Unit 2 Number and Operations: Decimals and Fractions

Focal Point

Apply addition, subtraction, multiplication, and division to problems involving fractions and decimals.

CHAPTER 3 Adding and Subtracting Decimals

BIG Idea) Represent and use rational numbers in a variety of equivalent forms.

BIG Idea) Add, subtract, multiply, and divide to solve problems and justify solutions.

CHAPTER 4 Fractions and Decimals

BIG Idea) Represent and use rational numbers in a variety of equivalent forms.

BIG Idea) Use coordinate geometry to identify location in two dimensions.

CHAPTER 5 Adding and Subtracting Fractions

BIG Idea) Add, subtract, multiply, and divide to solve problems and justify solutions.

Cross-Curricular Project

Math and Finance

Down To The Last Penny! On your mark, get set, SHOP! Being the cost-conscious shopper that you are, you have been asked to help a family make and maintain a grocery budget. On this shopping adventure, you'll gather data about the cost of grocery items, find their total cost, and compare this cost to the amount a family can spend on groceries. This family really needs your help, so put on your thinking cap and let's get shopping!

Math Control Log on to tx.msmath1.com to begin.



Knowledge and Skills

- Represent and use rational numbers in a variety of equivalent forms. TEKS 6.1
- Add, subtract, multiply, and divide to solve problems and justify solutions. TEKS 6.2

Key Vocabulary

clustering (p. 153) equivalent decimals (p. 143) front-end estimation (p. 153) standard form (p. 139)

Real-World Link

Rodeos Average times of roping events at rodeos are measured in thousandths of a second. You can use place value to compare and order the average times of the rodeo participants.

FOLDABLES

Adding and Subtracting Decimals Make this Foldable to help you organize your notes. Begin with two sheets of notebook paper.

Fold one sheet in half. Cut along fold from edges to margin.



Insert first sheet through second sheet and along folds.

2 **Fold** the other sheet in half. Cut along fold between margins.



CONTENTS

0





Adding and Subtracting

David Stoecklein/CORBIS

GET READY for Chapter 3

Diagnose Readiness You have two options for checking Prerequisite Skills.

Option 2

Math Take the Online Readiness Quiz at <u>tx.msmath1.com</u>.

Take the Quick Quiz below. Refer to the Quick Review for help.

QUICK Quiz

Option 1

Evaluate each expression if a = 3 and b = 4. (Used in Lessons 3-4, 3-5, and 3-6)

1. 3a - 2b **2.** 5 + 2a

- **3**. b 1 + a **4**. 16 b
- 5. **SHOPPING** The cost of buying d DVDs and c CDs is given by the expression 17d + 12c. What is the cost of buying 4 DVDs and 6 CDs?

Write each number in words.

(Used in Lesson 3-1)

6.	234,5 00	7.	17,289
8.	3,992,001	9.	611,205

Round each number to the nearest

tens	place.	(Used in	Lesson 3-3	5)

10.	3	11.	13
12.	148	13.	156

Replace each • with < or > to make a true sentence. (Used in Lesson 3-2)

- **14**. 302,788 203,788
- **15**. 54,300 543,000
- **16**. 64,935 61,935
- 17. 892,341 892,431

QUICK Review

= 25

Example 1

Evaluate the expression 6a - b + 2 if a = 5 and b = 7. $6a - b + 2 = 6 \times 5 - 7 + 2$ Replace a with 5 and b with 7. = 30 - 7 + 2 Multiply 6 by 5. = 23 + 2 Subtract 7

from 30.

Add 23 and 2.

Example 2

Write the number 5,602,781 in words. Standard Form 5,602,781 Words five million, six hundred two thousand, seven hundred eighty-one

Example 3

Round 568 to the nearest tens place.

The ones digit is 8. Since $8 \ge 5$, round the tens digit up. 568 rounds to 570.

Example 4

Replace the \bullet in 71,238 \bullet 71,832 with < or > to make a true sentence.

Use place value.

- 71,238 Line up the digits.
- 71,832 Compare the hundreds place. ↑

Since 2 < 8 in the hundreds place, 71,238 < 71,832.



Representing Decimals

Main IDEA

Represent decimals in word form, standard form, and expanded form.

Targeted TEKS 6.1 The student represents and uses

rational numbers in a variety of equivalent forms. (B) Generate equivalent forms of rational numbers including whole numbers, fractions, and decimals.

NEW Vocabulary

standard form expanded form MINI Lab

1,000

thousands

0

COncepts in MOtion Interactive Lab tx.msmath1.com

The models below show some ways to represent the decimal 1.34. **Place-Value Chart** 100 10 1 0.1 0.01 0.001 thousandths hundredths hundreds tenths ones tens 3 4 0 1 Ο Ο

Money





1 dollar

3 dimes 4 pennies







Model each decimal using a place-value chart, money, a decimal model, and base-ten blocks.

1. 1.56 **2**. 0.85 **3**. 0.08 4. \$2.25

Vocabulary Link . . .

Decibel Everyday Use a unit of sound intensity based on powers of ten

Decimal

Math Use a number system based on powers of ten

Decimals, like whole numbers, are based on the number ten. The digits and the position of each digit determine the value of a decimal. The decimal point separates the whole number part of the decimal from the part that is less than one.





EXAMPLE Write a Decimal in Word Form





35.376 is thirty-five and three hundred seventy-six thousandths.



Standard form is the usual way to write a number. Expanded form is a sum of the products of each digit and its place value.



Standard Form and Expanded Form EXAMPLE



Diago Value Chart

	Flace-Value Chart						
1,000	100	10	1	0.1	0.01	0.001	0.0001
thousands	hundreds	tens	ones	tenths	hundredths	thousandths	ten- thousandths
0	0	5	4,	0	0	0	7

Standard form: 54.0007

CHECK Your Progress

Expanded form: $(5 \times 10) + (4 \times 1) + (0 \times 0.1) + (0 \times 0.01) + (0 \times$

 $(0 \times 0.001) + (7 \times 0.0001)$

READING in the Content Area

READING Math Decimal Point Use the

thousandths.

word and only to read the decimal point. For example, read 0.235 as two hundred

thirty-five thousandths. Read 235.035 as two hundred thirty-five and thirty-five

For strategies in reading this lesson, visit tx.msmath1.com.

Extra Examples at tx.msmath1.com

d. Write *three and eighty-five thousandths* in standard form and in expanded form.

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HECK Your Understanding Write each decimal in word form. Example 1 (p. 139) 1. 0.7 2. 0.08 3. 5.32 4. 0.022 5. 34.542 **6**. 8.6284 Write each decimal in standard form and in expanded form. Example 2 (p. 139) 7. nine tenths 8. twelve thousandths 9. three and twenty-two hundredths 10. forty-nine and thirty-six ten-thousandths 11. **FOOD** A bottle of soda contains 1.25 pints. Write this number in two Examples 1, 2 (p. 139) other forms.

Exercises

DMEWORKHELP	Write each decin	nal in word fo
	0.4	0.0

HUMEWORK HUL				
For Exercises	See Examples			
12–23,	1			
32, 33				
24–31	2			

orm.

12 . 0.4	13 . 0.9	14. 3.56	15 . 1.03
16. 7.17	17 . 4.94	18 . 0.068	19. 0.387
20 . 78.023	21 . 20.054	22 . 0.0036	23 . 9.0769

Write each decimal in standard form and in expanded form.

- 24. five tenths 25. eleven and three tenths
- **26**. two and five hundredths 27. thirty-four and sixteen hundredths
- 28. forty-one and sixty-two ten-thousandths
- **29**. one hundred two ten-thousandths
- **30**. eighty-three ten-thousandths 31. fifty-two and one hundredth
- 32. HIKING Pedernales Falls State Park in Johnson City, Texas, has 19.8 miles of hiking and biking trails. Write this number in two other forms.
- 33. **BANKING** To safeguard against errors, the dollar amount on a check is written in both standard form and word form. Write \$23.79 in words.
- 34. ANALYZE TABLES In the table, which numbers have their last digit in the hundredths place? Explain your reasoning. Write each number in expanded form.
- **35**. How is 301.0019 written in word form?
- **36.** Write $(5 \times 0.1) + (2 \times 0.01)$ in word form.
- **37**. Write $(4 \times 0.001) + (8 \times 0.0001)$ in standard form.

