



#9934

INTEGER OPERATIONS--INTO THE NEGATIVE ZONE!: PART 2-- MULTIPLYING AND DIVIDING

BENCHMARK MEDIA, 2002
Grade Level: 6-12
13 mins.

DESCRIPTION

Reviews adding and subtracting positive and negative integers before moving into multiplying and dividing them. Clarifies the rule that multiplying integers with like signs equals positives and multiplying those with mixed signs equals negatives. Demonstrates that division follows the same rule. A quiz follows each section.

ACADEMIC STANDARDS

Subject Area: Mathematics

- Standard: 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 1 and 3.)
- 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, 2, and 4.)
 - ♦ Benchmark: Uses models (e.g., number lines, two-dimensional and three-dimensional regions) to identify, order, and compare numbers (See INSTRUCTIONAL GOALS 1.)

INSTRUCTIONAL GOALS

1. To illustrate the multiplication of positive and negative single-digit numbers using a multiplication table and number patterns.
2. To show that order doesn't matter in multiplication.
3. To depict division of integers as the reverse of multiplication.
4. To state rules for determining the sign of the result of multiplying or dividing two positive numbers, two negative numbers, and a positive and negative number.

BACKGROUND INFORMATION

Negative numbers are widely used in everyday life. They are also necessary for mathematical theory. Acquaintance with negative numbers, and the ability to perform operations that employ negative numbers, is necessary both for further studies in mathematics and for solving everyday problems. It is worth mentioning that some of the concepts to which students are introduced in the course of this lesson are generalized in other mathematical applications (for instance, the notion of the inverse operation and the additive inverse).

VOCABULARY

- | | | |
|----------------|-------------------------|--------------|
| 1. addition | 7. multiplication | 13. positive |
| 2. answer | 8. multiplication table | 14. result |
| 3. calculation | 9. negative | 15. reverse |
| 4. division | 10. opposite | 16. times |
| 5. equal | 11. order | |
| 6. integer | 12. pattern | |

BEFORE SHOWING

- Review adding and subtraction of positive and negative numbers. Try adding these combinations and discuss what happens:
 - $(-2) + (-2) = ?$
 - $(-2) + (-2) + (-2) = ?$
 - $(-2) + (-2) + (-2) + (-2) = ?$
- Discuss how multiplication can be described in terms of repeated addition.
 - Consider multiplication of positive integers as repeated addition (e.g., 3×4 is the same as $3 + 3 + 3 + 3$).
 - Explain that $(-3) \times 4$ can be seen as the sum of 4 copies of (-3) .
 - Discuss ways to find products of other integers.
- Discuss the concept of division as the reverse operation for multiplication.
 - Review that $2 \times 3 = 6$ means that $6 \div 3 = 2$, and that $3 \times 4 = 12$ means that $12 \div 4 = 3$, etc.
 - Explain that multiplication is the key operation that must be defined and that it will be possible to use multiplication while working with division.
- Explain that there will be problems to solve throughout the video, so paper and pencil will be necessary.

DURING SHOWING

- View the video more than once, with one showing uninterrupted.
- Pause to allow students time to complete the problems shown on the screen. Discuss solutions then check the answers by continuing the video.
- Additional pauses may be desired to review content after presentation of particular concepts.

AFTER SHOWING

Discussion Items and Questions

1. Discuss which sign the product has if you multiply two positive integers, a positive and a negative integer, or two negative integers.
2. Why doesn't the order matter when multiplying two numbers?
3. Explain how division is related to multiplication.
4. State the rule for identifying the sign of the product or quotient when multiplying two positives, two negatives, or a negative and a positive.
5. Discuss the importance of the order of the digits in division. Also remember that the result of the division of two integers may not be an integer. (It may be a decimal or fraction.)

Applications and Activities

1. Create individual multiplication tables similar to the one shown in the video, but extend it out through the tens or twelves. Practice using the table with multiplication problems.
2. Show how to use the multiplication table to solve simple division problems.
3. Locate word problems for multiplying and dividing single-digit positive and negative numbers. Practice solving them as a group and individually.
4. Working in small groups or in pairs, create math word problems for multiplication and division. Trade problems with another group and solve each other's problems.
5. Play a variation of the card game WAR to practice multiplication.
 - a. Use a regular deck of playing cards. Assign values to the face cards ($J = 11$, $Q = 12$, and $K = 13$ or 0) or remove them.
 - b. Identify one color as positive and the other as negative.
 - c. Each pair of students deals the cards as if playing WAR—the whole deck evenly. Students do not look at the cards.
 - d. Each player flips up two cards and multiplies the two numbers announcing the answer to their partner.
 - e. The player with the largest product wins the trick. If the students disagree on an answer, the teacher can be the referee.
 - f. Play for a set time, and the player with the most cards wins, or play until one player possesses *all* the cards.
6. Create a bulletin board showing the rules for multiplying and dividing positive and negative integers.
7. A few other models for defining the products of integers may be suggested:
 - a. Each day John writes a check for \$25 and his checking account balance shrinks by \$25 (adding $-\$25$ each day). In four days, it will be $(-25) \times 4 = -100$.
 - i. Compare John's account now and four days ago. How much larger was the balance in John's account four days ago?
 - ii. Answer: $(-25) \times (-4) = 100$

- b. Every minute a point moves three units to the left on a number line (addition of -3). In five minutes it will move $(-3) \times 5 = -15$ units.
- i. Describe its location five minutes ago. Was it to the right or the left of its current position?
- ii. Answer: $(-3) \times (-5) = 15$, the point was 15 units to the right of its current position.

SUMMARY

The key concepts explained are the multiplication and division of integers. The narrator makes use of patterns observed while constructing a multiplication table for finding the product of: two negative numbers; a negative and positive number, and two positive numbers. The order of the integers in a multiplication calculation is irrelevant, that is, $ab = ba$ for any integers a and b . The sign for the result of the division is determined by the fact that division is the reverse operation for multiplication.

CMP RELATED RESOURCES

- *Integer Operations–Into the Negative Zone!: Part 1–Adding and Subtracting #9933*
- *Basic Math: Multiplying Integers #10141*
- *Basic Math: Dividing Integers #10137*

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.

• MULTIPLYING AND DIVIDING INTEGERS

<http://www.math.com/school/subject1/lessons/S1U1L12GL.html>

Multiple-page Web site with explanations of multiplying and dividing positive and negative integers. Also has an interactive “workout” of online multiplication problems.



- **MATH FORUM: ASK DR. MATH**



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 more materials that relate to this video, choose "Elementary" and then "Multiplication" or "Division," or choose "Middle School," then "Negative Numbers" or "Division."

- **MULTIPLICATION WITH INTEGERS**

<http://www.quia.com/jg/32578.html>

Play any one of the three different games to practice multiplying with two integers.

