Mathematics:
Decimals

The following section of this customized textbook includes material from these skill areas:

Skill Description

2023: compare decimals

4.NF.7: Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

2025: explore decimals using a variety of representations

4.NF.7: Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

2027: order decimals

4.NF.7: Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

2028: read decimals

2031: solve problems with decimals

4.NF.7: Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

Place Value in Decimals

Places to the right of the ones place show decimals.
A decimal point separates the ones place from the tenths place.

The chart below shows the first six places to the right of the decimal point.

tens	ones	tenths	hundredths	thousandths	ten thousandths	hundred thousandths	millionths
	5.	5					
	1.	1	2	3			
	0.	0	0	7	1		
	0.	1	5	0	5	5	
1	2.	0	0	0	8	6	6

> The tiny Cuban arrow-poison frog is just 1.2 cm long. That's one and two tenths of a centimeter.

Reading & Writing Decimals

Read the whole number first. Then, read the entire number to the right of the decimal point, adding the label from the place of the last digit.

5.5	reads *five and five tenths*
1.123	reads *one and one hundred twenty-three thousandths*
0.0071	reads *seventy-one ten thousandths*
0.15055	reads *fifteen thousand fifty-five hundred thousandths*
12.000866	reads *twelve and eight hundred sixty-six millionths*

Writing Decimals

nine thousandths
= 0.009
nine millionths
= 0.000009
nine hundreths
= 0.09
nine ten thousandths
= 0.0009

Rounding Decimals

Decimals are rounded in the same way as whole numbers.

If a digit is 5 or greater, round up to the next highest value in the place to the left. If the digit is 4 or less, round down.

0.005 *rounded to the nearest hundred is* **0.01**

0.63 *rounded to the nearest tenth is* **0.6**

5.068 *rounded to the nearest tenth is* **5.1**

5.068 *rounded to the nearest hundredth is* **5.07**

NOSE ROLLS & FAKIES

This must be the sport with the wildest names for moves and tricks! On a snowboard you can do Halfpipes, Nose Rolls, Wheelies, McTwists, Chicken Salads, and Ollies—and many more tricks with wild, wacky names! 1998 was the first time snowboarders could take part in the Olympic Games. The boarders were ready to do all these fancy tricks in Japan!

To finish each of these tricks with a good score, read the decimals on each card. Then number them in order from the largest to the smallest.

Trick #1 FAKIE

____	0.11103	____	1.7
____	0.103	____	11.3
____	10.37	____	13.01
____	11.370	____	0.13

Trick #5 CHICKEN SALAD

____	2.6	____	6.2
____	2.7	____	2.9
____	2.06	____	22.6
____	26.6	____	2.999

Trick #2 NOSE ROLL

____	15.02	____	15.21
____	1.5	____	1.51
____	0.005	____	55.5
____	0.05	____	5.5

Trick #3 BACKSCRATCHER

____	4.5	____	4.7
____	0.451	____	44.5
____	0.45	____	4.4
____	0.06	____	0.44

Trick #6 OLLIE

____	7.2	____	7.7
____	0.72	____	77.27
____	0.072	____	0.07
____	72.1	____	0.007

Trick #4 McTWIST

____	5.28	____	5.6
____	9.97	____	0.009
____	0.8	____	5.8
____	0.99	____	0.08

Trick #7 TAIL WHEELIE

____	0.0001	____	0.000001
____	0.001	____	0.01
____	101.1	____	10.11
____	1.1	____	0.00011

Decimals

The set of **decimals** includes all numbers in a base ten system. The term *decimal,* however, is often used to describe numbers that use a decimal point to show an amount between two whole numbers. A mixed decimal numeral is one that includes a whole number and digits to the right of the decimal point.

0.706   *–18.5*

10.0505

–6.07   *127.3*

Place Value in Decimals

Learn these places.

tenths   hundredths   thousandths   ten thousandths   hundred thousandths

5 . 1 2 3 4 5

5.1.............................. reads *five and one tenth.*

5.12........................ reads *five and twelve hundredths.*

5.123 .... reads *five and one hundred twenty-three thousandths.*

5.1234 .... reads *five and one thousand two hundred thirty-four ten thousandths.*

