Lesson 11

Multiplication of Decimal Numbers

Problem Solving: Direct Relationships

Multiplication of Decimal Numbers

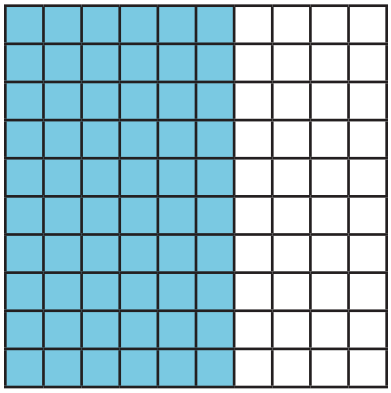
How do we multiply decimal numbers?

When we multiplied fractions, we found the product was usually smaller than the factors we were multiplying. The same is true for decimal numbers. Let's look at the problem 0.6 • 0.4. It was solved on a calculator. The answer, 0.24, is smaller than 0.6 or 0.4.

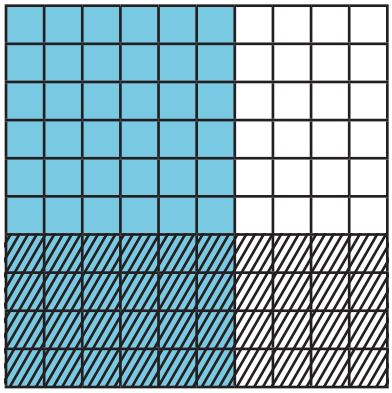
0.6 • 0.4 = 0.24

The 100-square grid is a good way to see what happens when we multiply decimal numbers. First, we change the numbers 0.6 and 0.4 to their equivalents 0.60 and 0.40 because we are using a 100-square grid.

The first grid shows 0.60. The second grid shows 0.60 in color and 0.40 with diagonal lines.



0.60 is shaded



0.40 is shaded with diagonals

The overlap is 0.24 or 24 out of the 100 squares.

That is the same answer we got when we worked the problem on a calculator.

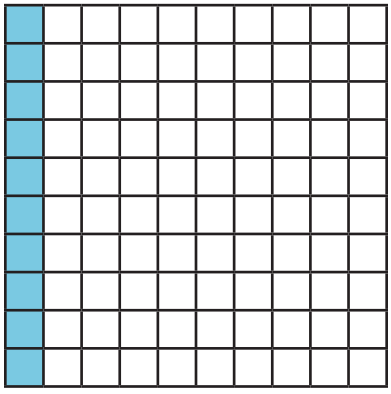
$$0.6 \cdot 0.4 = 0.24$$

Here is one more example of multiplication of decimal numbers. This time we will use a problem with a very small answer. We begin by converting 0.1 to 0.10.

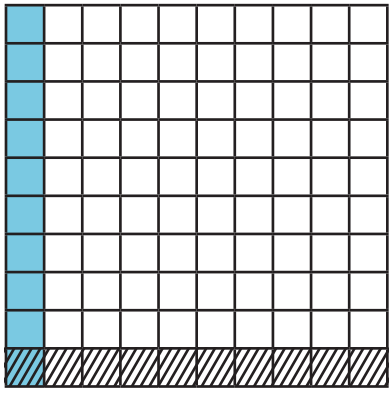
Example 1

Use a 100-square grid to multiply decimal numbers.

0.1 • 0.1



0.10 is shaded



The second 0.10 is shaded with diagonals.

The overlap is 0.01 or 1 out of 100 squares. That is the same answer that we get when we solve the problem using a calculator.

0.1 • 0.1 = 0.01

When we look at multiplication with decimal numbers using an area model, it becomes clearer why the answer is smaller than the numbers we start with.

Apply Skills
Turn to ***Interactive Text***, page 29.

