

## Chapter 9: Multiplication and Division of Decimals

### Lesson 1 – Estimating Products

**Learning Goals:** Estimate products of decimal numbers using whole numbers.

#### Question:

Saffron is a very expensive spice. It costs about \$2.29 for just 1 g. As a gift, Rupi gave her mother 8 g of saffron.

- a) How do you know that the cost of the saffron was more than \$16 but less than \$24?
- b) How do you know that the cost was close to \$18?

#### Answer:

- a) For example, 2.29 is between 2 and 3, so  $8 \times 2.29$  is between  $8 \times 2$ , which is 16, and  $8 \times 3$ , which is 24.
- b) For example, 2.29 is closer to 2 than to 3, so the amount should be closer to \$16 than \$24, but a bit more than \$16, so \$18 is a good estimate.

#### At-Home Help

You can use front-end estimation to estimate the product of decimals or of a decimal number and a whole number.

For example, estimate  $4 \times 3.2$ . 3.2 is about 3, and  $4 \times 3 = 12$ . The product is about 12.

## Lesson 2 - Multiplying Money Amounts by One-Digit Numbers

**Learning Goals:** Multiply decimal hundredths by one-digit numbers using different strategies.

### Question:

A can of juice costs \$1.36.

- How do you know that the cost of four cans of juice is between \$4 and \$8?
- How much do four cans of juice cost?  
Show your work.

### Answer:

- For example, 1.36 is greater than 1, so  $4 \times 1.36$  is greater than  $4 \times 1$ , which is 4.  
1.36 is less than 2, so  $4 \times 1.36$  is less than  $4 \times 2$ , which is 8.

- \$5.44

For example, 1.36 is 136 hundredths so I can multiply  $4 \times 136$  and then change the answer back to hundredths.

$$\begin{aligned}4 \times 136 &= 4 \times 100 + 4 \times 30 + 4 \times 6 \\ &= 400 + 120 + 24 \\ &= 544\end{aligned}$$

$$544 \text{ hundredths} = 5.44$$

### At-Home Help

Here are three ways to multiply a decimal number by a one-digit number.

For example, multiply  $\$4.35 \times 3$ .

- Think of \$4.35 as 435 pennies. Use base ten blocks to model three groups of 435. Regroup 10 ones as 1 ten, and 10 tens as 1 hundred.
- Add  $\$4.35 + \$4.35 + \$4.35$ .
- Use play coins to model  $\$4.35 \times 3$ . Multiply the loonies first ( $4 \times 3 = 12$ ). Multiply the dimes next ( $3 \times 3 = 9$  dimes, or 0.90). Multiply the pennies last ( $3 \times 5 = 15$  pennies, or 0.15). Add each part together:  $12 + 0.90 + 0.15$ .

### Lesson 3 – Multiplying Decimals by One-Digit Numbers

**Learning Goals:** Multiply decimal tenths, hundredths, and thousandths by one-digit numbers.

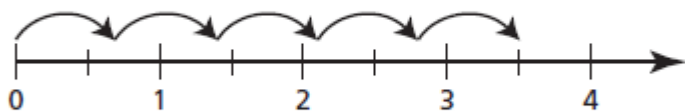
**Question:**

Mark is packaging ground turkey. Each package holds 0.678 kg.

- a) Estimate the total mass of five packages of ground turkey.
- b) Explain why your estimate makes sense. Use a number line.
- c) Calculate the total mass of five packages. Show your work.

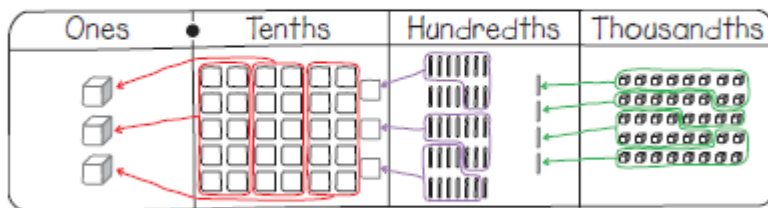
**Answer:**

- a) For example, 0.678 is close to 0.7 and  $5 \times 0.7 = 3.5$ ; the total mass is about 3.5 kg.
- b) For example:



My picture shows 5 jumps of 0.7. That gets me to 3.5 on the number line. First I was at 0.7, then 1.4, then 2.1, then 2.8, and then 3.5.

