

2.2

Multiplying and Dividing Decimals

You will need
• a calculator

▶ GOAL

Understand and apply multiplication and division of decimals.

Learn about the Math

Costas works part time as an usher at a movie theatre. Until this week, he earned \$8.25 per hour and worked 29.5 h a week. This week, he received a raise of \$0.35 per hour.



? **How many hours would Costas need to work now to earn the same amount he earned before he got the raise?**

Example 1: Multiplying decimals

How much did Costas earn each week before he got the raise?

Annika's Solution

My estimate is $\$8/\text{h} \times 30 \text{ h} = \240

$$\begin{array}{r} 29.5 \\ \times 825 \\ \hline 1475 \\ 5900 \\ 236000 \\ \hline 24337.5 \end{array}$$

$$24\ 337.5 \div 100 = 243.375$$

Costas earned \$243.38 each week before he got the raise.

I estimated what Costas earned by multiplying \$8 per hour by 30 h of work.

To calculate what he earned, I had to multiply $29.5 \times \$8.25$. I multiplied \$8.25 by 100 to get a whole number. Then I multiplied 29.5 h by 825 pennies.

Then I divided by 100 to change my answer back to dollars.

I rounded my answer to the nearest cent. Based on my estimate, my answer of \$243.38 is reasonable.



Communication Tip

When a calculation involves money, the answer is usually rounded to the nearest hundredth, or cent. For example, \$28.875 is rounded to \$28.88.

Example 2: Dividing decimals

How many hours would Costas need to work now to earn the same amount that he used to earn each week?

Nathan's Solution

My estimate is 28 h.

$$\begin{aligned}\text{Number of hours} &= 243.38 \div 8.60 \\ &= (243.38 \times 100) \div (8.60 \times 100) \\ &= 24\,338 \div 860\end{aligned}$$

$$\begin{array}{r} 28.3 \\ 860 \overline{)24338.0} \\ \underline{1720} \\ 7138 \\ \underline{6880} \\ 2580 \\ \underline{2580} \\ 0 \end{array}$$

Keep adding zeros after the decimal until the quotient has the desired number of decimal places.

Costas must work 28.3 h at \$8.60 per hour to earn the same amount he earned working 29.5 h at \$8.25 per hour.

If Costas is earning more, he should be able to work fewer than 29.5 h to earn the same amount.

Costas received a raise of \$0.35 per hour, so he now earns \$8.60 per hour. To calculate the number of hours he needs to work, I have to divide his earnings by his hourly wage.

I multiplied both the divisor and dividend by 100 to express both amounts in cents. This allowed me to divide by a whole number.

Based on my estimate, my answer of 28.3 h is reasonable.



Reflecting

1. How do you know that the answer to $243 \div 8.60$ is the same as the answer to $24\,300 \div 860$?
2. How are multiplication and division calculations with decimals the same as multiplication and division calculations with whole numbers that have the same digits? How are these calculations different?



Work with the Math

Example 3: Solving a division problem

Linda's dial-up Internet service provider (ISP) claims to have a speed of 56.9 kilobytes per second. Bharat's cable ISP has a speed of 1556.44 kilobytes per second. How much faster is Bharat's ISP?

Solution

Divide the faster speed by the slower speed.

Estimate first: $1500 \div 50 = 30$. Bharat's ISP should be about 30 times as fast.

$$1556.44 \div 56.9 = 27.353\ 954\ 31$$

This answer seems reasonable. Bharat's cable ISP is about 27 times as fast as Linda's dial-up ISP.

Example 4: Solving a problem using several operations

Marina needs 0.75 kg of chocolate chips and 0.5 kg of pecans for a cookie recipe. The bulk food store sells chocolate chips for \$7.99 per kilogram and pecans for \$19.45 per kilogram. How much will Marina pay for these ingredients?

Solution

Multiply the quantity by the cost to calculate the total cost for each ingredient.

$$\begin{aligned}\text{Cost of chocolate chips} &= 0.75 \text{ kg} \times \$7.99/\text{kg} \\ &= \$5.9925\end{aligned}$$

$$\begin{aligned}\text{Cost of pecans} &= 0.5 \text{ kg} \times \$19.45/\text{kg} \\ &= \$9.725\end{aligned}$$

The cost of 0.75 kg of chocolate chips is \$5.99. The cost of 0.5 kg of pecans is \$9.73.

$$\begin{aligned}\text{Total cost} &= \$5.99 + \$9.73 \\ &= \$15.72\end{aligned}$$

Marina will pay \$15.72 for these ingredients.

A Checking

3. Complete each solution by placing the decimal point correctly.

- a) $3.1 \times 1.2 = 372$
- b) $5.4 \div 1.2 = 45$
- c) $26.45 \times 2.162 = 571849$
- d) $12.18 \div 0.005 = 2436$

4. Calculate.

- a) 4.5×3.6
- b) 12.23×3.6
- c) $56.58 \div 6.9$
- d) $10.71 \div 0.75$

5. The price of gas is 85.9¢ per litre. If Brenda needs 48.3 L of gas to fill her gas tank, how much will she pay?

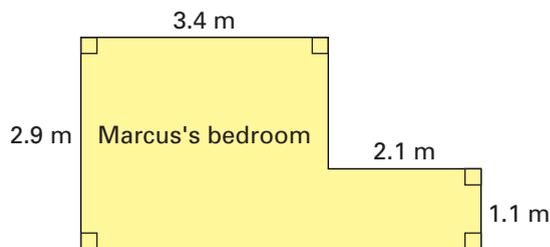
B Practising

6. Calculate.
- a) 32.25×1.8 d) $48.87 \div 1.35$
 b) 0.45×2.6 e) $1.862 \div 0.38$
 c) 12.347×0.64 f) $0.2419 \div 0.59$
7. Sheila has \$4.75 to buy pencils for art class. Each pencil costs 89¢.
- a) Estimate the number of pencils she can buy.
 b) Calculate the number of pencils she can buy.
8. Suppose that you have 5.25 kg of jellybeans. How many 0.25 kg bags can you fill?
9. If one postage stamp costs \$0.85, how much does a book of 25 stamps cost?
10. To rent a carpet cleaner, Tools To Go charges \$15.00 for the first hour or part of an hour plus \$3.50 for each additional half hour or part of a half hour.
- a) Tim picked up a carpet cleaner at 8:10 a.m. and returned it at 4:10 p.m. Determine his rental charge.
 b) Calculate the average cost per hour for Tim's rental.
 c) Charmaine rented a carpet cleaner from Carpet Emporium. Her bill was \$59.40 for 5.5 h. Compare the average cost per hour for Charmaine's rental with the average cost per hour for Tim's rental. How many times as much was Charmaine's rental?

11. Mary and Aperna worked together to mow a neighbour's lawn. They were paid \$25.50. To split the money equally, Mary wants to divide by 2. Aperna disagrees and says that they need to multiply. By how much do they need to multiply? Explain.
12. How many 0.4 L glasses can be filled from a 4.75 L jug of juice?
13. A single subway token costs \$2.25. A machine dispenses eight tokens for \$15.00. If you need eight tokens, how much would you save by buying the tokens from the machine?
14. A carpenter charged \$1455.98 for materials plus \$35.75 per hour for 22.5 h of labour. What was the total bill?

C Extending

15. Marcus wants to carpet the floor of his bedroom. If the carpet costs \$23.99 per square metre, how much will he pay?



16. Calculate the area of the shaded part of this diagram.