Unpopped Po	19	
Ingredient	Grams	1.11
water	0.125	0
fat	0.03	
protein	0.105	
carbohydrates	0.71	18 2 4
mineral water	0.02	7
Source: popcornpopper.cor	n 🔰	$T \setminus$



COBBIS



H.O.T. Problems

CHALLENGE For Exercises 38 and 39, use the following information.

A decimal is made using each digit 5, 8, and 2 once.

- **38**. Formulate the greatest possible decimal greater than 5 but less than 8.
- **39**. Formulate the least possible decimal greater than 0 but less than one.
- **40.** Which One Doesn't Belong? Select the number that does not have the same value as the other three. Explain your reasoning.



TEST PRACTICE

- 42. The world's smallest vegetable is the snow pea. It measures about 0.25 inch in diameter. Which phrase correctly represents this value?
 - **A** twenty-five hundreds
 - **B** twenty-five hundredths
 - C twenty-five tenths
 - **D** twenty-five thousandths
- **43. GRIDDABLE** Write *two hundred eighty-four and twelve hundredths* in standard form.

44. Which of the following is another way to write the diameter of the tire in inches?



- **F** $(3 \times 1) + (6 \times 0.1) + (1 \times 0.01)$
- **G** $(3 \times 10) + (0 \times 1) + (1 \times 0.1) + (6 \times 0.01)$
- H thirty and sixty-one tenths
- J thirty and sixty-one hundredths



- **45. GEOGRAPHY** Jacksonville, Florida, is at sea level. Write this elevation as an integer. (Lesson 2-9)
- **46. SURVEYS** Cheryl surveyed the students in her class to find their favorite type of music. What type of statistical display should Cheryl make to show the results? (Lesson 2-8)

CONTENTS

GET READY for the Next Lesson

PREREQUISITE SKILL Choose the letter of the point that represents each decimal.				
47 . 6.3	48 . 6.7	49. 6.2		
50 . 6.5	51 . 7.2	52 . 6.9		
1				



Comparing and Ordering Decimals

Main IDEA

Compare and order decimals.

Targeted TEKS 6.1 The student represents and uses rational numbers in a variety of equivalent forms. (A) Compare and order non-negative rational numbers. Also addresses TEKS 6.11(A), 6.11(D).

NEW Vocabulary

equivalent decimals

READING Math

< **and** > Recall that the symbol always points toward the lesser number.

GET READY for the Lesson

SNOWBOARDING The table lists the top five finishers at the 2002 Olympic Games Men's Halfpipe.

Men's Halfpipe Results				
Snowboarders	Country	Score		
Danny Kass	USA	42.5		
Giacomo Kratter	Italy	42.0		
Takaharu Nakai	Japan	40.7		
Ross Powers	USA	46.1		
Jarret Thomas	USA	42.1		

Source: mountainzone.com

1. Which player had the highest score? Explain.

Comparing decimals is similar to comparing whole numbers.

EXAMPLE Compare Decimals

SNOWBOARDING Refer to the table above. Use > or < to compare Danny Kass' score with Jarret Thomas' score.

METHOD 1 Use place value.				
Danny Kass: 4	2. <mark>5</mark>	First, line up the decimal points.		
Jarret Thomas: 4	Jarret Thomas: 42.1 Then, starting at the left, find the first place the digits differ. Compare the digits.			
Since 5 > 1, 42.5 > 42.1.				
METHOD 2 Use a number line.				



Numbers to the right are greater than numbers to the left. Since 42.5 is to the right of 42.1, 42.5 > 42.1.

So, Danny Kass' score was higher than Jarret Thomas' score.

CHOOSE Your Method

a. **SNOWBOARDING** Use >, <, or = to compare Takaharu Nakai's score with Giacomo Kratter's score.

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CONTENTS

AP/Wide World Photos

Decimals that name the same number are called **equivalent decimals**. Examples are 0.6 and 0.60.



When you *annex*, or place zeros to the right of the last digit in a decimal, the value of the decimal does not change. Annexing zeros is useful when ordering a group of decimals.



Example 1 (p. 142)

Extra Examples at tx.msmath1.com

le 1	Use >, <, or =	to compare	each pair of decimals.
------	----------------	------------	------------------------

 1. 0.4 • 0.5
 2. 0.38 • 0.35

 3. 2.7 • 2.07
 4. 25.5 • 25.50

- **5. POPULATION** Australia and Botswana are among the least populated countries in the world. In Australia, about 6.76 people live in each square mile, while 6.84 people live in each square mile in Botswana. Which country has the greater number of people per square mile?
- Example 2 (p. 143)
 6. BASEBALL The five highest career batting averages in Major League (MLB) baseball are listed at the right. Order these averages from least to greatest.



Exercises

HOMEWORKHELP		
For Exercises	See Examples	
7–20	1	
21–28	2	

Use >, <, or = to compare each pair of decimals.

7 . 0.2 2 .0	8 . 3.3 • 3.30	9 . 0.08 • 0.8
10 . 0.4 ● 0.004	11. 6.02 • 6.20	12 . 5.51 ● 5.15
13 . 9.003 • 9.030	14 . 0.204 • 0.214	15 . 7.107 ● 7.011
16. 23.88 • 23.880	17 . 0.0624 • 0.0264	18 . 2.5634 • 2.5364

- **19. OLYMPICS** In the 2004 Summer Olympics, Carly Patterson had a total score of 38.387 in the all-around gymnastics event. Svetlana Khorkina had a total score of 38.211 in the same event. Who had a higher score in this event?
- **20. AUTO RACING** In 1994, Sterling Marlin drove an average speed of 156.931 miles per hour to win the Daytona 500. In 2004, Dale Earnhardt Jr. won, driving an average of 156.345 miles per hour. Who was faster?

Order each set of decimals from least to greatest.

21 . 16, 16.2, 16.02, 15.99	22 . 44.5, 45.01, 44.11, 45
23 . 5.545, 4.45, 4.9945, 5.6	24. 9.27, 9.6, 8.995, 9.0599

Order each set of decimals from greatest to least.

25 . 2.1, 2.01, 2.11, 2.111	26 . 7.66, 7.6, 7.666, 7.06
27 . 32.32, 32.032, 32.302, 3.99	28 . 57.68, 57.057, 57.507, 57.57

29. INVENTORY To keep track of the inventory at his store's warehouse, Akio must arrange items on shelves according to their stock numbers. Arrange the numbers in order from least to greatest.

Stock Number
321.53
321.539
321.5

estimation

30. ANALYZE TABLES The following table shows the amount of money Antoine spent on lunch each day this week. Order the amounts from least to greatest and then find the median amount he spent on lunch.

Day	Mon.	Tue.	Wed.	Thu.	Fri.
Amount Spent (\$)	3.31	3.45	3.18	3.43	3.29

31. SELECT A TECHNIQUE The average annual snowfall in Syracuse, New York, is 115.6 inches. Takeetna, Alaska, gets an average of 115.4 inches of snow per year. Which of the following techniques might you use to find which city, on average, gets more snowfall during a 10-year time period? Justify your selection(s). Then use the technique(s) to solve the problem.

mental math	number sense	



H.O.T. Problems



- **32. OPEN ENDED** Write a decimal that is equivalent to 0.4.
- **33. FIND THE ERROR** Daniel and Carlos are ordering 0.4, 0.5, and 0.49 from least to greatest. Who is correct? Explain your reasoning.



- 34. CHALLENGE Della has more money than Lindsey but less money than Nate. Camila has 10¢ more than Hector. The amounts are \$0.89, \$1.70, \$1.18, \$0.79, and \$1.07. How much money does each person have?
- **35. WRITING IN MATH** Refer to the table in Exercise 36. Create a problem that involves comparing the times of two of the runners.



36. The table shows the finishing times for four runners in a 100-meter race.

Runner	Time (s)
Kara	14.31
Ariel	13.84
Mika	13.97
Nelia	13.79

In what order did the runners cross the finish line?

- A Kara, Ariel, Mika, Nelia
- B Nelia, Mika, Ariel, Kara
- C Mika, Nelia, Ariel, Kara
- D Nelia, Ariel, Mika, Kara

37. If Cheyenne correctly marked 1.005, 0.981, 0.899, and 0.93 on a number line, which number was closest to zero?

	-	1		1		I
	()	1		4	2
F	1.005			Н	0.89	9
G	0.981			J	0.93	

38. Which number is between 3.18 and 4.03?A. 2.082C. 4.052

Α	3.082	C	4.052
В	3.205	D	4.352





Rounding Decimals

Main IDEA

Round decimals.