- c) 3.390 kg; for example, I modelled 5 groups of 0.678 with base ten blocks. I traded 40 thousandths for 4 more hundredths. I traded 30 hundredths for 3 more tenths. I traded 30 tenths for 3 more ones.



Note that some students may choose to show their work symbolically; that is equally acceptable.

**At-Home Help**

When you use base ten blocks to multiply a decimal number by a one-digit number, choose your blocks based on the decimal.

**Example 1:** Multiply  $0.13 \times 5$ . The decimal involves hundredths, so use the flat square block to represent 1. The long thin block will represent 0.1 (one tenth). The small cube will represent 0.01 (one hundredth).

**Example 2:** Multiply  $0.214 \times 2$ . The decimal involves thousandths, so use the large cube (the thousands block) to represent 1. A flat square block will represent 0.1 (one tenth). A long thin block will represent 0.01 (one hundredth). A small cube will represent 0.001 (one thousandth).

## Lesson 4 - Estimating Quotients

**Learning Goals:** Estimate quotients when dividing decimal numbers by one-digit divisors.

### Question:

Each length of ribbon is cut into the given number of pieces. Estimate the length of each piece.

Explain your thinking.

- a) 8.28 m cut into five equal pieces
- b) 1.345 m cut into four equal pieces
- c) 1.52 m cut into eight equal pieces.

### Answer:

For example:

- a) For example, about 2 m; 8.28 is close to 10 and  $10 \div 5 = 2$ .
- b) For example, about 0.3 m; 1.345 is close to 1.2, or 12 tenths;  $12 \text{ tenths} \div 4 = 3 \text{ tenths}$ .
- c) For example, about 0.2 m; 1.52 is close to 1.6, or 16 tenths;  $16 \text{ tenths} \div 8 = 2 \text{ tenths}$ .

### At-Home Help

When you divide a decimal number and estimate the quotient, it helps to compare the decimal with whole numbers that are easy to divide.

For example, estimate  $5.6 \div 2$ . Compare 5.6 with two whole numbers that are easy to divide by 2. For example,  $6 \div 2 = 3$ , and  $4 \div 2 = 2$ . 5.6 is closer to 6, so choose  $6 \div 2 = 3$  as your estimate.

## Lesson 6 - Dividing Decimals by One-Digit Numbers

**Learning Goals:** Divide a decimal by a one-digit number using models and symbols.

### Question:

Describe two strategies you could use to divide 9.65 by 5.

### Answer:

For example, I could write 9.65 as  $5 + 4.5 + 0.15$ .

I would divide each part by 5 to get

$$1 + 0.9 + 0.03 = 1.93.$$

Another strategy I could use is to think of 9.65 as 965 hundredths.

I would divide 965 by 5.

$$965 = 1000 - 35$$

$$965 \div 5 = 1000 \div 5 - 35 \div 5$$

$$= 200 - 7$$

$$= 193$$

$$193 \text{ hundredths} = 1.93$$

### At-Home Help

Here are two ways to divide a decimal number by a one-digit number.

For example, calculate  $3.72 \div 4$ .

- Use base ten blocks to model 3.72. Divide the blocks into 4 equal groups. Regroup blocks as needed so you can divide.
- Rename 3.72 as 372 hundredths. Then calculate  $372 \div 4$ . Remember that the answer is also in hundredths.

## Lesson 7 - Solving Problems by Working Backwards

**Learning Goals:** Work backwards to solve problems that involve decimals.

### Question:

Aaron sewed together eight equal sections of fabric. When he added another 7.00 m, the total length of the fabric was 18.00 m. How long was each of the original eight sections?

### Answer:

1.375 m; for example, 11.00 m made up the eight sections since  $18.00 - 7.00 = 11.00$ . That means each section was  $11.00 \div 8 = 1.375$  m.

### At-Home Help

Follow these steps to solve a problem:

**Step 1:** Understand the problem.

**Step 2:** Make a plan.

**Step 3:** Carry out the plan.

**Step 4:** Look back and check your answer.