

Part 3 Decimals, Ratios, Rates, Proportions, and Percentages

Unit 14 Introduction to Decimals

1. Decimals are similar to fractions with denominators of 10, 100, 1,000, etc.

$\frac{1}{10}$ and .1 are read **one tenth**.

$\frac{11}{100}$ and .11 are read **eleven hundredths**.

$\frac{111}{1,000}$ and .111 are read **one hundred eleven thousandths**.

2. Decimals can be used with whole numbers. Read the decimal point as "and."

Note: The number 24.3 would be read twenty-four **and** three tenths.
The number 24.37 would be read twenty-four **and** thirty-seven hundredths.

3. Place value is important with decimals.

To the left of the decimal point,
place values are 10 times larger.

$$70 = (7)(10)$$

$$700 = (70)(10)$$

$$7,000 = (700)(10)$$

To the right of the decimal,
place values are 1/10 as large.

$$.7 = (7)\left(\frac{1}{10}\right)$$

$$.07 = (.7)\left(\frac{1}{10}\right)$$

$$.007 = (.07)\left(\frac{1}{10}\right)$$

Adding zeros between a
decimal and a number will
make the number smaller.

$$.7 \rightarrow .07 \rightarrow .007$$

$$\frac{7}{10} > \frac{7}{100} > \frac{7}{1,000}$$

Adding zeros to the right of
a number will not change
the value of the number.

$$.7 \rightarrow .70 \rightarrow .700$$

$$\frac{7}{10} = \frac{70}{100} = \frac{700}{1,000}$$

Unit 14 Practice Problems

Name the first six places to the right of the decimal point.

1) _____

4) _____

2) _____

5) _____

3) _____

6) _____

Use words to describe these decimals.

7) .4

8) .43

9) .438

10) .06

11) .0806

12) 1.25

Arrange the following in descending order.
Hint: Add zeros, then compare.

13) _____ .75

14) _____ .9

15) _____ .0097

16) _____ 4.49

17) _____ .005

Match each decimal with its written description.

18) .022 _____

19) .2 _____

20) .22 _____

21) .222 _____

22) .00022 _____

A. two hundred twenty-two thousandths

B. twenty-two thousandths

C. two tenths

D. twenty-two hundredths

E. twenty-two hundred thousandths

Unit 14 answers are on page 238.
Unit 14 additional practice problems are on page 169.

Unit 15 Rounding Decimals and Writing Decimals as Fractions

1. **Rounding** to a specific place makes using decimal numbers easier.
 - A. A rounded number is approximately equal to (\approx) the number it represents.
 - B. Rounding procedures
 1. Determine the number of places desired in the answer.
 2. Round up if the digit to the right is greater than or equal to 5.
 3. Do not round up if the digit to the right is less than 5.
 4. Eliminate all numbers to the right of the required place value.
 - C. Examples:

Round 1.4647 to tenths.

tenths is the desired place value

↓

1. 4 6 4 7 \approx 1.5

↑

because the number to the right is ≥ 5

Round 1.4647 to hundredths.

hundredths is the desired place value

↓

1. 4 6 4 7 \approx 1.46

↑

because the number to the right is < 5

Round 1.4647 to thousandths.

thousandths is the desired place value

↓

1. 4 6 4 7 \approx 1.465

↑

because the number to the right is ≥ 5

Round 1.4647 to units.

units is the desired place value

↓

1. 4 6 4 7 \approx 1.0

↑

because the number to the right is < 5

2. Repeating decimals

- A. $1/3$ repeats as .3333 forever. $1/3 = \bar{.3}$ where $\bar{.3}$ means .3 repeats forever. $1/3$ rounded to two places is .33 and $1/3$ rounded to three places is .333.
- B. $2/3$ repeats as .6666 forever. $2/3 = \bar{.6}$ where $\bar{.6}$ means .6 repeats forever. $2/3$ rounded to two places is .67 and $2/3$ rounded to three places is .667.
- C. Calculations using rounded repeating decimals are approximations of the correct answer.

