**Multiplying decimals**

Multiplying decimals is just like multiplying whole numbers. The only difference is the placement of the decimal point in the product. To figure out the placement of the decimal in a product, count the number of digits after each factor's decimal point. Add these numbers together, and this will be the total number of digits after the decimal point in the product.

1. Multiply 23.6 \times 13.79

\[
\begin{array}{r}
13.79 & \quad \text{2 digits after decimal} \\
\times 23.6 & \quad \text{1 digit after decimal} \\
\hline
325.444 & \quad \text{1 added to 2 gives 3 digits total after the decimal in this product.}
\end{array}
\]

2. Multiply 3.12 \times 100

To multiply by a power of 10, simply move the decimal point to the right as many places as there are zeros.

\[
3.12 = 312 \quad \text{Move decimal 2 places to the right since there are two zeros.}
\]

Note: When multiplying decimals, estimation is helpful to verify placement of the decimal point in a product.

1. State the rule for placement of the decimal point in a multiplication problem.

To make the statement true, place a decimal point in the factor that is missing a decimal.

2. \( (82)(.2) = 1.64 \)

3. \( (4.015)(41) = 164.615 \)

4. \( (575)(1.2) = 6.900 \)

5. \( (0.6)(216) = 12.96 \)

6. \( (65.7)(25) = 164.25 \)

7. \( (7.5)(75) = 562.5 \)

Multiply each expression.

8. \( 7 \times 20.2 \)

9. \( 6.2 \times 0.35 \)

10. \( 0.2 \times 0.18 \)

11. \( 8.5 \times 9.1 \)

12. \( 4.1 \times 4.1 \)

13. \( 5.014 \times 5.4 \)

14. John bought a case of soda (24 cans) at the store for $0.31 a can. How much money did John spend at the store?
Dividing decimals by whole numbers

Dividing decimals by whole numbers, is just like dividing whole numbers with one extra step shown below.

1. Divide 5.4 by 9

```
 .6
 9 | 5.4
   - 5.4
   -----  
     0
```
Place the decimal point directly above the decimal point in 5.4.
Divide as done with whole numbers.

2. Divide 2.6 by 3

```
 .866
 3 | 2.600
   - 2.4
   -----  
     20
   - 18
   -----  
     2
```
Place the decimal point directly above the decimal point in 2.6.
Divide as done with whole numbers. Add zeros until you see a pattern.
Use a line above the 6 to show that the 6 repeats.

3. Divide 67.841 by 1,000
To divide numbers by a power of 10, simply move the decimal to the left as many places as there are zeros.

\[67.841 \div 1,000 = 0.067841\]
Move decimal 3 places to the left since there were 3 zeros. A zero needed to be put in the final answer to hold a place value position.

Note: When dividing decimals by whole numbers, sometimes it is necessary to add zeros to a dividend until the remainder is zero or until the answer contains as many digits as one would like or need.

Divide each expression.

1. \(0.21 \div 6\)  
2. \(339.2 \div 8\)  
3. \(28.35 \div 9\)

4. \(9.008 \div 4\)  
5. \(0.0318 \div 6\)  
6. \(14.068 \div 100\)

7. \(16.8 \div 12\)  
8. \(6.88 \div 16\)  
9. \(46.7 \div 10\)

10. If a car uses 16.4 gallons of gas in 4 hours, how many gallons are used per hour?

11. Rob rode his bike 48.3 miles in 3 hours. How many miles did he bike in 1 hour?
Dividing decimals by decimals

To divide by decimals, move the decimals of each number in the problem the same number of places to change the divisor to a whole number. (Just as multiplying the numerator and the denominator of a fraction by the same number gives an equivalent fraction, moving the decimal points in a division problem the same number of places also gives the same answer.)

1. Divide 0.84 by 1.2

\[
\begin{array}{c}
\text{1.2} \\ \hline
\text{0.84} \\
\text{.7} \\
\text{12} \\
\hline
\text{8.4} \\
\text{8.4} \\
\hline
\text{= 0.7} \\
\text{0}
\end{array}
\]

Move the decimals until the divisor is a whole number.

Divide using the new numbers.

Final quotient

2. Divide 0.024 by 0.002

\[
\begin{array}{c}
\text{0.002} \\ \hline
\text{0.024} \\
\text{12} \\
\hline
\text{24} \\
\text{2} \\
\hline
\text{04} \\
\text{4} \\
\hline
\text{= 12} \\
\text{0}
\end{array}
\]

Move the decimals until the divisor is a whole number.

Divide using the new numbers.

Final quotient

Change each division problem to make the divisor a whole number.