Rounding

Rounding to the nearest whole

number means to

the ones place.

Matt Meadows

Targeted TEKS 6.2 The student adds, subtracts, multiplies, and divides to solve problems and justify solutions. (D) Estimate and round to approximate reasonable results and to solve problems where exact answers are not required. Also addresses TEKS 6.11(D).

GET READY for the Lesson

SCHOOL The Jackson Middle School lunch menu is shown at the right.

- 1. Round each cost to the nearest dollar.
- 2. How did you decide how to round each number?
- 3. Make a conjecture about how to round each cost to the nearest dime.



You can round decimals just as you round whole numbers.

KEY CONCEPT

Round Decimals

To round a decimal, first underline the digit to be rounded. Then look at the digit to the right of the place being rounded.

- If the digit is 4 or less, the underlined digit remains the same.
- If the digit is 5 or greater, add 1 to the underlined digit.
- After rounding, drop all digits after the underlined digit.

EXAMPLES Round Decimals



146 Chapter 3 Adding and Subtracting Decimals



Round each decimal to the indicated place-value position.

a. 13.419; hundredths

b. 0.2785; thousandths

Real-World EXAMPLE

PEANUTS Refer to the information at the left. To the nearest cent, how much did U.S. farmers receive for each pound of peanuts produced in 2003?

There are 100 cents in a dollar. So, rounding to the nearest cent means to round to the nearest hundredth.



To the nearest cent, the average price is \$0.19.

CHECK Your Progress

- c. **FOOD** A bag of potato chips costs \$0.2572 per ounce. How much is this to the nearest cent?
- d. **ANIMALS** An Arabian camel averages 3.45 meters tall. Round 3.45 to the nearest meter.

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Examples 1, 2 (p. 146)

- Round each decimal to the indicated place-value position.
 - 1. 0.329; tenths
 - **3**. 45.522; hundredths
 - 5. 7.67597; ten-thousandths
- Example 3 (p. 147)7. ANALYZE TABLES The table shows the rate of acceleration due to gravity for a few of the planets. To the nearest tenth, what is the rate for each planet?
- **2**. 1.75; ones
- 4. 0.5888; thousandths
- 6. 34.59; tens

Planet	Acceleration (m/s)	
Jupiter	23.12	
Saturn	8.96	
Uranus	8.69	
Mars	3.69	
Source: Scien	ce Scope	

Example 3 (p. 147)8. GASOLINE On September 5, 2005, the average price of a gallon of unleaded gasoline in the Midwest was \$3.038. How much is this to the nearest cent?





Source: adminpeanutsusa.com



Exercises

HOMEWORKHELP		
For Exercises	See Examples	
9–16	1, 2	
17–20	3	

Round each decimal to the indicated place-value position.

- **9**. 7.445: tenths
- 11. 5.68; ones
- **13**. 2.499; hundredths
- **15**. 5.4572; thousandths
- 12. 10.49; ones

10. 7.999: tenths

- 14. 40.458; hundredths
- **16**. 45.0189; thousandths
- 17. **FOOD** The United States is considered the "Ice Cream Capital of the World." Each person eats an average of nearly 5.75 gallons per year. Round 5.75 gallons to the nearest gallon.
- **18. CELL PHONES** In the U.S., there are 48.81 cell phones for every 100 people. Round 48.81 to the nearest whole number.
- **19. MONEY MATTERS** The price of a 12 pack of soda is \$4.39. How much is this to the nearest dollar?
- 20. CURRENCY Fifty Japanese Yen are equal to \$0.475441 U.S. dollars. Round this amount of U.S. dollars to the nearest cent.

CALCULATOR A calculator will often show the results of a calculation with a very long decimal. Round each of the numbers on the calculator displays to the nearest thousandth.

Round each decimal to the indicated place-value position.

- 24. 9.56303; hundredths
- **25**. 988.08055; thousandths

- 26. 87.09; tens
- 28. CYCLING The table shows the average winning speeds in the Tour de France from 2000–2005. Will it help to round these average speeds before listing them in order from least to greatest? Explain.
- **27**. 1,567.893; ten-thousandths

Winner	Year	Average Speed (km/h)
Lance Armstrong	2005	41.654
Lance Armstrong	2004	40.553
Lance Armstrong	2003	40.94
Lance Armstrong	2002	39.93
Lance Armstrong	2001	40.02
Lance Armstrong	2000	38.57

H.O.T. Problems

EXTRAPRACTICE

See pages 668, 697.

Math 🐨 🗐 🔤

Self-Check Quiz at

tx.msmath1.com

29. OPEN ENDED Select three different decimals that round to 10.0 when rounded to the nearest tenth.

CONTENTS

30. Which One Doesn't Belong? Identify the decimal that does not belong with the other three. Explain your reasoning.





- **31. CHALLENGE** A number rounded to the nearest tenth is 6.1. The same number rounded to the nearest hundredth is 6.08 and rounded to the nearest thousandth is 6.083. Draw a conclusion as to what the original number could be.
- 32. **SELECT A TECHNIQUE** On four different days of walking on a treadmill, Mansi burned 149.6, 150.1, 150.4, and 149.8 Calories. Which of the following techniques might Mansi use to find the average number of Calories she burned to the nearest whole number over those four days? Justify your selection. Then use the technique to solve the problem.



33. **WRITING IN MATH** Draw a number line to show why 3.47 rounded to the nearest tenth is 3.5. Write a sentence explaining your reasoning.

PRACTICE

34. The atomic masses of certain elements are given in the table.

Element	Atomic Masses		
Sodium	22.9898		
Neon	20.180		
Magnesium	24.305		

Source: webelements com

What is the atomic mass of sodium to the nearest tenth?

A	22.98	С	23.0
В	22.99	D	23.1

- 35. On July 28, 1976, a Lockheed SR–71A set the record for jet speed at 2,193.167 miles per hour. What is this speed rounded to the nearest mile per hour?
 - **F** 2,190
 - **G** 2,192
 - H 2,193
 - J 2,194

Spiral Review

Use >, <, or = to compare each pair of decimals. (Lesson 3-2) **36.** 8.64 • 8.065

37. 2.5038 • 25.083

38. 12.004 • 12.042

149

- **39.** Write *thirty-two and five hundredths* in standard form. (Lesson 3-1)
- 40. **ZOOS** Admission to the San Diego Zoo is \$21 for adults and \$14 for children. Define variables and write an expression to find the total cost of 2 adult tickets and 3 children's tickets. Then, find the value of the expression. (Lesson 1-4)

GET READY fo	r the Next Lesson		
PREREQUISITE SK	LL Add or subtract. (Page 657)	
41 . 43 + 15	42 . 68 + 37	43 . 85 – 23	44 . 52 - 29
1+ 			
			Lesson 3-3 Rounding Decir

Mid-Chapter Quiz

Lessons 3-1 through 3-3

Write each decimal in word form. (Lesson 3-1)

- **1**. 0.6
- **2**. 12.65

CHAPTER

- **3**. 3.0091
- 4. 0.25

Write each decimal in standard form and in expanded form. (Lesson 3-1)

- 5. four tenths
- 6. fifteen and seventy-two hundredths
- 7. thirty-five ten-thousandths
- 8. **SKIING** Bianca's speed while crosscountry skiing was 2.5 miles per hour. Write this number in two other forms. (Lesson 3-1)

Use >, <, or = to compare each pair of decimals. (Lesson 3-2)

- **9**. 0.06 0.6
- **10**. 8.04 **•** 8.0004
- 11. 6.3232 6.3202
- **12**. 2.15 2.150
- **13. ANIMALS** The table shows the length of two of the smallest animals. Which animal is smaller? (Lesson 3-2)

Animal	Length (inches)			
Brazilian Frog	0.33			
Dwarf Goby Fish 0.30				
Services The Marid Almones for Kide				

Source: The World Almanac for Kids

Order each set of decimals from least to greatest. (Lesson 3-2)

14. 8.2, 8.02, 8.025, 8.225

15. 0.101, 0.0101, 0.011, 1.00001

16. 0.002, 0.09, 0.2, 0.19

17. **TEST PRACTICE** The finish times for runners in a relay race are shown in the table. Which of the following is the order of the times from least to greatest? (Lesson 3-2)

