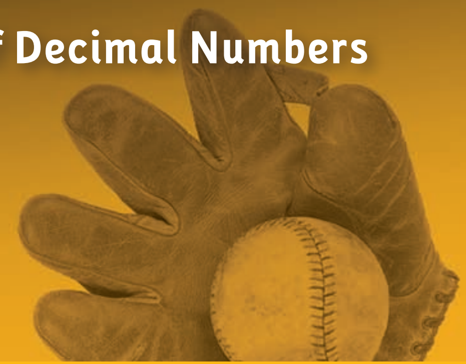
Lesson 12 ▶Traditional Multiplication of Decimal Numbers and Number Sense

Problem Solving: ▶Indirect Relationships



▶Traditional Multiplication of Decimal Numbers and Number Sense

What is the traditional method for multiplying decimal numbers?

The traditional method for multiplication is useful because it gives us a shortcut. It also lets us multiply numbers with a lot of digits. This is important because using square grids is difficult when the decimal numbers have a lot of digits. In many cases, it would not work.

The traditional method for multiplying decimal numbers is similar to that for multiplying whole numbers. Let's see how it works.

Steps for Multiplying Decimal Numbers

STEP 1

Line up the numbers just as we would with whole numbers.

$$\begin{array}{r} 7.7 \\ \times\ 4.5 \\ \hline \end{array}$$

STEP 2

Multiply just as we would with whole numbers.

$$\begin{array}{r} {\scriptstyle 2} \\ {\scriptstyle 3} \\ 7.7 \\ \times\ 4.5 \\ \hline 385 \\ +\ 3080 \\ \hline 3465 \end{array}$$

STEP 3

To find out where to put the decimal point in the answer, we count the number of digits to the right of the decimal point in both numbers in the problem. Starting from the right of our answer, we count over that many digits and place a decimal point.

$$\begin{array}{r} {\scriptstyle 2} \\ {\scriptstyle 3} \\ 7.7 \\ \times\ 4.5 \\ \hline 385 \\ +\ 3080 \\ \hline 34.65 \end{array}$$

Here is a good exercise for thinking about multiplying decimal numbers. In Example 1, there are three problems with the correct digits in each answer but no decimal point. Where do we put the decimal point?

Example 1

Place the decimal point in the answers.

$25.3 \cdot 10.6 = 26818$

$25.3 \cdot 0.106 = 26818$

$25.3 \cdot 1.06 = 26818$

In each case, we count the number of digits to the right of the decimal point in the problem. Then we count the same number of digits from the right in the answer and put the decimal point there.

two digits after the decimal points

$25.3 \cdot 10.6 = 268.18$

four digits after the decimal points

$25.3 \cdot 0.106 = 2.6818$

three digits after the decimal points

$25.3 \cdot 1.06 = 26.818$

How do we use number sense to check our answers?

There are two main number sense strategies that we use to check multiplication problems involving decimal numbers.

First, we round whenever possible. In the problem 25.3 • 10.6, the decimal number 25.3 rounds to 25 and 10.6 rounds to 11. We find an approximate answer in our head: 25 • 11 = 275. This means the exact answer must be near 275. The number 268 is close to 275, so it is probably the correct answer.

In the second strategy, we use rounding and convert decimal numbers to fractions. In the problem 25.3 • 0.106, the decimal number 25.3 rounds to 25 and 0.106 rounds to 0.11, or $\frac{11}{100}$. What is $\frac{11}{100}$ of 25.3? It is 2.5. The number 2.5 is close to the exact answer 2.6818.

It is useful to think about decimal numbers this way. Even though we can use a calculator or a computer to find exact answers, sometimes we enter the numbers incorrectly. That is why number sense strategies are a good way of determining if we have the correct answer.

Speaking of Math

We tell how we solved a multiplication problem with decimal numbers by explaining our thinking like this:

- *I line up the numbers to the right, not by the decimal point.*
- *I multiply the decimal numbers as if they were whole numbers.*
- *Once I get the answer, I count the digits to the right of the decimal points in my factors.*
- *Then I count the same number from the right digit in my answer and put a decimal point.*
- *I check my answer by rounding the numbers to whole numbers or fractions that are easy to use.*

Apply Skills
Turn to ***Interactive Text***, page 32.

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

▶Problem Solving: Indirect Relationships

Vocabulary

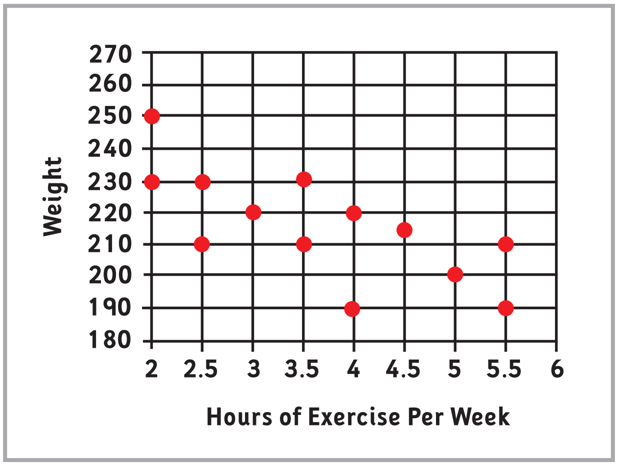
indirect relationship

What do indirect relationships look like?