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

Problem Solving: Direct Relationships

Vocabulary
direct relationship

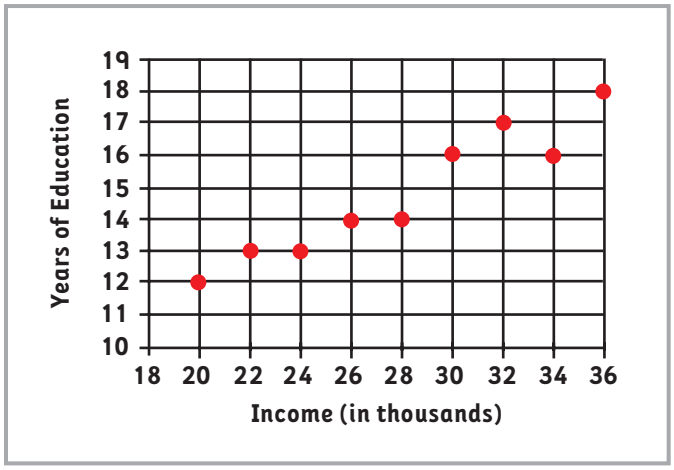
What is a direct relationship on a scatter plot?

In the last lesson, we learned how to examine relationships between variables. For example, in the summer the hotter it gets, the more people go swimming. Another common relationship is that the more you eat, the more you weigh. We call these **direct relationships**. When one variable goes up or increases, the other variable increases as well.

Example 1 shows a scatter plot based on what happens when a person keeps going to school. The data start in the 12th grade, or the end of high school. The points show a consistent pattern—as education goes up, so does income.

Example 1

Use a scatter plot to show the relationship between years of education and income.



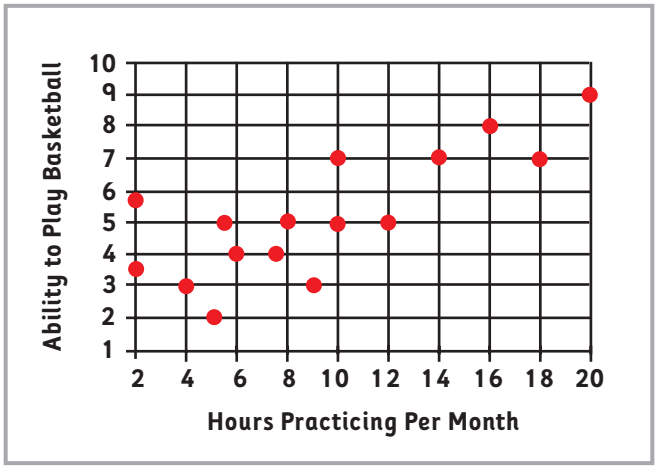
The scatter plot shows a consistent pattern: As the amount of education goes up, income also goes up.

In a direct relationship, both variables increase or decrease at the same time.

Not all direct relationships are easy to read. Let's look at Example 2. This plot shows data for high school basketball players. The players were rated from 1 (a very poor player) to 10 (an excellent player).

Example 2

Use a scatter plot to show the relationship between practicing basketball and the ability to play basketball.



The data show:

- The more a player practices, the better that player will be.
- However, there are some players who practice a lot, but do not get that much better.
- There are other players who do not have to practice that much because they have natural talent.

This type of situation creates a more complicated pattern.

The more data we have, the easier it is to find a pattern. When there isn't a clear pattern, we might need to do more research to find more data.

Problem-Solving Activity
Turn to ***Interactive Text***, page 30.

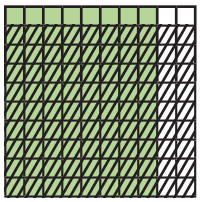
Reinforce Understanding
Use the ***mBook Study Guide*** to review lesson concepts.

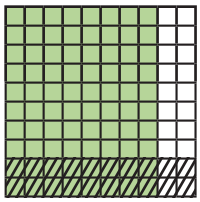
Homework

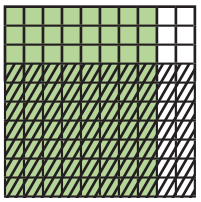
Activity 1

Select the 100-square grid that matches the problem.