Runner	Finish Time (s)		
1	32.02		
2	31.95		
3	32.2004		
4	32.0029		

- A 32.2004, 32.02, 32.0029, 31.95
- **B** 32.02, 32.0029, 32.2004, 31.95
- C 31.95, 32.0029, 32.02, 32.2004
- **D** 31.95, 32.2004, 32.0029, 32.02
- **TEST PRACTICE** Ruben recorded the lengths of his model airplanes in inches. Which list shows the lengths in order from greatest to least? (Lesson 3-2)
 - F 7.2, 7.35, 8.01, 8.10
 - G 7.35, 7.2, 8.01, 8.10
 - H 8.01, 8.10, 7.2, 7.35
 - J 8.10, 8.01, 7.35, 7.2

Round each decimal to the indicated placevalue position. (Lesson 3-3)

- **19**. 8.236; tenths
- **20**. 10.0879; thousandths
- **21**. 2.38141; ten-thousandths
- **22**. 7.84; ones
- 23. **SPIDERS** The *Tegenaria atrica* spider can travel at a speed of 20.592 inches per second. What is the speed rounded to the nearest tenth? (Lesson 3-3)
- 24. **GASOLINE** To the nearest cent, what would you pay for a gallon of gasoline that costs \$2.239? (Lesson 3-3)

READING Word Problems

Estimating Answers

When you have a math problem to solve, don't automatically reach for your paper and pencil. Look for key words like *about* or *approximate* that let you know you just need an estimate.



PRACTICE

Determine whether you need an estimate or exact answer to solve each problem. Explain your reasoning. Then solve the problem.

CONTENTS

 Mario collected donations for the American Red Cross at school. He kept a record of the donations in a notebook.

Donations			
Monday	\$92.33		
Tuesday	\$107.08		
Wednesday	\$75.98		
Thursday	\$63.01		
Friday	\$111.64		

About how much money will Mario collect the following week if he expects those donations to double?

2. Suppose you want to buy a drum set for \$359 and drum cases for \$49. You've already saved \$259 toward buying these items. How much more money do you need? **3.** A group of students at Centerville Middle School were surveyed on how they get to school.



According to the graph, what is the approximate difference between the most popular way to get to school and the least popular?

Estimating Sums and Differences

Main IDEA

Estimate sums and differences of decimals.

Targete The stu subtrac

Targeted TEKS 6.2

The student adds, subtracts, multiplies, and divides to solve

problems and justify solutions. (B) Use addition and subtraction to solve problems involving fractions and decimals. (D) Estimate and round to approximate reasonable results and to solve problems where exact answers are not required.

NEW Vocabulary

clustering front-end estimation

Using Estimation

There is no one correct answer when estimating. To estimate means to find an approximate value. However, reasonableness is important.

GET READY for the Lesson

TRAVEL The graph shows about how many passengers travel through the busiest United States airports.

- 1. Round each number to the nearest million.
- 2. About how many more people travel through Chicago O'Hare than Denver?





To estimate sums and differences of decimals, you can use the same methods you used for whole numbers.

EXAMPLES Use Estimation to Solve Problems

Estimate the total number of passengers that travel through Dallas-Fort Worth and Los Angeles.

Round each number to the nearest ten for easier adding.

 $53.3 \rightarrow 50 \quad 53.3 \text{ rounds to } 50.$ $+ 55.0 \rightarrow + 60 \quad 55.0 \text{ rounds to } 60.$ 110

About 110 million passengers travel through these two airports.

Estimate how many more passengers travel through Hartsfield-Atlanta than through Chicago O'Hare.

About 10 million more passengers travel through Hartsfield-Atlanta.

CHECK Your Progress

- a. Estimate the sum of 4.37 and 6.75 using rounding.
- **b.** Estimate the difference of 42.18 and 17.25 using rounding.



When estimating a sum in which all of the addends are close to the same number, you can use **clustering**.

TEST EXAMPLE

Julia works at a grocery store a few hours each week. The table shows the number of hours she worked in four months. Which is the closest to the number of hours Julia worked?

- A 210 hours
- **B** 280 hours
- C 350 hours
- D 420 hours

Julia's Hours			
Month Hours Worked			
May	72.50		
June 68.50			
July	69.75		
August	71.75		

Test-Taking Tip

Clustering Clustering is good for problems in which the addends are close together.

Read the Test Item

The addends are clustered around 70. Round each decimal to 70.

 $\begin{array}{rrrr} 72.50 &\rightarrow & 70 \\ 68.50 &\rightarrow & 70 \\ 69.75 &\rightarrow & 70 \\ 71.75 &\rightarrow & 70 \end{array}$

Solve the Test Item

Multiplication is repeated addition. So, a good estimate of the number of hours Julia worked in the four months is 4×70 , or 280. The answer is B.

CHECK Your Progress

- c. The table shows the number of miles Jaime ran last week. Estimate the total number of miles Jaime ran last week.
 - **F** 10 miles
 - G 15 miles
 - H 20 miles
 - J 25 miles

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CONTENTS

Another type of estimation is front-end estimation. When you use **front-end estimation**, add or subtract the values of the digits in the front place or left-most place-value. Front-end estimation usually gives a sum or difference less than the actual sum or difference.

Extra Examples at tx.msmath1.com



Lesson 3-4 Estimating Sums and Differences 153



Estimation You can still use front-end estimation when the addends have a different number of digits. For example, to estimate 113 + 42, add the values in both the hundreds and tens place. So, an estimate of 113 + 42 is 110 + 40 or 150.



4 Estimate 34.6 + 55.3 using front-end estimation.

Using front-end estimation, 34.6 + 55.3 is about 80.0.



Estimate using front-end estimation.

d. 22.35 - 11.14

e. \$47.92 - \$21.62

CONCE	PT Summary	Estimation Methods		
Rounding	Estimate by rounding each decimal t number that is easy for you to add o	o the nearest whole r subtract mentally.		
Clustering	Estimate by rounding a group of close addends to the same number before adding.			
Front-End Estimation	Estimate by adding or subtracting the the front place.	e values of the digits in		

CHECK Your Understanding

5. 5.32 + 4.78 + 5.42

Example 1	Estimate each sum using rounding.				
(p. 152)	1. 0.36 + 0.83	2 . 15.24 + 32.10			
Example 2	Estimate each difference using rounding.				
(p. 152)	3. 4.44 - 2.79	4 . 57.05 - 23.82			
Example 3	Estimate using clustering.				
(p. 153)					

7. **TEST PRACTICE** The amount Omar was charged for four phone calls is listed in the table.

6. 0.95 + 0.79 + 1.02

		Phone Calls					
		Minutes	Minutes 8.7 9.1 9.0 8.9				
		Amount (\$)	1.04	1.09	1.08	1.07	1
Which is the closest to the total cost of the phone calls?A \$3B \$4C \$5D \$36							
Example 4 (p. 154)	Estimate using front-end estimation. 8. 179.4 + 513.8 9. \$442.50 - \$126.73					126.73	

CONTENTS

154 Chapter 3 Adding and Subtracting Decimals

Exercises

HOMEWORKHELP		
For Exercises	See Examples	
10–17	1, 2	
18–23, 37, 38	3	
24–29	4	

Estimate using rounding.

10 . 49.59 + 16.22	11. 33.15 + 86.85	12 . 41.59 - 19.72
13 . 62.61 - 13.05	14. 2.33 + 4.88 + 5.5	15 . 9.05 + 1.42 + 6.79

16. **SHOPPING** Sandra bought a pair of shoes for \$24.75 and a dress for \$46.55. About how much did Sandra spend on the shoes and dress?

••17. **RECYCLING** Two classes are recycling paper. If one class earns \$16.52 and a second class earns \$28.80, about how much more did the second class earn?

Estimate using clustering.

18.	6.99 + 6.59 + 7.02 + 7.44	19 . \$3.33 + \$3.45 + \$2.78 + \$2.99
20.	5.45 + 5.3948 + 4.7999	21 . \$55.49 + \$54.99 + \$55.33
22.	10.33 + 10.45 + 10.89 + 9.79	23 . 99.8 + 100.2 + 99.5 + 100.4

Estimate using front-end estimation.