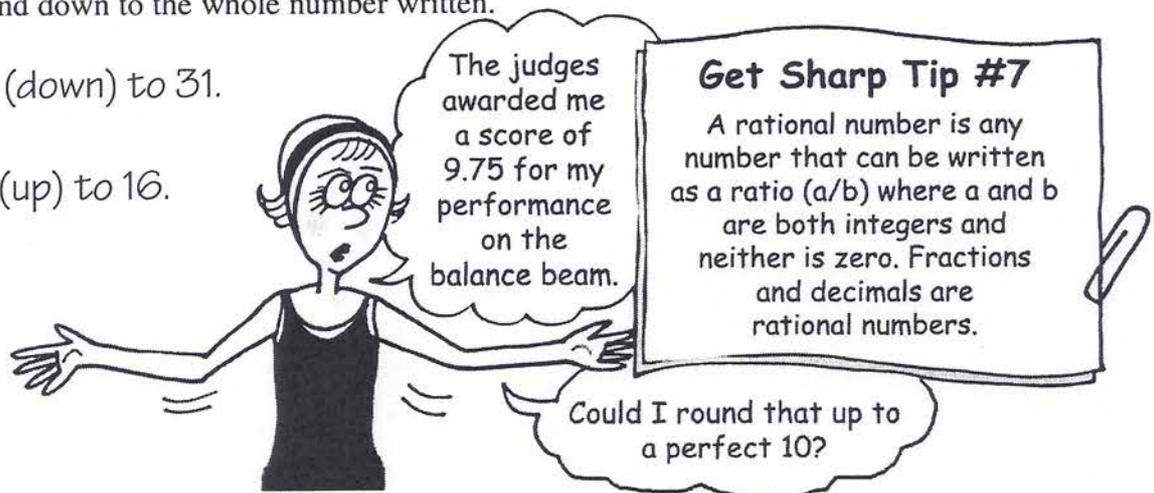5.12345........... reads *five and twelve thousand three hundred forty-five hundred thousandths.*

Rounding Decimals

To round a mixed numeral to a whole number, look at the first digit to the right of the decimal point.
If it is 5 or greater, round up to the next whole number.
If it is less than 5, round down to the whole number written.
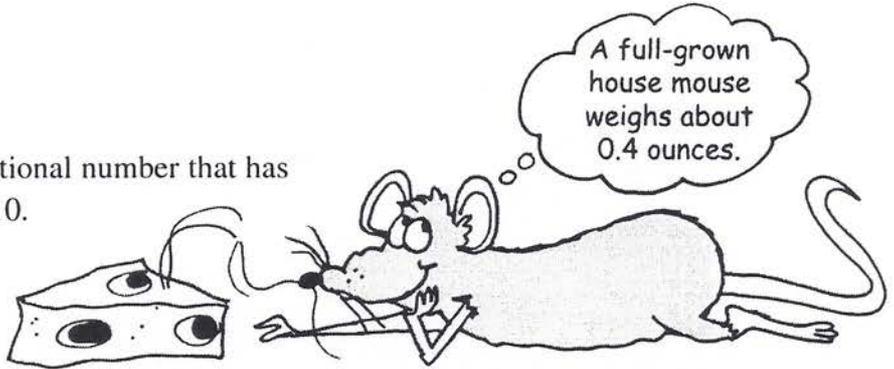
31.482 rounds (down) to 31.

15.677 rounds (up) to 16.

The judges awarded me a score of 9.75 for my performance on the balance beam.

Could I round that up to a perfect 10?

Get Sharp Tip #7

A rational number is any number that can be written as a ratio (a/b) where a and b are both integers and neither is zero. Fractions and decimals are rational numbers.
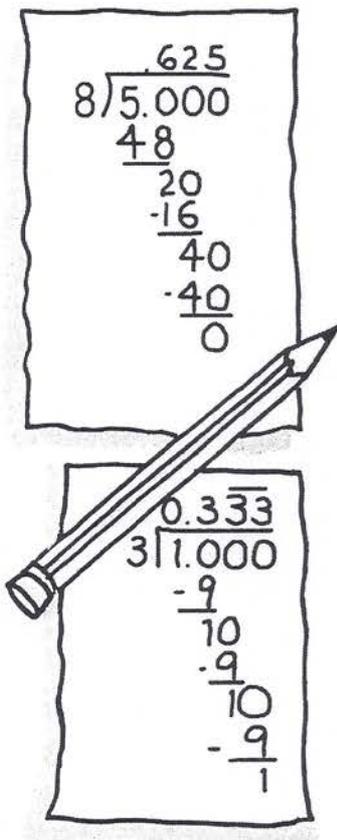
Decimals

A **decimal** is a way of writing a fractional number that has a denominator of 10 or a multiple of 10.

Decimals are written using a decimal point. The decimal point is placed to the right of the ones place.

$$\frac{1}{10} = .1 \qquad \frac{1}{100} = .01 \qquad \frac{1}{1000} = .001 \qquad \frac{1}{10,000} = .0001$$

```
      .625
  8)5.000
    48
      20
     -16
      40
     -40
       0
```

Terminating Decimals

A **terminating decimal** is a decimal number that ends. When a quotient for a divided fraction eventually shows a remainder of zero, the decimal terminates.