3. Writing decimals as fractions

- A. Procedures
 1. Write the decimal's fraction equivalent (tenths, hundredths, thousandths, etc.).
 2. Reduce to lowest terms.
- B. Examples:

.4 means $\frac{4}{10} = \frac{2}{5}$

.375 means $\frac{375}{1,000} = \frac{3}{8}$

.25 means $\frac{25}{100} = \frac{1}{4}$

2.75 means $2\frac{75}{100} = 2\frac{3}{4}$

Unit 15 Practice Problems

Round the following to the nearest: (\approx is the symbol for approximately equal to.)		
Tenth	Hundredth	Thousandth
1) $.79 \approx$	2) $.352 \approx$	3) $.48764 \approx$
Unit	Tenth	Unit
4) $4.49 \approx$	5) $.09 \approx$	6) $9.8 \approx$

Round the following to two places.		
7) $.754 \approx$	8) $.6864 \approx$	9) $.9258 \approx$

Write the following decimals as fractions. (As always, reduce to lowest terms.)		
10) $.5 =$	11) $2.0 =$	12) $.04 =$
13) $.65 =$	14) $.009 =$	15) $2.25 =$


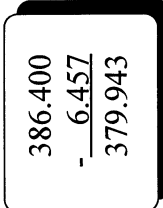
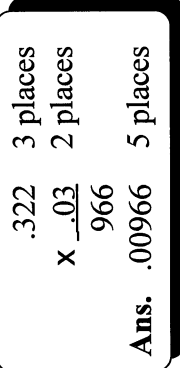
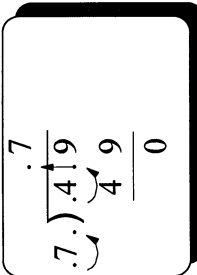
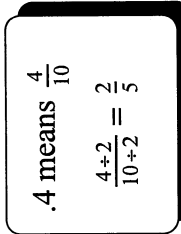
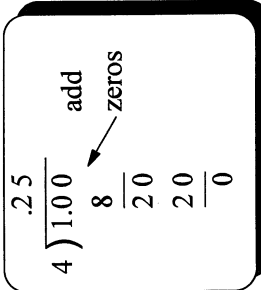
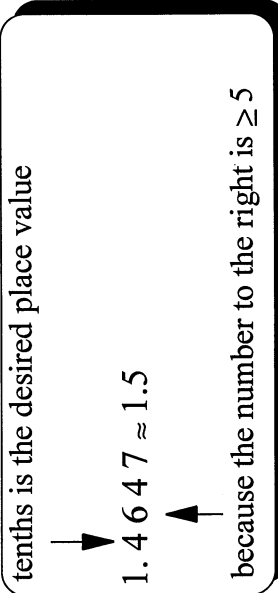
This new material is important. Be sure you understand it before going on to the next unit.



Unit 15 answers are on page 238.
Unit 15 additional practice problems are on page 170.

Part 3 Review of Decimals, Ratios, Rates, Proportions, and Percentages

Decimals (learning units are in parentheses)

Addition (16)	Subtraction (16)	Multiplication (16)	Division (17)
Line up the decimals Add zeros as placeholders	Line up the decimals Add zeros as placeholders	Line up the last digits	Move the divisor's decimal to the right Move the dividend's decimal the same number of places
Add	Subtract	Multiply	Divide
Place the decimal in the answer	Place the decimal in the answer	Count decimal places in numbers being multiplied and place a decimal that number of places in the answer	Copy the decimal straight up into the answer
$22.57 + 1.457 + 386.4$ 	$386.4 - 6.457$ 	$.322 \times .03$ 	$.49 \div .7$ 
Writing decimals as fractions (15)	Writing fractions as decimals (17)	Rounding decimals (15)	
Write fraction equivalent Divide Reduce if possible	Divide denominator into numerator Place a decimal in the answer Divide	Determine the required place value Copy all numbers before that place If the number to the place value's right is ≥ 5 , round up If the number to the place value's right is < 5 , do not round Exclude all numbers to the right of the required place value	
Express .4 as a fraction 	Express $\frac{1}{4}$ as a decimal $\frac{1}{4}$ means $1 \div 4$ and 	Round 1.4647 to the nearest tenth. 	

