# Multiply and Divide Decimals



## Use What You Know

**You've learned about place value. You've also learned how to multiply and divide decimals to the hundredths. In this lesson, you will multiply and divide decimals to thousandths. Take a look at this problem.**

Ben wants to buy a baseball cap that costs $24.50. The state sales tax is 8%, or 0.08. How much will he pay in sales tax?

**Use the math you already know to solve the problem.**

**a.** How would you estimate the amount of sales tax?

_____

_____

_____

**b.** You can write 24.50 as 24.5. What is 24.5 as a fraction? _____

**c.** What is 0.08 as a fraction? _____

**d.** How could you show the problem using fractions? _____

**e.** Multiply the fractions. What is the tax? _____

**f.** Write the tax as a decimal. _____

**g.** Does your answer make sense? Explain. _____

_____

**h.** Explain how you could find the amount of sales tax Ben will pay.

_____

_____

_____

## Find Out More

You multiply decimals in the same way you multiply whole numbers. You just need to think about where to place the decimal point in the product.

You can think about multiplying fractions to make sense of multiplying decimals.

$$\frac{245}{10} \times \frac{8}{100} = \frac{1{,}960}{1{,}000}$$

The denominator is in the thousandths because **tenths × hundredths = thousandths**.
$\left(\frac{1}{10} \times \frac{1}{100} = \frac{1}{1{,}000}\right)$

$$\begin{array}{rl} 24.5 & \textbf{1 decimal place} \\ \times\ 0.08 & +\ \textbf{2 decimal places} \\ \hline 1.960 & \textbf{3 decimal places} \end{array}$$

The number of decimal places in the product equals the sum of the number of decimal places in the factors.

## Reflect

**1** Explain why $0.02 \times 0.3 = 0.006$.

# Learn About Multiplying Decimals to Thousandths

**Read the problem below. Then explore how to multiply decimals to the thousandths place.**

Four 6th graders are working on a project. They are going to paint a large banner and need to protect the floor. They measured the floor, which is 3.05 meters by 3.658 meters. How many square meters of plastic do they need to cover the entire floor?

## Estimate It You can estimate the product.

3.05 meters is close to 3 meters.

3.658 meters is close to 4 meters.

$3 \times 4$

## Model It You can think about fractions to place the decimal point.

$3.05 = 3\frac{5}{100}$ or $\frac{305}{100}$

$3.658 = 3\frac{658}{1{,}000}$ or $\frac{3{,}658}{1{,}000}$

$\frac{305}{100} \times \frac{3{,}658}{1{,}000}$

## Model It You can use an algorithm to multiply.

Multiply as you would whole numbers.

| | |
|---|---|
| 3.658 | 3 decimal places |
| $\times$ 3.05 | 2 decimal places |
| 18290 | |
| 0000 | |
| 10974 | |

## Connect It **Use what you know about decimals and place value to solve the problem.**

**2** Look at *Estimate It*. About how many square meters of plastic will they need?

**3** Look at the first *Model It*. What will the denominator of the product be?

**4** Look at the second *Model It*. How many decimal places will be in the product? How do you know?

**5** Add the partial products and place the decimal point in the product in the second *Model It*. Does your answer make sense?

**6** Explain how to multiply decimals.

## Try It **Use what you just learned about multiplying with decimals to solve these problems. Show your work on a separate sheet of paper.**

**7** Madeline studies honeybees. Every week she weighs the same honeybee hive. The first week the hive weighs 11.607 kilograms. Its weight increases about 0.204 kilograms every week. At this rate, how many kilograms will it increase in 7.5 weeks?

**8** Your fingernails grow at an average rate of 2.25 inches per year. If they grew at an average rate, you never cut them, and they did not break, how much would your fingernails grow in 4.5 years?

# Learn About Dividing by Decimals

**Read the problem below. Then explore how to divide by decimals.**

Olympic National Park is 28.5 miles from Forks, Washington. It took the Pearce family 0.75 hours to drive there. What was their average speed, in miles per hour?