1. $0.8 \cdot 0.9 = 0.72$

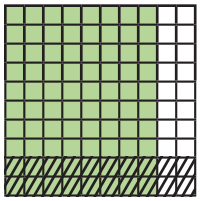
(a) 

(b) 

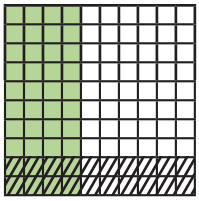
(c) 

Activity 2

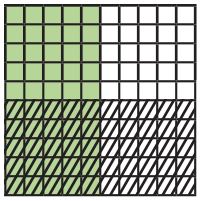
Select the problem that goes with each of the 100-square grids shown below.

1. 

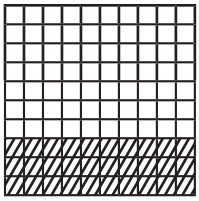
(a) $0.8 \cdot 0.2 = 0.16$
(b) $0.08 \cdot 0.2 = 0.016$
(c) $0.80 \cdot 0.02 = 0.016$

2. 

(a) $0.04 \cdot 0.2 = 0.008$
(b) $0.40 \cdot 0.20 = 0.08$
(c) $0.4 \cdot 0.2 = 0.08$

3. 

(a) $0.25 \cdot 0.2 = 0.050$
(b) $0.05 \cdot 0.05 = 0.0025$
(c) $0.5 \cdot 0.5 = 0.25$

4. 

(a) $0.1 \cdot 0.3 = 0.03$
(b) $0.1 \cdot 0.03 = 0.003$
(c) $0.01 \cdot 0.03 = 0.0003$

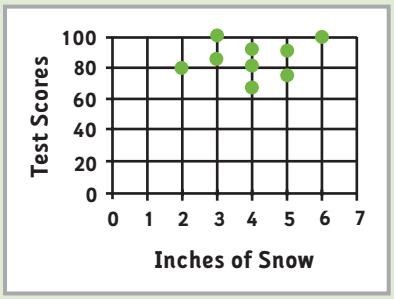
Homework

Activity 3

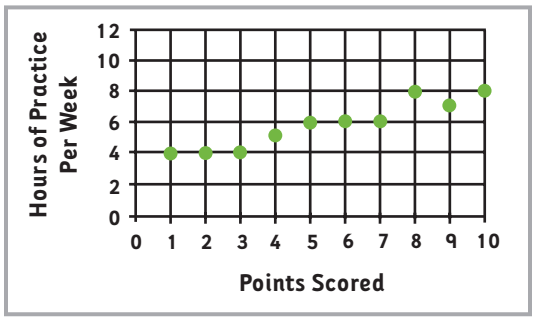
Tell if the following scatter plots show a direct relationship. Explain your answer.

Model Is this a direct relationship?

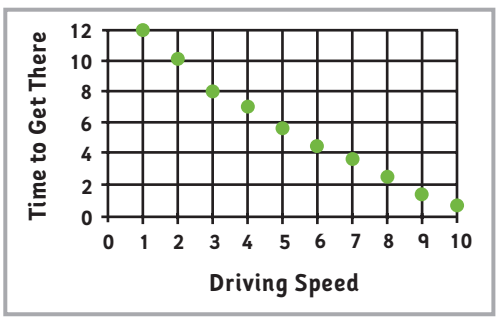
Answer: No, it's not a direct relationship. The amount of snow that falls does not relate to the test scores.



1. Is this a direct relationship?



2. Is this a direct relationship?



Activity 4 • Distributed Practice

Solve.

1. $\frac{1}{4} + \frac{1}{2}$

2. $\frac{2}{3} - \frac{1}{9}$

3. $\frac{1}{6} \cdot \frac{3}{2}$

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

5. $\frac{1}{3} \cdot \frac{1}{6}$

6. $\frac{5}{9} \div \frac{1}{9}$

7. 1.23 + 2.47

8. 10.01 − 8.9

9. 3.7 + 8.02 + 2.99