



#10144

BASIC MATH: WORKING WITH DECIMALS

CEREBELLUM CORPORATION, 2001

Grade Level: 4-10

11 mins.

2 Instructional Graphics Enclosed

DESCRIPTION

The primary difference between math functions with whole integers and those with decimals is having to keep up with the decimal point. Examples cover adding, subtracting, multiplying, and dividing decimals. Explains how to round them off. Standard Deviants School.

ACADEMIC STANDARDS

Subject Area: Mathematics

- Standard: Uses basic and advanced procedures while performing the processes of computation
 - ♦ Benchmark: Adds, subtracts, multiplies, and divides whole numbers, fractions, decimals, integers, and rational numbers (See INSTRUCTIONAL GOALS 3.)
 - ♦ Benchmark: Uses specific strategies (e.g., front-end estimation, rounding) to estimate computations and to check the reasonableness of computational results (See INSTRUCTIONAL GOALS 4.)
- Standard: Understands and applies basic and advanced properties of the concepts of numbers
 - ♦ Benchmark: Understands the characteristics and properties (e.g., order relations, relative magnitude, base-ten place values) of the set of rational numbers and its subsets (e.g., whole numbers, fractions, decimals, integers) (See INSTRUCTIONAL GOALS 1 and 2.)
 - ♦ Benchmark: Understands the relationships among equivalent number representations (e.g., whole numbers, positive and negative integers, fractions, ratios, decimals, percents, scientific notation, exponentials) and the advantages and disadvantages of each type of representation (See INSTRUCTIONAL GOALS 5.)
 - ♦ Benchmark: Understands the characteristics and uses of exponents and scientific notation (See INSTRUCTIONAL GOALS 5.)

INSTRUCTIONAL GOALS

1. To define *decimal numbers* and the use of decimal points.
2. To identify the place value names to the right of the decimal to the thousandths place.
3. To demonstrate addition, subtraction, multiplication, and division of decimal numbers.
4. To explain how to round decimal numbers.
5. To illustrate the use of scientific notation.

VOCABULARY

- | | | |
|---------------------|----------------------|-------------------------|
| 1. addition | 8. integers | 15. scientific notation |
| 2. carrying | 9. keep track | 16. subtraction |
| 3. decimal | 10. line up | 17. tenths place |
| 4. decimal point | 11. multiplication | 18. thousandths place |
| 5. division | 12. negative numbers | 19. units place |
| 6. exponent | 13. power of ten | 20. value |
| 7. hundredths place | 14. rounding | |

BEFORE SHOWING

1. Discuss the use of the decimal point. Give practical examples of when decimals are used.
2. Review place value including at least three places to the right of the decimal point.
3. Discuss rounding numbers. Explain when to round up and when not to. Practice rounding without decimals to the units, tens, and hundreds place.
4. Explain the use of scientific notation for very large numbers. Give examples.
5. Copy and distribute the "Working with Decimals: Viewing Guide." (See INSTRUCTIONAL GRAPHICS.)
 - a. Encourage students to follow along on the guide with the video.
 - b. Explain that they will have time to complete the problems either during pauses of the video or after viewing.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause after the explanation of the decimal places and how to read decimal numbers.
 - a. Review the names of the places to the left and right of the decimal point. Practice several examples.
 - b. Discuss how to read decimal numbers using whatever communication mode is appropriate for the students. Practice several more examples.
3. Pause after the explanation about adding or dropping zeroes. Discuss how to know if the zeroes can be dropped or not. Discuss when it is a good idea to add a zero.

C a p t i o n e d M e d i a P r o g r a m

4. Pause when the decimal addition example is done. Allow time for the students to complete the problem on their viewing guides. Discuss and clarify with more examples.
5. Pause after the brief explanation of subtracting decimals. Clarify questions, and practice several problems.
6. Pause after the explanation and example of multiplying decimals.
 - a. Review the steps. Allow students time to do the math on the viewing guide as the steps are reviewed.
 - b. Practice counting the number of places to the right of the decimal in both numbers being multiplied and moving the decimal that many places to the left in the product.
7. Pause after the example of dividing decimals. Discuss the steps shown on the viewing guide. Emphasize moving the decimal points before dividing. Practice more examples.
8. Pause after the rounding off explanation. Review the steps on the viewing guide. Practice several more examples.
9. Pause after the explanation of scientific notation. Discuss the steps for numbers greater than one and less than one. Practice several examples.

AFTER SHOWING

Discussion Items and Questions

1. Where does the decimal point go in a number? What does the decimal point represent?
2. Name the places to the right and left of the decimal point.
3. When is it okay to drop a zero? When is it a good idea to add a zero?
4. Explain the steps for adding and subtracting decimal numbers.
5. What's the most important rule for addition and subtraction of decimal numbers?
6. Explain the steps for multiplying and dividing decimals. In which kind of problem do you move the decimal before you compute? In which one do you move it after you compute?
7. Explain the process for rounding off a decimal number. Is it different than rounding off an integer? How do you know whether to round up or down?
8. When should you use scientific notation? Why?
9. Explain how to write numbers greater than one with scientific notation. Explain the steps for numbers less than one.