## Estimate It **You can estimate the quotient.**

28.5 miles is close to 30 miles.

0.75 hours is close to 1 hour.

The average speed is about 30 miles ÷ 1 hour.

## Model It **Since the fraction bar means division, you can write the division problem as a fraction to understand how to divide by decimals.**

$$28.5 \div 0.75 = \frac{28.5}{0.75}$$

To get a whole number divisor, multiply 0.75 by 100. The decimal point moves 2 places to the right. If you multiply the denominator by 100, you also have to multiply the numerator by 100.

$$\frac{28.5}{0.75} \times \frac{100}{100} = \frac{2{,}850}{75}$$

28.5 ÷ 0.75 is equivalent to 2,850 ÷ 75.

The divisor has two decimal places. Moving the decimal point 2 places to the right to get a whole number is the same as multiplying the divisor by 100. If you multiply the divisor by 100, you have to do the same to the dividend.

$$0.75\overline{)28.50}$$

$$\begin{array}{r} 38 \\ 75\overline{)2{,}850} \\ -\ 2\,25 \\ \hline 600 \\ -\ 600 \\ \hline 0 \end{array}$$

## Connect It

**Use what you know about equivalent fractions and division to solve the problem.**

**9** Look at *Estimate It*. About how many miles per hour is their average speed?

**10** Look at *Model It*. Why do you multiply 0.75 by 100?

**11** Why do you have to multiply 28.5 by 100?

**12** What is the Pearce family's average speed?

**13** Does your answer make sense? Explain how you know.

**14** Explain how to divide when the divisor is a decimal.

## Try It

**Use what you just learned about dividing by decimals to solve these problems. Show your work on a separate sheet of paper.**

**15** At a craft fair, Emily made $52.50 selling paper flowers. If she sold the flowers for $0.75 each, how many paper flowers did she sell? _____

**16** Every day Marco puts $0.25 into a jar for savings. One day he counted his money and found he had $91.75. How many days had he been saving? _____

# Learn About Dividing Decimals

**Read the problem below. Then explore how to divide decimals using an algorithm.**

The average walking speed is 3.4 miles per hour. How many hours would it take to walk from Boston to Seattle, a distance of 3,020.22 miles?

## Estimate It **You can estimate the quotient.**

3.4 miles per hour is about 3 miles per hour.

3,020.22 miles is about 3,000 miles.

3,000 miles ÷ 3 miles per hour = number of hours

## Model It **You can think about equivalent fractions to understand the division algorithm.**

$$3{,}020.22 \div 3.4 = \frac{3{,}020.22}{3.4}$$

$$\frac{3{,}020.22}{3.4} \times \frac{10}{10} = \frac{30{,}202.2}{34}$$

$$3.4\overline{)3020.22}$$

$$\begin{array}{r} 888.3 \\ 34\overline{)30202.2} \\ -\ 272 \\ \hline 300 \\ -\ 272 \\ \hline 282 \\ -\ 272 \\ \hline 102 \\ -\ 102 \\ \hline 0 \end{array}$$

## Connect It

**Use what you know about equivalent fractions and dividing by decimals to solve the problem.**

17 Look at *Estimate It*. About how many hours would it take to walk from Boston to Seattle? _____

18 Look at the fractions in *Model It*. Why do you multiply the numerator and denominator by 10? _____

19 Explain how moving the decimal point one place to the right is the same as multiplying the numerator and denominator of the fraction. _____

20 How many hours would it take to walk from Boston to Seattle? And, how can your estimate help you decide where to place the decimal point? _____

21 How do you divide by decimals? _____

## Try It

**Use what you just learned to solve these problems. Show your work on a separate sheet of paper.**

22 Annette had a 24-karat gold necklace with a mass of 2.3 grams. She sold it for $123.51. What was the price per gram of her necklace? _____

23 At maturity, a stalk of corn is 76.56 inches tall. It took 2392.5 hours to reach that height. What was the rate of growth per hour? _____

# Practice Multiplying and Dividing Decimals

**Study the example below. Then solve problems 24–26.**

The student multiplied as with whole numbers and used estimation to place the decimal point.