24 . 75.45 - 15.23	25 . 27.9 - 12.5	26 . 28.65 + 71.53
27 . 124.8 + 264.9	28 . \$315.65 + \$130.42	29. \$50.96 + \$19.28

- **30. MUSIC** The best-selling artist has sold 168.5 million albums. About how many more albums will need to be sold to reach 175 million?
- **31. TUNNELS** The Flathead rail tunnel in Montana is 7.78 miles long. Colorado's Moffat rail tunnel is 6.21 miles long. About how much longer is the Flathead rail tunnel than the Moffat rail tunnel using rounding? If you use front-end estimation, would the estimate be the same? Why or why not?

ANALYZE GRAPHS For Exercises 32 and 33,

- 32. Use clustering to estimate the mean ticket cost for one Houston Astros game, Atlanta Braves game, and **Texas Rangers**
- **33**. If the average price for a soda and hot dog at a New York

2004 Major League Baseball Ticket Prices





Yankees game is \$5.75, about how much would a family pay for four tickets, four sodas and four hot dogs?

CONTENTS



Real-World Link Approximately one ton of recycled paper saves 17 trees. Source: resourceful-schools.org

use the graph.

game.





- **H.O.T.** Problems.... 34. NUMBER SENSE Explain how you know that the sum of 5.4, 6.3, and 9.6 is greater than 20.
 - **35. CHALLENGE** Five same-priced items are purchased. Based on rounding, the estimate of the total was \$15. Decide what the maximum and minimum price of the item could be.
 - **36. WRITING IN** MATH Explain how you would estimate 1.843 0.328.

PRACTICE

37. A school lunch menu is shown.



Estimate how much money you will need to buy a slice of pizza, a taco, and a soda.

- **A** A little less than \$2
- **B** A little more than \$2
- C A little more than \$3
- **D** A little less than \$3

38. Refer to the table.

Year	Acres Burned in Wildfires (millions)
2004	6.8
2000	8.4
1996	6.7
1988	7.4
1969	6.7
1969	0.7

Source: nifc.gov

Which is the best estimate for the total number of acres of land burned by wildfires?

- F 25 million
- G 35 million
- H 45 million
- J 55 million

.....



- **39. WEATHER** Washington, D.C., has an average annual precipitation of 35.86 inches. Round this amount to the nearest tenth. (Lesson 3-3)
- 40. **ANALYZE TABLES** The table at the right lists five elements in the periodic table. List them in order from least to greatest according to their atomic masses. (Lesson 3-2)

Elements of the Periodic Table		
Element	Symbol	Atomic Mass
Argon	Ar	39.948
Calcium	Ca	40.078
Chlorine	Cl	35.453
Potassium	K	39.0983
Titanium	Ti	47.867
Source: The Time Almanac		

44. 1,252 - 79



41.	278	42 . 1,297	43.	700
<u>+</u>	- 199	+ 86	Ξ	- 235



Math Lab Adding and Subtracting Decimals Using Models

Main IDEA

Use models to add and subtract decimals.

Explore

Targeted TEKS 6.12 The student communicates about Grade 6 mathematics through informal and mathematical language, representations, and models. (A) Communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models. Decimal models can be used to add and subtract decimals.



ANALYZE THE RESULTS

CONTENTS

- 1. Explain how you can use grid paper to model 0.8 0.37.
- 2. **MAKE A CONJECTURE** Write a rule you can use to add or subtract decimals without using models.

Explore 3-5 Math Lab: Adding and Subtracting Decimals Using Models 157

Adding and Subtracting Decimals

Main IDEA

Add and subtract decimals.



Targeted TEKS 6.2 The student adds,

subtracts, multiplies, and divides to solve problems and justify solutions. (B) Use addition and subtraction to solve problems involving fractions and decimals.

READING Math

Approximation Symbol The symbol \approx is read *is approximately equal to* or *is about equal to*.

GET READY for the Lesson

SOFT DRINKS The table shows the top five consumers of carbonated soft drinks.

- 1. Estimate the sum of the top two countries.
- 2. Add the digits in the same place-value position for the top two countries.
- **3**. Compare the estimate with the actual sum. Place the decimal point in the sum.
- 4. Make a conjecture about how to add decimals.



To add or subtract decimals, add or subtract digits in the same placevalue position. Line up the decimal points before you add or subtract.

EXAMPLES Add and Subtract Decimals

Find the sum of 23.1 and 5.8. **Estimate** 23.1 + 5.8 ≈ 23 + 6 or 29 ◄ Compare the answer to Line up the decimal points. 23.1 the estimate. Since 28.9 +5.8is close to 29, the answer 28.9 Add as with whole numbers. is reasonable. The sum of 23.1 and 5.8 is 28.9. 2 Find 5.774 — 2.371. **Estimate** $5.774 - 2.371 \approx 6 - 2$ or 4 5.774 Line up the decimal points. -2.3713.403 Subtract as with whole numbers. So, 5.774 - 2.371 = 3.403. Check for Reasonableness $3.403 \approx 4$ V CHECK Your Progress Find each sum or difference. a. 54.7 + 21.4 **b.** 14 + 23.5c. 17.3 + 33.5**d**. 9.543 - 3.67 **e**. 18.4 − 12.9 f. 50.62 - 39.81



Sometimes it is necessary to annex zeros before you subtract.





How Does a Personal Trainer Use Math? Personal trainers use math to analyze records of time improvements for their clients.



For more information, go to tx.msmath1.com.

Real-World EXAMPLE

SWIMMING The table shows the top three times for the women's 100-meter butterfly event in the 2004 Summer Olympics. What is the difference between Petria Thomas' time and Inge de Bruijn's time?

Women's 100-Meter Butterfly			
Swimmer Country Time (s)			
Petria Thomas	Australia	57.72	
Otylia Jedrzejczak	Poland	57.84	
Inge de Bruijn	Netherlands	57.99	

Source: athens2004.com

Estimate $57.99 - 57.72 \approx 58 - 58$ or 0

57.99 Line up the decimal points.

- 57.72

0.27 Subtract as with whole numbers.

So, the difference between Petria Thomas' time and Inge de Bruijn's time is 0.27 second. Check for Reasonableness $0.27 \approx 0 \checkmark$

CHECK Your Progress

j. **BONES** The table shows the average length of the three longest bones in the human body. How much longer is the average femur than the average tibia?

Longest Bones in the Human Body		
Bone Length (in.		
Femur (upper leg)	19.88	
Tibia (inner lower leg)	16.94	
Fibula (outer lower leg)	15.94	

Source: The Top 10 of Everything

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CONTENTS

Extra Examples at tx.msmath1.com

You can also use decimals to evaluate algebraic expressions.

EXAMPLE Evaluate an Expression **ALGEBRA** Evaluate x + y if x = 2.85 and y = 17.975. x + y = 2.85 + 17.975 Replace x with 2.85 and y with 17.975. Estimate $2.85 + 17.975 \approx 3 + 18$ or 21 2.850 Line up the decimal points. Annex a zero. $\frac{+17.975}{20.825}$ Add as with whole numbers. The value is 20.825. Check for Reasonableness $20.825 \approx 21$ V **Example 2.56** and b = 28.96. k. 3.23 + a 1. 68.96 - b m. b - a



Example 2 (p. 158)	Find each difference. 4 . 0.40 - 0.20	5 . 9.67 – 2.35	6 . 42.28 - 1.52
Example 3	Find each difference.		
(p. 159)	7. $8 - 5.78$	8 . 15 - 6.24	9. $36 - 7.3$

- (p. 159) 10. **ANALYZE TABLES** Use the table to find out how many more students per teacher there are in California than in Nevada.
 - 11. **MAGAZINES** In a recent year, *National Geographic* had an average paid circulation of 6.6 million magazines, and *Time* had an average paid circulation of 4.1 million magazines. What is the difference in circulation of these two magazines?

Students-per- Teacher Ratio	
State	Ratio
Washington	19.2
Oregon 20.4	
Nevada	18.4
California 20.7	

Source: The World Almanac

Example 5 12. ALGEBRA Evaluate s - t if s = 8 and t = 4.25. (p. 160)



Exercises

HOMEWORKHELP		
For Exercises	See Examples	
13–18	1	
19–24	2, 3	
25, 26	4	
27–30	5	

Find each sum.