Applications and Activities

1. Review the information from the video using the viewing guide.
2. Complete the "Working with Decimals: Check Your Knowledge" worksheet. (See INSTRUCTIONAL GRAPHICS.)
3. Note that the viewing guide has "Word Problem Strategies" at the bottom of the page that were not explained in the video.
 - a. Read and explain these steps.
 - b. Practice each step while doing simple word problems together.

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4. Practice solving additional word problems involving decimals, rounding, and scientific notation using the problem-solving steps on the viewing guide. Examples include:
 - a. Bartholomew Jackson is paid \$8.35 an hour to knit dog sweaters. He gets paid 1.5 times his normal wages for overtime (over 40 hours per week). If he works 55.5 hours in one week, how much money does he earn?
 - b. Six friends go to a restaurant. The bill (plus tip) comes to \$71.43. How much should each person pay, rounding to the nearest dollar?
 - c. The nearest star to us, Alpha Centauri, is 4.3 light years away. A light year is 5,865,696,000,000 miles. How far away is Alpha Centauri in miles? Express in scientific notation.
 - d. Americans eat an average of 1,200,000,000 pounds of hamburger each year. Assuming that each hamburger is a quarter-pounder, how many hamburgers do Americans eat each year? Express your answer in scientific notation.
 - e. Global Monster Bank makes $\frac{1}{10}$ of a cent on each transaction it oversees. If the bank oversees 346,912 transactions in a day, how much money does it make?
5. In small groups or pairs, write original word problems involving decimals, rounding, and/or scientific notation. Exchange problems with another group and solve.
6. Draw models of decimal numbers using squares divided into ten or one hundred equal parts.
7. Write the decimal number that corresponds with the number of colored parts in a square that is divided into ten or one hundred equal parts.
8. Investigate the use of scientific notation. When was it created and by whom? Find a variety of examples of its use.
9. Using grocery ads from a newspaper, make a shopping list with the costs of each item.
 - a. Multiply the cost per item times how many of each thing you will buy.
 - b. Round each item's cost to the nearest dollar.
 - c. Total the rounded costs.
 - d. Total the actual costs and compare to the rounded number. Share and discuss the results.
10. Plan a car trip to a well-known place in another state.
 - a. Figure out how many miles the trip will be both ways.
 - b. Estimate the mileage you will get for the car you will drive.
 - c. Using the current cost of gasoline, calculate how much the trip will cost with and without rounding the gas costs.

CMP RELATED RESOURCES

- [*Ace Math for Kids: Volume II, Part 4* #3559](#)
- [*Percentages that Make Sense* #9548](#)

World Wide Web



The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

• DECIMAL NUMBERS

<http://www.math.com/school/subject1/lessons/S1U1L2GL.html>

Multiple-page Web site with explanations of decimal numbers. Also has an interactive "workout" of online decimal problems.

• E-LAB GRADE 5

http://www.harcourtschool.com/activity/elab2002/grade_5/

This site provides several interactive models related to the concepts in the video. Try "Thousandths" for a rounding activity and any of the decimal activities. Choose "Grade 6" for more decimal activities.

• AAA MATH: DECIMALS

<http://www.aaamath.com/B/dec.htm>

Find a whole range of decimal activities, each with an explanation, interactive practice, and games. Includes rounding and scientific notation.

• MATH FORUM: ASK DR. MATH

<http://forum.swarthmore.edu/dr.math/>

"Ask Dr. Math" allows users to e-mail questions to Dr. Math and access archived material. For other materials that relate to this media, click on "Elementary" and then "Fractions/Decimals," or choose "Middle School" and then "Exponents."

INSTRUCTIONAL GRAPHICS

- WORKING WITH DECIMALS: VIEWING GUIDE
- WORKING WITH DECIMALS: CHECK YOUR KNOWLEDGE

Working with Decimals:

Basic Math Viewing Guide

Show your work and solve the problems with the program!

Your teacher will be asking you for the answers!

Each digit place represents a power of ten (10).

263		3.12	
3	(ones)	3.00	(ones)
60	(tens)	.10	(tenths)
200	(hundreds)	.02	(hundredths)

- The decimal point is to the right of the units place.
- The decimal point represents the separation of the units place and the tenths place.

Multiplication

1. Put one number on top of another.
2. Multiply each digit of the bottom number times each digit of the top number.
3. Insert zeroes for each result where appropriate.
4. Add results together.
5. Count the total number of decimal places in both numbers.
6. Move your product's decimal point to the left by the number of decimal places you counted.

$$\begin{array}{r} 1.86 \\ \times 2.3 \\ \hline \end{array}$$

Rounding Decimals

Find the decimal point you want to round off to.

- > 5: Round up the digit.
- < 5: Round down the digit.