1. 9.2 ÷ 1.2

2. 16 ÷ 0.48

3. 0.014 ÷ 0.005

4. 10.81 ÷ 9.1

5. 0.8 ÷ 2.6

6. 24.75 ÷ 0.95

Divide each expression.

7. 16.25 ÷ 0.5

8. 0.564 ÷ 1.2

9. 8.704 ÷ 3.4

10. 4.848 ÷ 0.08

11. 0.0448 ÷ 0.014

12. 10.98 ÷ 0.02

13. On Juan’s road trip, he spent $15.50 for 12.5 gallons of gas. How much money did he pay per gallon?
Why Is a Mathematician Like an Airline?

Round each answer to the nearest hundredth (if necessary) and find it in the appropriate answer column. Use 3.14 for \( \pi \). Fill in the correct unit of measure for each answer you choose. Write the letter of the exercise in the box containing the number of the answer.

1. A circle has a radius of 12 in. Find:
   - (E) The diameter of the circle.
   - (H) The circumference of the circle.
   - (T) The area of the circle.

2. A circle has a radius of 4.4 cm. Find:
   - (S) The diameter of the circle.
   - (Y) The circumference of the circle.
   - (H) The area of the circle.

3. A circle has a diameter of 60 m. Find:
   - (I) The radius of the circle.
   - (O) The circumference of the circle.
   - (T) The area of the circle.

4. A circle has a diameter of 1.8 km. Find:
   - (O) The radius of the circle.
   - (E) The circumference of the circle.
   - (U) The area of the circle.

5. Solve.
   - (B) Jack’s cow is tied to a beanstalk with a piece of rope that is 15 ft long. What is the area of the circle in which the cow can graze?
   - (T) A round game table has a diameter of 1 m. How much plastic laminate is needed to cover the top of this table?
   - (S) The diameter of the earth at the equator is about 8,000 mi. Based on this figure, how far is it around the earth?
   - (P) Radio station KROQ broadcasts in all directions to a distance of 40 mi. How many square miles are in the station’s broadcast area?
   - (L) WORLD RECORD: The world’s largest Ferris Wheel was built in London in 1897. The wheel had a radius of 150 ft. How far would you travel in one turn of this wheel?
Review of Unit 5

Topics covered:
Decimals as Fractions and Mixed Numbers
Rounding Numbers
Estimating Sums and Differences
Estimating Products and Quotients
Adding and Subtracting Decimals

Decimals and Estimation

Multiplying Decimals
Dividing Decimals by Whole Numbers
Dividing Decimals by Decimals
Solving Equations and Inequalities with Decimals

1. Explain how to read 2.48. Change this decimal to a mixed number in lowest terms.

2. Rewrite $10 \frac{3}{5}$ with a denominator that is a power of 10, and then rewrite as a decimal.

3. Round 351.276 to the nearest hundred and then to the nearest tenth.

Estimate each answer. Tell whether it is a sum, difference, product, or quotient.

4. $15.23 \times 9.98$
5. $311.02 + 207.56$
6. $61.97 \div 11.24$
7. $298 - 114$

8. Explain the rule that is used when adding and subtracting numbers with decimals.

9. State the rule used to place a decimal point when multiplying.

Evaluate each expression.

10. $7.68 + 12.3$
11. $7.1 \times 0.98$
12. $3.1 \times 3.2$

13. $28.7 - 5.4$
14. $10.908 \div 9$
15. $0.762 \div 1.2$

16. Explain how to solve $0.2x - 3.5 = 7.1$ and then solve.

17. Solve $\frac{y}{2.3} \leq -5.1$ for $y$. 
Page 54
1. 5; 45,500; 2. 4; 7, 2; 3. 5; 6,130; 4. 2; 2,590; 5. 8; 12,20; 6. 6; 23,1; 7. 3; 78; 8. 8; 182,617; 9. 685; 685,4; 685,37; 685,37; 10. 0, 0, 0; 0,09; 0,094; 11. 1; 1, 1; 149; 1488

Page 55
1. Answers will vary; 2. to find an answer quickly when an exact answer is not necessary; to see if an answer is reasonable or not; 3–14. Answers will vary; 3. 64; 4. 20,000; 5. 2; 6. 33; 7. 7; 8. 3; 9. 23; 10. 15; 11. 400; 12. 6,000; 13. 8900; 14. 40,000

Page 56
1. Answers will vary; 2–11. Answers will vary; 2. 140; 3. 10; 4. 8; 5. 90,000; 6. 3; 7. 5; 8. 3; 9. 20; 10. 4,500; 11. 72; 12. Answers will vary.