 13. 7.2 + 9.5 16. 0.796 + 13 	 14. 4.9 + 3.0 17. 54.5 + 48.51 	15 . 1.34 + 2 18 . 15.63 + 24.36
Find each difference.		
19 . 5.6 - 3.5	20 . 19.86 - 4.94	21 . 97 - 16.98
22 . 82 - 67.18	23 . 58.67 - 28.72	24 . 14.39 - 12.16

25. RODEO The table shows the top three finishers in barrel racing at the 2004 Pasadena Livestock Show and Rodeo. What is the time difference between first place and second place?



26. MONEY How much change would you receive if you gave a cashier \$20 for a purchase that costs \$18.74?

ALGEBRA Evaluate each expression if a = 128.9 and d = 22.035.

	27 . <i>a</i> - 11.25	28. 75 + a	29 . <i>a</i> – <i>d</i>	30 . <i>d</i> + <i>a</i>
--	------------------------------	-------------------	---------------------------------	---------------------------------

Find the value of each expression.

31 . 2 • 6 + 0.073	32 . 3.4 + 5 • 3	33. 6 - 4.304 + 2.5
34. $11.8 - 2^2$	35 . 8 + 6.3 - 3.9	36. $4^2 - 1.67$

- **37. POPULATION** If the world's population is 6.3 billion people and grows by 2.6 billion by 2050, how many people will there be in 2050?
- **38. ANALYZE TABLES** The table shows the top five color choices for sport compact cars. How many more people per 100 chose the top three colors than the last two? Do you believe that the colors chosen from year to year would be the same? Explain your reasoning.

Favorite Color Choices for Sport Compact Cars			
Color	Average Number of People per 100		
Silver	20.1		
Black	13.6		
Med./Dk. Gray	11.9		
Med./Dk. Blue	11.1		
Med. Red	9.2		

39. FIND THE DATA Refer to the Texas Data File on pages 16–19. Choose some data and write a real-life problem in

which you would add more than two decimals.

CONTENTS

40. SHOPPING You have \$10 to buy art supplies. Can you buy construction paper that costs \$2.69, a glue stick that costs \$1.59, and markers that cost \$5.15? Explain your reasoning.



Source: infoplease com

H.O.T. Problems

- **41. CHALLENGE** Arrange the digits 1, 2, 3, 4, 5, 6, 7, and 8 into two decimals so that their difference is as close to 0 as possible. Use each digit once.
- 42. **REASONING** Find a counterexample for the following statement.

If two decimals each have their last nonzero digit in the hundredths place, their sum also has its last nonzero digit in the hundredths place.

43. FIND THE ERROR Toby and Akiko are finding 8.9 – 3.72. Who is correct? Explain your reasoning.



44. **WRITING IN MATH** Explain how you would find the difference of 3 and 2.89.

PRACTICE

- 45. Jamal took \$15.00 to spend at a sports card store. Baseball cards cost \$1.75 per pack, and hockey cards cost \$0.99 per pack. If Jamal buys 6 packs of baseball cards for \$10.50, how can he determine how much money he has left to spend on hockey cards?
 - A Subtract \$10.50 from \$15.00
 - **B** Add \$1.75 and \$0.99
 - C Subtract \$0.99 from \$1.75
 - **D** Add \$0.99 and \$10.50

Spiral Review

Estimate. (Lesson 3-4)

47. 4.231 + 3.98

48. 3.945 + 1.92 + 3.55 **49.** 9.345 - 6.625

How many more inches of rain did

Indianapolis receive than Houston?

46. GRIDDABLE The table lists the

cities in a 24-hour period.

City

Indianapolis, IN

Source: The World Almanac

Houston, TX

Jackson, MS

Fresno, CA

greatest amount of rain for certain

Rainfall

(inches)

5.67

7.31

8.50

1.13

50. Round 28.561 to the nearest tenth. (Lesson 3-3)

GET READY for the Next Lesson

51. PREREQUISITE SKILLS In a recent year, there were 45,033 beagles registered with the American Kennel Club. In the same year, there were 32,176 poodles registered. Find the total number of registered beagles and poodles. Use the four-step plan. (Lesson 1-1)



Problem-Solving Investigation

MAIN IDEA: Solve problems by working backward.

Targeted TEKS 6.11 The student applies Grade 6 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(C) Select or develop an appropriate problem-solving strategy from a variety of different types, including . . . working backwards to solve a problem.** *Also addresses TEKS 6.11(B).*

P.S.I. TERM 🕂

3-6

eMail: WORK BACKWARD

YOUR MISSION: Solve the problem by working backward.

THE PROBLEM: How many pink squares are there on the board game?

PACO: I have some clues about the squares on my favorite board game. They are listed below.

EXPLORE	You know the number of gray squares. You need to find the number of pink	1
	squares.	
	 The squares on the game board are pink, dark blue, light blue, red or gray. 	
	There are 8 more light blue than pink.	
	 There are twice as many light blue as dark blue. 	
	There are 6 times as many red as dark blue.	
	There are 28 fewer red than gray.	
	 There are 100 gray squares on the board. 	
PLAN	Start at the last clue and reverse the clues.	
SOLVE	$100 - 28 = 72 \longrightarrow$ number of red squares	
	$72 \div 6 = 12 \longrightarrow$ number of dark blue squares	
	$12 \times 2 = 24 \longrightarrow$ number of light blue squares	
	$24 - 8 = 16 \longrightarrow$ number of pink squares	
CHECK	Look at the clues. Start with 16 pink squares and follow the clues to be sure you	
	end with 100 gray squares.	1
		100
		00

Analyze The Strategy

- 1. Compare and contrast the words from the game clues with the operations Paco used to find the number of pink squares.
- 2. **WRITING IN MATH** Explain how using the work backward strategy helped Paco find the number of pink squares.

Mixed Problem Soluing

For Exercises 3–5, solve using the *work backward* strategy.

- 3. **NUMBER SENSE** A number is divided by 5. Next, 4 is subtracted from the quotient. Then, 6 is added to the difference. If the result is 10, what is the number?
- 4. **TIME** Marta and Scott volunteer at the food bank at 9:00 A.M. on Saturdays. It takes 30 minutes to get from Scott's house to the food bank. It takes Marta 15 minutes to get to Scott's house. If it takes Marta 45 minutes to get ready in the morning, what is the latest time she should get up?
- 5. **NUMBER SENSE** A number is multiplied by 4, and then 6 is added to the product. The result is 18. What is the number?

Use any strategy to solve Exercises 6–9. Some strategies are shown below.



6. **ROLLER COASTERS** The list shows how many times each of 20 students rode a roller coaster at an amusement park one day.

	Nu	mber	of Th	mes F	Rode I	Roller	Coas	ster	
5	10	0	12	8	7	2	6	4	1
0	14	3	11	5	9	13	8	6	3

How many more students rode a roller coaster 5 to 9 times than 10 to 14 times?

7. **MONEY** Chet has \$4.50 in change after purchasing a skateboard for \$62.50 and a helmet for \$32. How much money did Chet have originally?

- 8. **NUMBER SENSE** What is the least positive number that you can divide by 7 and get a remainder of 4, divide by 8 and get a remainder of 5, and divide by 9 and get a remainder of 6?
- **9. CABLE** In 1977, there were 12,168,450 cable television subscribers. By 2003, there were 73,365,880 subscribers. How many more cable television subscribers were there in 2003 than in 1977?

Select the Operation

For Exercises 10–13, select the appropriate operation(s) to solve the problem. Justify your selection(s) and solve the problem.

- **10. COMETS** Halley's comet is visible from Earth approximately every 76 years. If the next scheduled appearance is in 2062, when was the last visit by Halley's comet?
- 11. **RECIPES** A fruit punch recipe calls for 8 cups of orange juice. If there are 4 cups in one quart, how many quarts of juice are needed for the recipe?
- 12. MONEY You have \$100.75 in your checking account. You write checks for \$21.78 and \$7.08. Then you deposit \$43. What is your new balance?
- **13. PARKING** The diagram shows the number of parking spaces available in several different parking lots on a college campus. Find the mean number of parking spaces available in each lot.



Study Guide and Review

GET READY to Study



Download Vocabulary Review from tx.msmath1.com

OLDABLES

CHAPTER

Be sure the following Key Concepts are noted in your Foldable.



Key Concepts

Rounding Decimals (Lesson 3-3)

First underline the digit to be rounded. Then look at the digit to the right of the place being rounded.