Rounding off to the ones place:	3.814 \longrightarrow 4
Rounding off to the tenths place:	3.814 \longrightarrow 3.8
Rounding off to the hundredths place:	3.814 \longrightarrow 3.81

Word Problem Solving Strategies

Read	the problem.
Identify	what you must solve.
Out of here!	Remove all unnecessary information.
Translate	the word problem into a math problem; break it down into logical steps.
Solve	the problem.

Addition and Subtraction

The decimal points must line up.

Addition:	Right	Wrong
	$\begin{array}{r} 56.30 \\ + 7.89 \\ \hline \end{array}$	$\begin{array}{r} 56.30 \\ + 7.84 \\ \hline \end{array}$

Subtraction:

Works the same way—just line up the decimal points.

Division

- Move decimal point in divisor so last digit is in the units place. $0.5 \overline{) 1.45}$
- Move decimal point in dividend same number of places to the right. $5 \overline{) 14.5}$
- Divide.
$$\begin{array}{r} 2.9 \\ 5 \overline{) 14.5} \\ -10 \\ \hline 45 \\ -45 \\ \hline 0 \end{array}$$
- Insert a decimal point into the answer above the decimal point in the dividend.

Scientific Notation

- For numbers greater than one, move the decimal point to the LEFT, so the number being multiplied is between 1 and 10.
- The number of places moved is the exponent.

$$144,000,000,000 = 1.44 \times 10^{11}$$

- For numbers less than one, move the decimal place to the RIGHT, so the number being multiplied is between 1 and 10.
- The number of places moved is the negative exponent.

$$0.0003789 = 3.789 \times 10^{-4}$$

Working with Decimals: Check Your Knowledge

Total Score / 50

A. Adding and Subtracting

Solve each problem (3 points each).

1. $72.6 - 34.9 =$

2. $12.21 + 21.12 =$

3. $67.329 + 8.04 =$

4. $1.0 - 0.0705 =$

B. Multiplying and Dividing

Solve each problem. Show your work (3 points each).

1.
$$\begin{array}{r} 5.62 \\ \times .08 \\ \hline \end{array}$$

2. $.08 \overline{)4.76}$

3.
$$\begin{array}{r} 4.29 \\ \times 9.01 \\ \hline \end{array}$$

4. $0.23 \overline{)8.05}$

C. Rounding

Round each number to the tenths place (2 points each).

1. 5.82

2. 6.01

3. 0.947

4. 3.155

D. Scientific Notation

Convert each number to scientific notation (3 points each).

1. 45,328,000,000

2. 0.657

3. 1,000,000,000,000,000

4. 0.000000000000009

E. Word Problems

Solve each problem. Show your work (3 points each).

- The stitching on a shirt sleeve hem is very close together: a stitch every 0.05 inches. If the hemline is 5.4 inches long, how many stitches are there?
- The spiny horn frog hops at a speed of .35 miles an hour. How far can the frog hop in $2\frac{1}{2}$ hours?

Working with Decimals: Check Your Knowledge *Answer Key*

 Total Score
/ 50

A. Adding and Subtracting

Solve each problem (3 points each).

1. $72.6 - 34.9 = 37.7$

2. $12.21 + 21.12 = 33.33$

3. $67.329 + 8.04 = 75.369$

4. $1.0 - 0.0705 = 0.9295$

B. Multiplying and Dividing

Solve each problem. Show your work (3 points each).

$$\begin{array}{r} 1. \quad 5.62 \\ \times .08 \\ \hline 4496 \\ 0 \\ \hline .4496 \end{array}$$

$$\begin{array}{r} 2. \quad .08 \overline{)4.76} \\ \underline{40} \\ 76 \\ \underline{72} \\ 40 \end{array}$$

$$\begin{array}{r} 3. \quad 4.29 \\ \times 9.01 \\ \hline 429 \\ 386100 \\ \hline 38.6529 \end{array}$$

$$\begin{array}{r} 4. \quad 0.23 \overline{)8.05} \\ \underline{69} \\ 115 \end{array}$$

C. Rounding

Round each number to the tenths place (2 points each).

1. 5.82 5.8

2. 6.01 6.0

3. 0.947 0.9

4. 3.155 3.2

D. Scientific Notation

Convert each number to scientific notation (3 points each).

1. 45,328,000,000 4.5328×10^{10}

2. 0.657 6.57×10^{-1}

3. 1,000,000,000,000,000 1.0×10^{15}

4. 0.000000000000009 9×10^{-14}

E. Word Problems

Solve each problem. Show your work (3 points each).

1. The stitching on a shirt sleeve hem is very close together: a stitch every 0.05 inches. If the hemline is 5.4 inches long, how many stitches are there?

$$5.4 \div 0.05 = 108 \text{ stitches}$$

2. The spiny horn frog hops at a speed of .35 miles an hour. How far can the frog hop in 2 1/2 hours?

$$0.35 \times 2.5 = .875 \text{ miles}$$