Operations with Decimals

You compute with decimals when you work with money amounts or with measurements using metric units. Many statistics including those in sports involve decimals.

You add and subtract decimals when you shop. Add and subtract as you would with whole numbers. Remember to align the decimal point in the sum or difference with the decimal points in the numbers you are adding or subtracting.

EXAMPLE A

Tricia buys a granola bar for $3.75 and a fruit drink for $1.49. She pays with a $10 bill. How much change should Tricia get?

Step 1: *Find how much Tricia spends. Add $3.75 and $1.49.*

$$\begin{array}{r} \$3.75 \\ +\ 1.49 \\ \hline \$5.24 \end{array}$$

Step 2: *Find the change. Subtract what Tricia spent from $10.00.*

$$\begin{array}{r} \$10.00 \\ -\ 5.24 \\ \hline \$4.76 \end{array}$$

Solution: Tricia should get $4.76 in change.

Multiply decimals just as you would whole numbers. When multiplication is complete, place the decimal point in the product. To place the decimal point, find the total number of digits to the right of the decimal points in the factors. The product will have this total number of places to the right of the decimal point. You can use estimation to help you decide if a product is reasonable.

EXAMPLE B

Kevin rides his bicycle at a speed of 8.4 miles per hour. If he rides for 2.5 hours, how many miles will he ride?

Step 1: *Estimate by rounding. Round to the nearest whole number.*

8.4 rounds to 8.
2.5 rounds to 3.
$8 \times 3 = 24$

Step 2: *Multiply as you would with whole numbers.*

$$\begin{array}{r} 8.4 \\ \times\ 2.5 \\ \hline 420 \\ +\ 1680 \\ \hline 2100 \end{array}$$

Step 3: *Count the number of decimal places in the factors. The product will have the same number of places to the right of the decimal point.*

$$\begin{array}{r} 8.4\ \leftarrow 1 \text{ decimal place} \\ \times\ 2.5\ \leftarrow 1 \text{ decimal place} \\ \hline 420 \\ +\ 1680 \\ \hline 21.00\ \leftarrow 2 \text{ decimal place} \end{array}$$

Step 4: *Compare your solution to the estimate. Since 21 is close to 24, the solution is reasonable.*

$21.00 = 21$

Solution: Kevin will ride 21 miles in 2.5 hours.

Operations with Decimals (continued)

You can also use the distributive property to multiply with decimals. The distributive property states that to multiply a sum by a number, you can multiply each addend by the number and add the products.

EXAMPLE C

Multiply 5.2×3.6 using the distributive property.

Step 1: Break one of the decimals into a sum using addition. $5.2 \times 3.6 = (5 + 0.2) \times 3.6$

Step 2: Rewrite the expression. $= (5 \times 3.6) + (0.2 \times 3.6)$

Step 3: Multiply inside each set of parentheses. $= 18 + 0.72$

Step 4: Add the products. $= 18.72$

Solution: $5.2 \times 3.6 = 18.72$

To divide a decimal by a whole number, place the decimal point in the quotient directly above the decimal point in the dividend. Then divide as you would whole numbers.

One difference in division with decimals is that you may have to write zeros in the dividend so that you have enough digits to divide.

EXAMPLE D

Mr. Armstrong divided 5.1 liters of water equally among 6 jars for a science experiment. How much water did Mr. Armstrong put in each jar?

Step 1: Place the decimal point in the quotient directly above the decimal point in the dividend.

$$6\overline{)5.1}$$

Step 2: Because $5 < 6$, the quotient will be less than 1, so place a 0 before the decimal point in the quotient.

$$\begin{array}{r} 0. \\ 6\overline{)5.1} \end{array}$$

Step 3: Divide as you would with whole numbers. Add one or more zeros after the decimal point in the dividend and divide until the decimal in the quotient terminates.

$$\begin{array}{r} 0.85 \\ 6\overline{)5.10} \\ -4.8 \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

Solution: Mr. Armstrong put 0.85 liter of water in each jar.

To divide by a decimal, you must first write an equivalent expression with a whole-number divisor. To do this, multiply both the dividend and divisor by a power of 10 that will make the divisor a whole number.

Operations with Decimals (continued)

EXAMPLE E

Ryan earned $52.50 for baby-sitting 3.5 hours. How much money did he earn per hour?

Step 1: The divisor has 1 decimal place. So, multiply 3.5 by 10 to make a whole-number divisor. You must also multiply the dividend by 10.

$$\begin{array}{rcr} \$52.50 & \div & 3.5 \\ \$52.50 \times 10 & & 3.5 \times 10 \\ 525.0 & \div & 35 \end{array}$$

Step 2: Divide as you would with whole numbers.

$$\begin{array}{r} 15 \\ 35\overline{)525} \\ -35 \\ \hline 175 \\ -175 \\ \hline 0 \end{array}$$

Solution: Ryan earns $15 per hour.

PRACTICE

Solve.

1. $12.87 + 3.5$

2. $2.16 + 0.43 + 0.2$

3. $12.3 - 5.08$

4. $0.26 - 0.008$

5. 32×1.84

6. 0.73×1.4

7. $1.062 \div 3$

8. $83 \div 0.2$

9. $36.4 \div 2.6$

10. David is going to Mexico for vacation. He will exchange $550 for new pesos. The exchange rate is $1 = 11.85 new pesos. How many new pesos will David receive?

11. When you multiply two decimals less than 1, how does the product compare to the factors? Illustrate with an example.

12. A road race is 15 kilometers long. After the starting line, there are water stations every 0.3 kilometer. How many water stations are there?

13. A new CD costs $13.79, plus $0.97 in sales tax. How much do 3 new CDs cost? Explain how you found your answer.