Ratios, Rates, and Proportions

Ratios (18)	Rates (18)	Proportions (19 and 20)
<p>Ratios compare two like things. 5 feet to 2 feet as a ratio is (5:2).</p> <p>Ratios must be in the same unit of measure. Express \$2 to 25 cents as a ratio.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> $\frac{\\$2}{25 \text{ cents}} = \frac{200 \text{ cents}}{25 \text{ cents}}$ $= \frac{200 \div 25}{25 \div 25} = \frac{8}{1} \text{ or } 8:1$ </div>	<p>Rates compare two unlike things. \$8 dollars for 1 hour is a rate.</p> <p>Rates compare important relationships. Express traveling 200 miles in 4 hours as a rate.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> $\frac{200 \text{ miles}}{4 \text{ hours}} = \frac{50 \text{ miles}}{1 \text{ hour}}$ <p style="text-align: center;">or 50 miles per hour</p> </div>	<p>The ratios 6:2 and 3:1 are in proportion because they are equal.</p> <p>When proportions are written as fractions, their cross products are equal.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> $\frac{2}{6} = \frac{3}{9} \rightarrow \frac{2}{6} \times \frac{3}{9} \text{ and}$ $2 \times 9 = 6 \times 3 \rightarrow 18 = 18$ <p>Note: When two ratios are not in proportion, the position of the larger product indicates the larger fraction.</p> </div>
	<p>Rates compare two unlike things. \$8 dollars for 1 hour is a rate.</p> <p>Rates compare important relationships. Express traveling 200 miles in 4 hours as a rate.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> $\frac{200 \text{ miles}}{4 \text{ hours}} = \frac{50 \text{ miles}}{1 \text{ hour}}$ <p style="text-align: center;">or 50 miles per hour</p> </div>	<p>Proportions can be used to solve some interesting problems. The scale of a map uses 1 inch to represent 200 miles. How far apart are cities separated by 5 inches on this map?</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> $\frac{1 \text{ inch}}{5 \text{ inches}} = \frac{200 \text{ miles}}{x \text{ miles}}$ $1x = (5)(200)$ $x = 1,000 \text{ miles}$ </div>

Percentages (21 and 22)

Writing fractions as percentages	Writing decimals as percentages	Writing percentages as fractions	Writing percentages as decimals
<p>Multiply the fraction by $\frac{100\%}{1}$.</p> $\frac{1}{5} \rightarrow \frac{1}{5} \times \frac{100\%}{1} = \frac{100\%}{5} = 20\%$	<p>Multiply the decimal by 100%.</p> $.2 \rightarrow .2 \times 100\% = 20\%$	<p>Multiply the percentage without its percent sign by $\frac{1}{100}$.</p> $3\% \rightarrow 3 \times \frac{1}{100} = \frac{3}{100}$	<p>Multiply the percentage without its percent sign by .01.</p> $3\% \rightarrow 3 \times .01 = .03$
Solving percent problems (23)			
<p>Percentages may be used to compare 2 numbers.</p> <p>One number represents the part, the other number represents the whole. 16 is what percent of 20?</p>	<div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> $\frac{\%}{100} = \frac{\text{Part (is)}}{\text{Whole (of)}}$ $\frac{x}{100} = \frac{16}{20}$ $20x = 100(16)$ $20x = 1600$ $x = 80\%$ </div>	<p>The change proportion is used to find percent of increase or percent of decrease. What is the percent of increase from 16 to 20?</p>	<div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> $\frac{\%}{100} = \frac{\text{Change}}{\text{Original Number}}$ $\frac{x}{100} = \frac{4}{16}$ $16x = 400$ $x = 25\%$ <p>20 is 25% larger than 16.</p> </div>

Quiz 3 on Decimals, Ratios, Rates, Proportions, and Percentages

1) Write 25.237 in words.	2) Round .548 to the nearest A) tenth _____ B) hundredth _____	3) $85.74 + 3.9 + 158.2 =$
4) Write one dollar and twenty-seven cents as a decimal.	5) $78.4 - 6.49 =$	6) $(47.24)(2.5) =$
7) $9.378 \div .9 =$	8) $36 \div .06 =$	9) Express $5/2$ as a decimal.
10) Bill paid \$39.90 for two dress shirts. What did he pay for each shirt?	11) Write a ratio expressing that 12 out of 14 students passed a test.	12) Write \$2.75 to 25 cents as a ratio.