Page 57
1. Decimal points must be aligned; 2. none if decimal points are aligned; 3. 9,75; 4. 55,16; 5. 0,5; 6. 2,585; 7. 19,28; 8. 50,19; 9. 9,27; 10. 20,32

Page 58
1. Count total number of factors after decimal points. This is how many digits go after the decimal point in answer; 2. 8,2; 3. 4,1; 4. 5,75; 5. 2; 6; 2,5; 7. 7,75; 8. 14,14; 9. 2,17; 10. 0,036; 11. 77,35; 12. 16,81; 13. 27,0758; 14. 7,44

Page 59
1. 0,035; 2. 42,4; 3. 3,15; 4. 2,252; 5. 0,0053; 6. 0,14068; 7. 1,4; 8. 0,43; 9. 4,67; 10. 4.1 gallons/hour; 11. 16.1 miles/hour

Page 60
1. 92 + 12; 2. 1,600 + 48; 3. 14 + 5; 4. 108 + 91; 5. 8 + 26; 6. 2,475 + 95; 7. 32,35; 8. 0,47; 9. 2,56; 10. 60,6; 11. 3,2; 12. 549; 13. $1.24/gallon

Page 61
1. Divide both sides by 0.4, x = 17; 2. Answers will vary; 3. y = 0.5; 4. d ≤ 41,12; 5. z = 17,28; 6. t = 1; 7. a = 0,3; 8. x = 44,59; 9. b = 2,743; 10. x ≥ 13,57; 11. x ≥ 1,226; 12. c = 5,2

Page 62
1. two and forty-eight hundredths; 2. 12,25; 2. 10 6/10; 3. 400, 351, 3; 4. 150—product; 5. 500—sum; 6. 6—quotient; 7. $200—difference; 8. Decimal points must be aligned; 9. Count digits after decimal points in both numbers. This is how many digits after decimal in product; 10. 19.98; 11. 6,568; 12. 5,92; 13. 23,3; 14. 1,212; 15. 0,635; 16. 53. Answers will vary; 17. y = 11.73

Page 63
1. 16,100; 0,16; 2. 7 13/20; 3. hundredths, 761,46; 4. Find an approximate answer quickly if an exact number is not needed; find if an answer is reasonable or not; 3–14. Answers will vary; 3. 64; 4. 20,000; 5. 2; 6. 33; 7. 7; 8. 3; 9. 23; 10. 15; 11. 400; 12. 6,000; 13. 8900; 14. 40,000

Page 65
1. right, 2; down; 3. right, 3; down 2; 4. right, 7; up 6; 5. no move right or left, down 3; 6. left 1, up 4; 7. left 4, down 5; 8. right, 7, no move up or down; 9. (3, 3); 10. (2, -5); 11. (-6, 2); 12. (-4, 3); 13. (2, 6); 14. (5, -2); 15. See graph.

Page 66
1. An equation is a linear equation if its graph is a straight line; 2. Find three solutions, locate points on a graph, and draw a line to connect the points; 3–8. Answers will vary. Possible answers: 3. (1, 3); (3, 9), (-1, -3); (0, 0); 4. (1, -1), (10, -10), (0, 0), (-2, 2); 5. (1, 5), (10, 14), (0, 4), (2, 6); 6. (1, 12), (3, 20), (0, 8), (2, 16); 7. (1, 1), (2, 0), (6, -4), (0, 2); 8. (10, 5), (6, 1), (5, 0), (0, -5)

Page 67
1. Divide difference in y-values by difference in x-values; 2. From any point on the line, go down 2, to the right 1. This new point will be on the line; 3. 1; 4. 2; 5. 2; 6. 3; 7. 1/2; 8. 9; 9. -8/3; 10. 7/4; 11.Answers will vary but line will have some slant as line shown.

Page 68
1. Place points at (0, 2) and (4, 0). Draw a line connecting them; 2. Solve equations letting x = 0 for y-intercept, y = 0 for x-intercept. x = 1, y = -2; 3. x-int = -1, y-int = 2; 4. x-int = 3, y-int = 4; 5. x-int = 1, y-int = -2; 6. x-int = 4, y-int = 7, y-int = 3, y-int = 8; 7. y-int = 9, x-int = 2, x-int = 8; 11. x-int = 6, y-int = -6; 10. x-int = 2, y-int = 8; 11. x-int = 6, y-int = -2

Page 69
1. Answers will vary; 2. (0, 2); 3. (-1, 5); 4. (1, 0); 5. (2, 3); 6. (-4, -1); 7. (-2, 2); 8. (0, 0); 9. infinitely many; 10. none; 11. (5, 11)