When $\frac{5}{8}$ is divided, the result is a terminating decimal.

Repeating Decimals

A **repeating decimal** is a decimal that has one or more digits that repeat indefinitely. The quotient for a divided fraction never results in a remainder of zero, and one or more of the final digits keep repeating. A repeating decimal is indicated by a bar written above the numbers that repeat.

When $\frac{1}{3}$ is divided, the result is a repeating decimal: $\mathbf{0.\overline{33}}$

```
     0.333
  3)1.000
    -9
     10
    -9
     10
    -9
      1
```

Mixed Decimal Numbers

Mixed decimal numbers combine whole numbers and decimals.

A mixed number has digits on both sides of the decimal point.
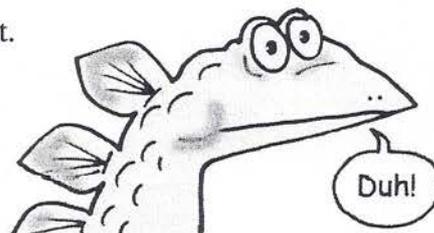
Duh!

TAKE THE PLUNGE!

Can you imagine jumping off a three-story building into a pool of water? This is what platform divers do. Olympic divers either jump off high platforms, where they begin at a standstill, or they jump off a bouncy springboard. Seven judges watch each dive and score it between 0 and 10. Scores for eleven dives are added together. The diver with the highest score wins. In 1982, Mary Ellen Clark got a bronze medal for the USA with a score of 401.91.
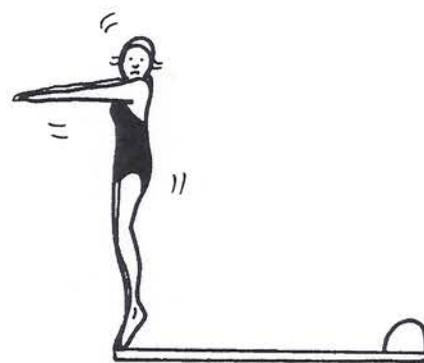
Find a decimal in the pool to match each of the decimal words below.

1. one hundred eighty-three ten thousandths
   _____

2. one and eighty-three thousandths
   _____

3. one hundred fifteen thousandths
   _____

4. fifty-five hundredths
   _____

5. ninety-nine and seven tenths
   _____

6. thirteen and four tenths
   _____

7. five hundred and five thousandths
   _____

8. nine and seventy-eight hundredths
   _____

9. ninety-seven hundredths
   _____

10. ten and eighty-three hundredths
    _____

11. one hundred eight and three tenths
    _____

12. two hundred thirty-four thousandths
    _____

13. five and five hundred fifty-five thousandths
    _____

14. nine hundred seventy-eight thousandths
    _____

15. nine hundred seventy-eight and three tenths
    _____

16. eleven and five hundred one thousandths
    _____

500.005 .97 108.3 1.083

.55 13.4 99.7

5.555 11.501 10.83 .115

978.3 .234 9.78 .0183 .978
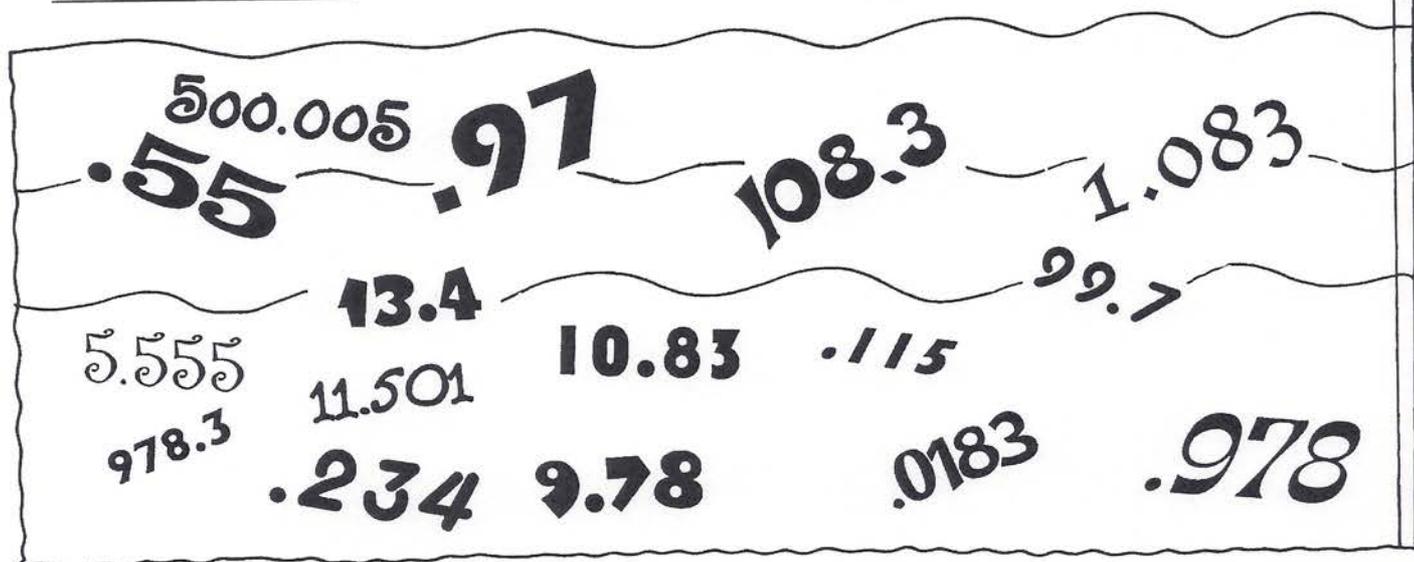
Dividing a Decimal by a Whole Number