<p>13) One of your friends studies for 2 hours and practices sports for 3 hours every weekend. Write a ratio of hours spent on sports to hours spent studying.</p>	<p>14) A plane made the 4,400-mile trip across the Atlantic Ocean in 8 hours. What rate of speed was the plane flying?</p>
<p>15) Maria earns \$18 per day and saves \$8 of the money. Saving at the same rate, how much would she save in a week that she earned \$90?</p>	<p>16) Express $\frac{4}{5}$ as a percentage.</p>
<p>17) Express .825 as a percentage.</p>	<p>18) Express 60% as a fraction.</p>
<p>19) Express 33% as a decimal.</p>	<p>20) What is 30% of 55?</p>

21) Which number is largest?

- A) .25 C) 49%
B) $\frac{3}{8}$ D) .365

Answer _____

22) What percent of this figure is shaded?
Hint: State the shaded area as a fraction
and then write it as a percent.



- A) 20% B) 40%
C) 60% D) 80% Answer _____

23) What was the percent change in a grade point average that increased from 2.5 to 3.0?

24) A \$3.15 sales tax was paid on a \$45 radio. Express the sales tax as a percent.

25) A map scale shows that 1 inch equals 75 miles. How far apart are two cities separated by 6 inches on this map?

26) Sixteen ounces of hamburger are needed to make four hamburgers. How many ounces of hamburger are required to serve 15 people one hamburger each?

<p>27) 15% of 80 Statistics students earned an A as a final grade. How many students earned an A?</p>	<p>28) Margarita pays social security taxes of 8.2% on her salary. What was her pay if \$41 was taken out for the tax?</p>
<p>29) John usually studies 80 minutes on weekends. He would like to increase his study time by 25%. Find the required increase in study time.</p>	<p>30) An \$85 sports coat was marked down by 20%. What was the markdown?</p>

Arrange the numbers in the first column in descending order and then arrange those in the second column in ascending order.			
31)	Descending Order High to Low	32)	Ascending Order Low to High
0.0		.35	
62%		299%	
.3		.333	
47%		1.2	
.002		1/3	
.6		115/100	
.3%		3.0	

See page 222 for the complete solutions to these quiz problems.

Parts 1 - 3 Cumulative Problem Review

(Problem numbers match Learning Unit numbers.)

1) Write the number four thousand sixty-two.	2) Round 5,462 to the nearest hundred.
3) $\begin{array}{r} 6,234 \\ + 3,416 \\ \hline \end{array}$	4A) $9225 \div 205 =$
5) $6 + 5 \times 3 - 2(5-1) =$	4B) Roberto drove 64 miles per hour for 5 hours. How far did he travel?
	6) Which is a composite number? A) 3 B) 7 C) 10 D) 11 E) 13 Answer _____
7) Write a dime as a fraction of a dollar.	
8) Change $\frac{3}{4}$ to twelfths.	9) Hal did $\frac{1}{5}$ of his homework in study hall on Friday, $\frac{2}{5}$ on Saturday morning, and $\frac{2}{5}$ on Sunday. How much of his homework has been completed?
10) $\frac{5}{6} + \frac{1}{12} =$	11A) $\frac{5}{6} \div \frac{1}{12} =$
11B) Jane earned $\frac{3}{4}$ of a dollar. She always saves $\frac{2}{3}$ of her earnings. How much should she save?	12) $4\frac{2}{3} + 5\frac{3}{4} =$
13) $6\frac{1}{4} \div 2\frac{1}{2} =$	14) Write 3.09 in words.

15) Round 4.547 to the nearest tenth.	16) $44.792 + 7.02 =$	17A) $909.15 \div 275.5 =$
17B) Hot dogs cost \$1.65 per pound. How many pounds were purchased for \$7.26?	18) Express traveling 300 miles in 5 hours as a rate.	19) Choose the proper symbol ($<$, $=$, $>$) to make a true statement. $\frac{2}{7} \text{ ————— } \frac{6}{21}$
20A) Find the missing term. $\frac{3}{4} = \frac{x}{12}$	20B) A blueprint uses 1 in. to represent 5 ft. How long on the map is a 22.5 ft. room?	21) Write the following as percentages. A) $\frac{2}{5}$ B) .75
22A) Write 12.5% as a fraction.	22B) Write 4% as a decimal.	23A) What is 90% of 30?
23B) 44 is what percent of 132?	23C) A city of 15,000 has 8% unemployment. How many people are unemployed?	24) Students employed by a park department increased from 240 to 300. Find the percent of increase.

Answers to these Cumulative Review Problems are on page 238.