a very dangerous driver. Here is the list.

Driver Rating	Number of Car Accidents
1	0
2	1
3	1
4	2
5	4
6	5
7	10
8	14
9	16
10	19

Next, we use a grid to plot these relationships. One axis will be the rating of the driver. The other axis will be the number of accidents.



The scatter plot helps us see a clear pattern in these data.

- The person who has a low rating for dangerous driving has a low number of accidents.
- The person with a high rating has a high number of accidents.

This means that the more dangerously people drive, the more likely they are to have accidents.

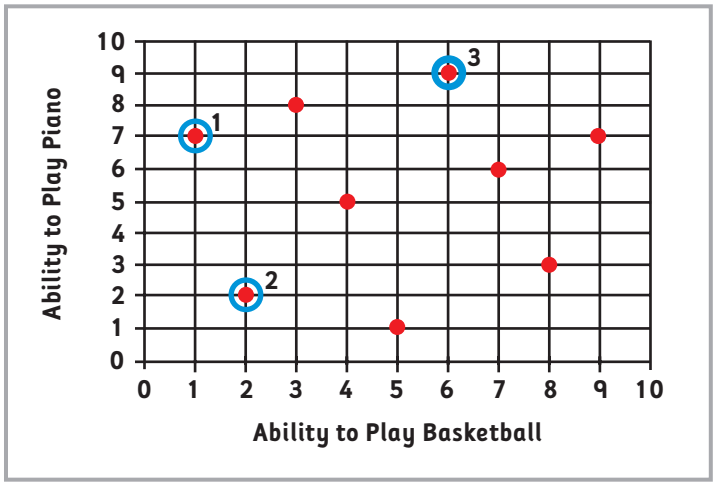
The points move up in a gradual curve going from the lower left corner to the upper right corner. When there is this kind of pattern to the data on the scatter plot, we can make predictions. For example, we can predict that a person with a rating of 10 would probably have around 18 accidents.

Not all relationships have such a clear pattern. In some relationships it is more difficult to make predictions. The next scatter plot shows the relationship between the ability to play a piano and the ability to play basketball. Each ability is rated from 1 to 10. A rating of 1 means low ability and a 10 means very high ability.

Example 1

Plot the data on a scatter plot and analyze the information.

Ability to Play Piano	Ability to Play Basketball
7	1
2	2
8	3
5	4
9	6
6	7
3	8
7	9



The data tell us:

- Person 1 has an above average piano-playing ability, but a low ability at basketball.
- Person 2 has low abilities at both piano and basketball.
- Person 3 has excellent ability at piano and good ability at basketball.

The lack of any pattern to the points makes sense when we look at the points that are circled.

Some scatter plots do not show a pattern. When there is no pattern, we cannot make a prediction. As we think about scatter plots, it is important to keep these two examples in mind. If the scatter plots show a certain direction, then we say there is a relationship between the two variables. If the points are all over the place with no clear direction, then it is safer to say that there is no relationship between the two variables.

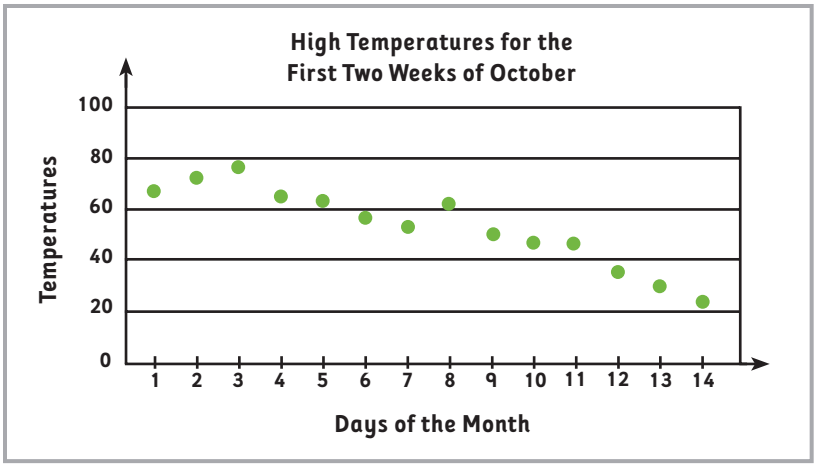
Problem-Solving Activity
Turn to ***Interactive Text***, page 25.

mBook Reinforce Understanding
Use the ***mBook Study Guide*** to review lesson concepts.

Homework

Activity 1

Select the best answer for each of the questions about the scatter plot.



1. How would you describe the pattern in the scatter plot?
   (a) High temperatures are getting higher.
   (b) High temperatures are getting lower.
   (c) High temperatures stay about the same.

2. If you were to predict the high temperature on the 15th of October, what would you predict?
   (a) The high temperature will be between 60–80 degrees.
   (b) The high temperature will be between 40–60 degrees.
   (c) The high temperature will be between 20–40 degrees.

3. If you were to estimate the high temperature on the last day of September of the same year, what would you estimate?
   (a) The high temperature was between 60–80 degrees.
   (b) The high temperature was between 40–60 degrees.
   (c) The high temperature was between 20–40 degrees.

4. How would you describe the relationship between the two variables from looking at the scatter plot?
   (a) The two variables change in the same way.
   (b) The two variables change in opposite ways.
   (c) There is no relationship between the two variables.

Homework

Activity 2

Add and subtract the decimal numbers. Be sure to line up the numbers carefully on your paper. Check your answers by rounding to the nearest whole numbers.

1. 34.5 + 29.7
2. 81.6 – 7.8
3. 15.01 + 22.33 + 49.87
4. 201.76 – 89.98
5. 127.5 + 227.3 + 899.7
6. 321.5 – 22.09

Activity 3

Round to the nearest whole number and estimate the answer.

1. 3.1 + 2.4
2. 9.1 – 4.07
3. 27.9 + 44.8
4. 98.01 – 29.8
5. 129.458 + 634.229
6. 878.005 – 499.87

Activity 4 • Distributed Practice

Solve.

1. 300 + 900
2. 420 – 198
3. 55 • 8
4. 420 ÷ 7
5. $\frac{3}{4} + \frac{2}{5}$
6. $\frac{5}{9} - \frac{1}{6}$
7. $\frac{1}{2} + \frac{4}{5}$
8. $\frac{13}{4} \div \frac{4}{1}$
9. $\frac{9}{10} - \frac{2}{5}$
10. $\frac{5}{8} \cdot \frac{3}{7}$