- If the digit is 4 or less, the underlined digit remains the same.
- If the digit is 5 or greater, add 1 to the underlined digit.

Estimation (Lesson 3-4)

Rounding:

Estimate by rounding each decimal to the nearest whole number that is easy for you to add or subtract mentally.

Clustering:

Estimate by rounding a group of close numbers to the same number.

• Front-End Estimation: Estimate by adding or subtracting the values of the digits in the front place or left-most place-value.

Adding and Subtracting Decimals (Lesson 3-5)

- To add decimals, line up the decimal points then add as with whole numbers.
- To subtract decimals, line up the decimal points, annex zeros if needed, and then subtract as with whole numbers.

Key Vocabulary

clustering (p. 153) equivalent decimals (p. 143) expanded form (p. 139) front-end estimation (p. 153) standard form (p. 139)

Vocabulary Check

State whether each sentence is *true* or *false*. If *false*, replace the underlined word or number to make a true sentence.

- 1. <u>Standard form</u> is a sum of the products of each digit and its place value.
- 2. Decimals that name the same number are called <u>equivalent decimals</u>.
- 3. In 643.082, the digit 2 names the number two <u>hundredths</u>.
- 4. *Seven hundred and nine thousandths* written as a decimal is <u>0.079</u>.
- Estimation in which all of the decimals are close to the same number is called <u>front-end estimation</u>.
- 6. The number 3.014 is <u>greater</u> than 3.0014.
- **7**. The number 245 written in expanded form is <u>two hundred forty five</u>.
- 8. The number 1.0487 rounded to the nearest hundredth is <u>1.049</u>.
- **9**. The symbol > means <u>less than</u>.
- **10**. <u>Clustering</u> can be used to estimate the sum of 119.3, 122.7, 118.9, 121.4, and 123.2 by rounding each number to 120 and multiplying 120 by 5.

Vocabulary Review at tx.msmath1.com



3-1

3-2

Lesson-by-Lesson Review

Representing Decimals (pp. 138–141) Write each decimal in standard form and Example 1 Write 21.62 in word form. in expanded form. 21.62 is twenty-one and sixty-two 11. thirteen hundredths hundredths. 12. six and five tenths **Example 2** Write three hundred forty-13. eighty-three and five thousandths six thousandths in standard form and in expanded form. 14. **GARDENING** A giant pumpkin weighed fifty-three and one hundred Standard form: 0.346 seventy-five thousandths pounds. Expanded form: Write this weight in standard $(3 \times 0.1) + (4 \times 0.01) + (6 \times 0.001)$ form.

Comparing and Ordering Decimals (pp. 142–145)

Use >, <, or = to compare each pair of decimals.

15.	0.35 • 0.3	16.	6.024 • 6.204
17.	0.10 • 0.1	18.	8.34 • 9.3

19. GEOGRAPHY In Texas, the land area of Cottle County is 901.59 square miles. Crosby County has a land area of 901.69 square miles. Which has the greater land area?

Order each set of decimals from least to greatest.

20. 9.501, 0.9051, 90.51, 0.0951

21. 7.403, 0.0743, 7.743, 74.43

Order each set of decimals from greatest to least.

- **22**. 0.314, 3.14, 0.0341, 34.1
- **23**. 22.56, 2.265, 0.226, 2.562
- 24. MONEY The cost of four items on a menu are \$9, \$0.99, \$9.99, and \$19.99. Order these costs from least to greatest.

Example 3 Use <, >, or = to compare 4.153 and 4.159.

- 4.15<u>3</u> Line up the decimal points.
- 4.159Starting at the left, find the first place the digits differ.
- Since 3 < 9, 4.153 < 4.159.

Example 4 Order 17.89, 0.17, 1.879, 10.789 from least to greatest.

17.89	\longrightarrow	17.890	Line up the decimal
0.17	\longrightarrow	0.170	points and annex
1.879	\longrightarrow	1.879	the same number of
10.789	\longrightarrow	10.789	decimal places.

Starting at the left, use place value to compare the decimals.

The order from least to greatest is 0.17, 1.879, 10.789, and 17.89.



3-3

3-4

Rounding Decimals (pp. 146–149)

Round each decimal to the indicated place-value position.

- **25**. 5.031; hundredths
- **26**. 0.00042; ten-thousandths
- 27. 2.29; tenths
- **28. AREA** The area of Long Beach, California, is 50.4 square miles. Round 50.4 to the nearest square mile.
- **29. FOOD COSTS** A box of cereal costs \$0.216 per ounce. Round this price to the nearest cent.

Example 5 Round 8.0314 to the hundredths place.

- 8.0<u>3</u>14 Underline the digit to be rounded.
- 8.0314 Then look at the digit to the right. ↑ Since 1 is less than 5, the digit 3 stays the same.

So, 8.0314 rounds to 8.03.

Example 6 Round 67.87 to the nearest whole number.

- 67.87 Underline the digit to be rounded.
- 67.87 Then look at the digit to the right. ↑ Since 8 is greater than 5, add one to the underlined digit.

So, 67.87 rounds to 68.

Estimating Sums and Differences (pp. 152–156)

Estimate using rounding.

30.	37.82 + 14.24	31.	\$72.18 - \$29.93
32.	6.8 + 4.2 + 3.5	33.	129.6 - 9.7

Estimate using clustering.

34. 12.045 + 11.81 + 12.3 + 11.56 **35.** \$6.45 + \$5.88 + \$5.61 + \$6.03

Estimate using front-end estimation.

36.	31.29	37.	93.65
	+58.07		- 62.13
38.	145.91 + 131.65	39.	87.25 - 63.97

40. SHOPPING Jodie buys a sweater for \$24.35, a bracelet for \$17.62, and a pair of earrings for \$11.19. If she uses front-end estimation to estimate the sum of her purchases, about how much does she spend?

CONTENTS

Example 7 Estimate 38.61 – 14.25 using rounding.

38.61 →	39	Round to the nearest
$-14.25 \rightarrow$	<u>- 14</u>	whole number.
	25	

Example 8 Estimate 8.12 + 7.65 + 8.31 + 8.08 using clustering.

All addends of the sum are close to 8. So, an estimate is 4×8 or 32.

Example 9 Estimate 24.6 + 35.1 using front-end estimation.

24.6 + 35.1 Add the front digits to get 5. An estimate is 50.





-5	Adding and Subtracting Decimals (pp. 158–162)						
	Fin	d each sun	n or difference.				
	41.	18.35 + 23.61	42. 148.93 <u>- 121.36</u>				
	43.	1.325 + 0.081	44 . 248 – 131.28				
	45		n Rockon drovo 11.2 miles				

- **45. TRAVEL** Mr. Becker drove 11.3 miles to the dentist, 7.5 miles to the library, and 5.8 miles back home. How far did he travel?
- **46. MONEY** Coral has \$40 to buy a backpack. If the backpack costs \$35.99, how much money will she have left?

Example 10 Find the sum of 48.23 and 11.65.

Estimate	$48.23 + 11.65 \approx 48 + 12 = 60$
48.23	Line up the decimals.
+ 11.65	Add as with whole numbers.
59.88	
T 71	. 50.00

The sum is 59.88. **Check for Reasonableness** $55.88 \approx 60$ \checkmark

Example 11 Find the difference between 57.68 and 34.64.

Estimate	57.68 – 34.64 ≈	25
57.68	Line up the deci	mals.
- 34.64	Subtract as with	whole numbers.
23.04		
The diffe	erence is 25.14.	
Check for	Reasonableness	25.14 ≈ 25 🖌

3-6 PSI: Work Backward (pp. 163–164)

Solve. Use the *work backward* strategy.

- **47. TIME** After school, Lynn watched TV for half an hour, played basketball for 45 minutes, and studied for an hour. If it is now 7:00 P.M., when did Lynn come home from school?
- **48. BASEBALL** Neil has four less than twice the number of baseball cards Marcus has. Neil has 156 baseball cards. How many baseball cards does Marcus have?
- **49. HEIGHT** Fernando is 2 inches taller than Jason. Jason is 1.5 inches shorter than Deirdre and 1 inch taller than Nicole. Hao, who is 5 feet 10 inches tall, is 2.5 inches taller than Fernando. How tall is each student?

Example 12 A number is divided by 2. Then 5 is added to the quotient. After subtracting 7, the result is 28. What is the number?