## Example

The greatest skateboarding speed recorded is 78.37 mph by Roger Hickey in 1990. If he could keep up that speed for 15 minutes or 0.25 hour, how far could he go?

**Look at how you can use estimation to place the decimal point.**

15 minutes is $\frac{1}{4}$ of an hour, and 78.37 rounds up to 80, so I can expect my answer to be about $\frac{1}{4}$ of 80, or 20.

$$\begin{array}{r} 78.37 \\ \times\ \ 0.25 \\ \hline 39185 \\ 15674\ \ \\ \hline 19.5925 \end{array}$$

Since I know that the answer is going to be around 20, the decimal point belongs after the 19.

***Solution*** 19.5925 miles, which is about 20 miles.

**Pair/Share**
What is another way to determine where to put the decimal point?

**24** By the age of 21, the best violinists and pianists will have practiced at least 10,000 hours. If you practice an instrument 45 minutes (or 0.75 hours) a day for 365.25 days, the length of a year, how many hours will you have practiced?

**Show your work.**

***Solution*** _____

Can you estimate the product?

**Pair/Share**
Without doing any multiplication, how can you tell whether the answer will be greater or less than 365.25 hours?

**25** When the Dixon family traded in their old car, it had 53,790 miles on it. They had the car for 8.25 years. On average, how many miles did they drive per year?

**Show your work.**

How many decimal place values are there in the divisor?

**Pair/Share**
How could you check your answer?

***Solution*** _____

**26** In 1970, a record 1.5 inches of rain fell in one minute at Basse Terre, Guadeloupe in the Caribbean. At this rate, how much rain fell in 3 seconds or 0.05 of a minute? Circle the letter of the correct answer.

**A** 3 inches

**B** 0.075 inch

**C** 0.75 inch

**D** 30 inches

Will the answer be greater than or less than 1.5 inches?

Evan chose **D** as the correct answer. How did he get that answer?

_____

_____

_____

_____

**Pair/Share**
Does Evan's answer make sense?

# Practice Multiplying and Dividing Decimals

**Solve the problems.**

**1** In 1892 a world record was set. France's M. Garisoain walked on stilts for 4.97 miles from Bayonne to Biarritz, France, at an average speed of 7.10 miles per hour. How long did it take him to walk that distance?

**A** 70 hours

**B** 7 hours

**C** 0.7 hour

**D** 0.07 hour

**2** Maria walks a round-trip of 0.75 mile to school every day. How many miles will she walk in 4.5 days?

**A** 0.3375 mile

**B** 3.375 miles

**C** 33.75 miles

**D** 337.5 miles

**3** Mika babysat for the Tylers for 3.5 hours. They gave her $26.25. How much did she make per hour?

**A** $0.75 per hour

**B** $7.50 per hour

**C** $9.80 per hour

**D** $13.33 per hour

**4** Look at each expression. Is it equivalent to $34.7 \times 2.03$? Select *Yes* or *No* for expressions a–e.

| | | | |
|---|---|---|---|
| **a.** | $3.47 \times 20.3$ | ☐ Yes | ☐ No |
| **b.** | $34.7 + 35.741$ | ☐ Yes | ☐ No |
| **c.** | $0.347 \times 203.0$ | ☐ Yes | ☐ No |
| **d.** | $3.47 \times 2.03$ | ☐ Yes | ☐ No |
| **e.** | $34.7 + 20.3$ | ☐ Yes | ☐ No |

**5** One of Mr. Edward's students answered the following problem on her homework.

$17.06 \times 25.1 = 42.8206$

**Part A** Explain to Mr. Edwards whether or not the student got the question correct, and explain the reason why. _____

_____

_____

_____

**Part B** Use the multiplication algorithm to find the answer to the same question.

$17.06 \times 25.1 = ?$

**Show your work.**

***Answer*** _____

**Self Check** **Go back and see what you can check off on the Self Check on page 51.**