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

Step 2: Divide as you would with whole numbers.

Step 3: Add zeros where necessary to hold places.

Chuck climbed a giant Ponderosa Pine tree that was 68.4 feet tall. The climb took him four hours. On the average, how much distance did he climb each hour?

```
        17.1
    4 ) 68.4
       -4
        28
       -28
         04
         -4
          0
```

If I divide my 2.5 sandwiches by 5 hours, I'll have 0.5 sandwiches per hour.

Charlene climbed an 81.9-foot Coast Douglas Fir tree. It was 2.6 times the height of the Western Red Cedar tree that C.J. climbed. How high was the cedar?

```
          31.5
  2.6 ) 81.9
        -78
         39
        -26
        130
       -130
          0
```
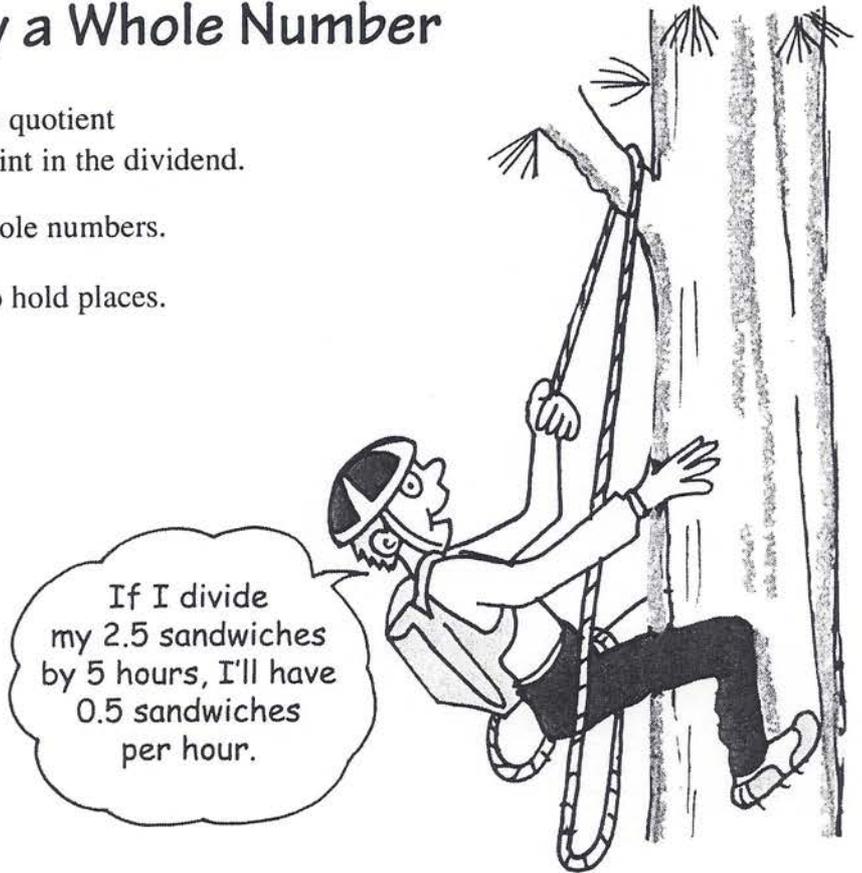
Dividing a Decimal by a Decimal

Step 1: Move the decimal point to the right to write the divisor as a whole number. Count the number of places you must move the decimal point.

Step 2: Move the decimal point in the dividend the same number of places to the right.

Step 3: Divide as you would with whole numbers.

Step 4: Align the decimal point in the quotient with the decimal point in the dividend.