Start with the final value and perform the opposite operation with each resulting value until you arrive at the starting value.

28 + 7 = 35 Undo subtracting 7. 35 - 5 = 30 Undo adding 5. $30 \cdot 2 = 60$ Undo dividing by 2. The number is 60

The number is 60.





Write each decimal in word form.

1. 0.07 **2.** 8.051 **3.** 43.43

Write each decimal in standard form and in expanded form.

4. six tenths

CHAPTER

- 5. two and twenty-one thousandths
- 6. eighty-one and nine hundredths
- **7. SCIENCE** The mass of a particular chemical sample is given as 4.0023 grams. Write the mass in word form.

Use >, <, or = to compare each pair of decimals.

8.	0.05 • 0.50	9 . 4.888 ● 4.880
10.	2.03 • 2.030	11 . 7.960 ● 7.906

12. TEST PRACTICE Dion recorded the daily high temperatures for Phoenix, Arizona, over five days in the table below.

Day	Temperature (°F)
Monday	109.8
Tuesday	108.9
Wednesday	111.08
Thursday	108.92
Friday	111.0

Which of the following shows the daily high temperatures in order from least to greatest?

- A 108.9°F, 108.92°F, 109.8°F, 111.0°F, 111.08°F
- **B** 108.92°F, 108.9°F, 109.8°F, 111.0°F, 111.08°F
- C 108.9°F, 108.92°F, 109.8°F, 111.08°F, 111.0°F
- **D** 108.92°F, 108.9°F, 109.8°F, 111.08°F, 111.0°F

Round each decimal to the indicated place-value position.

- **13**. 2.059; hundredths
- 14. 27.35; tens
- 15. 4.86273; ten-thousandths
- **16**. 3.4556; thousandths
- CURRENCY On July 21, 2005, one U.S. dollar was equal to 0.825606 Euro. Round this exchange rate to the nearest hundredth.

Estimate each sum or difference using the indicated method.

- **18**. 38.23 + 11.84; rounding
- **19**. \$75.38 \$22.04; front-end estimation
- **20**. 6.72 + 7.09 + 6.6; clustering
- 21. TEST PRACTICE Which of the following is the most reasonable total amount for the items purchased?
 F \$17
 G \$20

School Supplies		
Pens	\$2.09	
Ruler	\$0.99	
Paper	\$1.49	
Book	\$14.99	
Candy	\$0.49	
Glue	\$0.89	
Folder	\$1.19	
Erasers	\$1.99	
Pencils	\$1.87	

Find each sum or difference.

H \$26 I \$30

- **22.** 43.28 + 31.45 **23.** 392.802 173.521
- **24**. Evaluate the expression a + 17.31 b if a = 41.9 and b = 38.025.
- **25. SCIENCE** A bacteria doubles its population every 12 hours. After 3 days, there are 1,600 bacteria. How many bacteria were there at the beginning of the first day? Use the *work backward* strategy.

Texas Test Practice Cumulative, Chapters 1–3



CHAPTER

- Read each question. Then fill in the correct answer on the answer document provided by your teacher or on a sheet of paper.
- 1. Laura recorded the lengths of a litter of newborn puppies in inches. Which list shows the lengths in order from least to greatest?
 - A 8.42 in., 8.45 in., 8.9 in., 8.5 in., 8.64 in.
 - **B** 8.42 in., 8.45 in., 8.5 in., 8.64 in., 8.9 in.
 - C 8.9 in., 8.64 in., 8.5 in., 8.45 in., 8.42 in.
 - **D** 8.42 in., 8.45 in., 8.64 in., 8.5 in., 8.9 in.
- 2. The table below shows Mr. Coughlin's monthly heating bills for November through February. He estimated that the heating cost a total of \$800 over these four months. Which best describes his estimate?

Monthly Heating Bill		
Month Bill (\$)		
November	196.43	
December	214.89	
January	204.58	
February	222.76	

- **F** More than the actual amount because he rounded to the nearest \$10.
- **G** Less than the actual amount because he rounded to the nearest \$10.
- H More than the actual amount because he rounded to the nearest \$100.
- **J** Less than the actual amount because he rounded to the nearest \$100.
- 3. **GRIDDABLE** Before buying furniture, Sharon's mom had \$7,420.60 in her checkbook. After, the balance was \$4,684.90. How much did Sharon's mom spend on her shopping trip?

- 4. On Monday, 75 adults and 250 children visited the science museum. On Tuesday, 65 adults and 200 children visited the museum. The cost of an adult ticket is \$7.50 and \$5.25 for a child. Read the problem solving steps below. Arrange the steps in order to find how much money the museum took in on these two days. Which list shows the steps in the correct order?
 - Step K: Add the two products together.
 - Step L: Multiply the cost of an adult ticket by the number of adults.
 - Step M: Write down the number of adults and the number of children.
 - Step N: Multiply the cost of a child's ticket by the number of children.

A	L, K, M, N	C M, N, K, L
B	L, M, N, K	D M, N, L, K

5. The table shows the maximum speeds of winds in the U.S. for certain states. What is the mean of the data?

Place	Maximum Wind Speed (mph)
Atlanta, GA	60
Houston, TX	51
Miami, FL	86
Mobile, AL	63
New York, NY	40

Source: The World Almanac

F	46 mph	Η	60 mph
G	58 mph	J	86 mph

6. Zack plans on buying 4 shirts. The cost of each shirt ranges from \$19.99 to \$35.99. What would be a reasonable total cost for the shirts?

A	\$60	C	\$120
B	\$70	D	\$160

 Kenny recorded the heights of his tomato plants. Choose the group of numbers that lists the heights in order from least to greatest.

F 3.28 ft, 3.29 ft, 3.06 ft, 3.41 ft

G 4.15 ft, 4.10 ft, 4.10 ft, 4.01 ft

H 3.23 ft, 3.30 ft, 3.35 ft, 3.53 ft

- J 2.89 ft, 2.98 ft, 2.99 ft, 2.88 ft
- 8. Danielle purchased 4 concert tickets. Each ticket was on sale for \$5.95 off the original price. If the original price of each ticket was \$29.95, which equation can be used to find *t*, the total price of the 4 tickets Danielle purchased?

A
$$t = 4(5.95) - 4(29.95)$$

B
$$t = 29.95 - 5.95$$

C
$$t = 5.95 - 29.95$$

D t = 4(29.50) - 4(5.95)

TEST TAKING TIP

Question 8 Read the question carefully to check that you answered the question that was asked. In question 8, you are asked to write an equation, not to find the answer.

9. A student arranged some books on the shelf using the Dewey decimal system. Choose the group of book numbers that is listed in order from least to greatest.

Texas Test Practice at tx.msmath1.com

- **F** 749, 749.01, 749.21, 749.11
- **G** 109.012, 109.021, 109.001, 109.3
- H 456.076, 465.076, 465.189, 465.2
- J 688.89, 687.9, 688.91, 688.95

NEED EXTRA HELD?

GRIDDABLE The temperature at 6:30 A.M. was 58.7°F. By 1:00 P.M., it was 92.6°F. Find the difference between the two temperatures in degrees Fahrenheit.

Get Ready for the Texas Test For test-taking strategies and more practice, see pages TX1–TX23.

11. The number of hours that people studied for a Spanish test were 3, 2, 1, 0, 2, 1, 3, 5, 3, and 4. What is the mode of these hours?

A 3	C 1
B 2	D 5

12. The number of players on a junior varsity baseball team is described by p + 19 = 25. If *p* represents the number of pitchers, how many pitchers are there?

F	5	Η	7
G	6	J	8

Pre-AP

Record your answers on a sheet of paper. Show your work.

13. Mr. Evans had a yard sale. He wrote both the original cost and the yard sale price on each item.

ltem	Original Price (\$)	Selling Price (\$)				
Table	95.15	12				
Mirror	42.14	8				
Picture Frame	17.53	2				
Television	324.99	52				

- **a.** If Mr. Evans sold all four items, how much did he make at the yard sale?
- **b.** What was his loss?
- **c.** Explain how you calculated his loss.

If You Missed Question	1	2	3	4	5	6	7	8	9	10	11	12	13
Go to Lesson	3-2	3-4	3-5	1-4	2-6	3-4	3-2	1-8	3-2	3-5	2-7	1-8	3-5
For Help with Test Objective	4	1	1	6	5	1	4	2	4	1	5	2	1