Indirect relationships are a different kind of relationship. With indirect relationships, every time one variable goes up, the other variable in a relationship goes down. The scatter plot in Example 1 shows such a pattern. The data in the scatter plot involve a number of people who all weighed 250 pounds at the beginning of an exercise program. All of them went on the same diet. The only thing that changed was the amount of exercise. Some of the people exercised a little bit each week and others exercised a lot.

Example 1

Look at the scatter plot to find what happens when people exercise.



Notice the general direction of the points. They start out high and then decrease as they move across the graph. The weight is going down as the number of hours of exercise across the bottom is going up.

POWER CONCEPT

In an indirect relationship, the value of one variable increases when the other variable decreases.

Indirect relationships are all around us. The more police you have in a city, the less crime there is. The more time people spend working at jobs, the less time they have for hobbies or outside activities. These are just a few examples of where we find indirect relationships in the world around us.

Problem-Solving Activity
Turn to ***Interactive Text***, page 33.

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

Lesson 12

Homework

Activity 1

Select the correct answer for each of the multiplication problems.

1. $0.8 \cdot 0.9$
(a) 0.72
(b) 0.072
(c) 7.2

2. $0.02 \cdot 0.25$
(a) 0.50
(b) 0.0050
(c) 0.050

3. $0.75 \cdot 0.2$
(a) 0.15
(b) 0.015
(c) 1.50

4. $0.5 \cdot 4.8$
(a) 0.024
(b) 0.24
(c) 2.40

Activity 2

Multiply using the traditional method. Check your work using rounding.

1. $0.75 \cdot 0.8$

2. $0.029 \cdot 0.1$

3. $0.54 \cdot 0.7$

4. $0.25 \cdot 0.4$

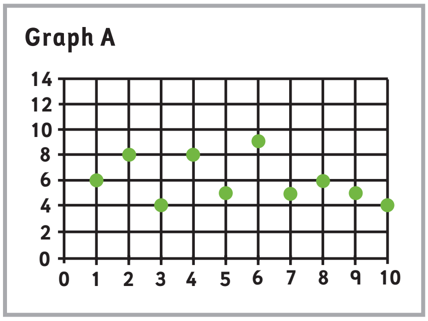
5. $0.1 \cdot 0.08$

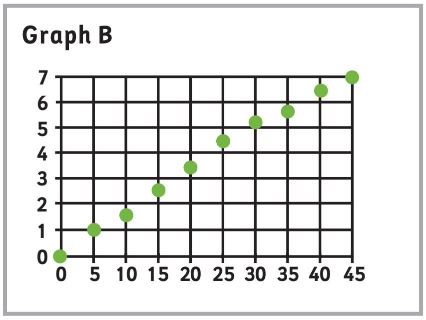
6. $2.5 \cdot 0.5$

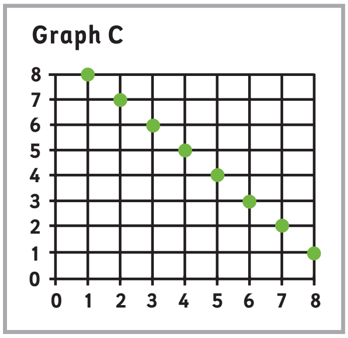
Homework

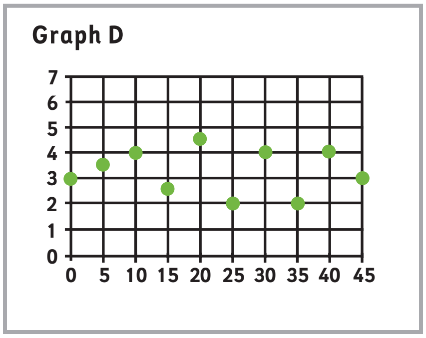
Activity 3

Tell which of the graphs below represent indirect relationships. Explain your answer.









Activity 4 • Distributed Practice

Solve.

1. $\frac{2}{3} \cdot \frac{4}{5}$

2. $\frac{1}{2} \div \frac{2}{3}$

3. $\frac{4}{6} + \frac{3}{2}$

4. $\frac{7}{8} - \frac{1}{4}$

5. $\frac{3}{4} \div \frac{1}{4}$

6. $\frac{3}{9} \cdot \frac{3}{4}$

7. 14.01 – 7.6

8. 4.78 + 2.95 + 8.7

9. 107.2 – 95.09

10. 127.85 + 495.76