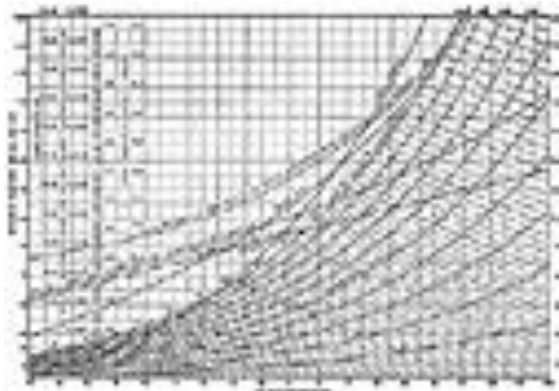Rational Numbers
Multiplying Rational Numbers
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Lesson Plan

I.      Topic:          Multiplying Rational Numbers

II.     Goals and Objectives:
        A. The students will demonstrate understanding of multiplication of different rational numbers.
        B. The students will learn how to multiply numbers with the same sign and with different signs.
        C. The students will find the answers to multiple expressions using multiplication and the
           distributive property.
        D. The students will evaluate algebraic expressions by addition, subtraction, and multiplication
           of rational numbers.

III.    Massachusetts Learning Standards:

        1.    CM.2.1
              Concepts (number sense, algebraic and geometric thinking, measurement, data analysis
              and probability)

        2.    AL.2.2
              Problem-solving skills (explore, plan, solve, verify.)

        3.    PA.3.3
              Perform calculations with and without technology in life situations.

        4.    PA.4.1
              Simplify expressions using the order of operations.

        5.    PA.4.2
              Identify numbers and relationship among numbers

        6.    PA.5.1
              Use and evaluate expressions involving variables

IV.     Materials:
        A. Whiteboard with dry-erase markers (Blackboard with chalk could also be used.)
        B. Ruler
        C. Pencils
        D. Multiplying Worksheets (Practice Worksheet, Quiz Worksheet)

V.      Presentation Outline:
    A.      Introductions: "Multiplying Rational Numbers"
          Definition

    B.      Find the product of two rational numbers
          Example

    C.      Simplify each expression
          Example

    D.      Evaluate each expression
          Example

VI.     Presentation:
    A.      Presentation Notes
    B.      Power Point Presentation

VII.    Independent Practice:          Multiplying Rational Numbers Worksheet
    A.      Class work:          # 1 - 39 Odds

    B.      Homework:          #s 2 - 40 Evens

    C.      Due 2 days from given day. Allow students to complete those questions which they did not complete in class.

VIII.   Topic Assessment:     Multiplying Rational Numbers Quiz
    A.      Answer questions from homework.

    B.      12-question Quiz:     15 – 25 minutes

# Rational Numbers

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# Multiplying Rational Numbers
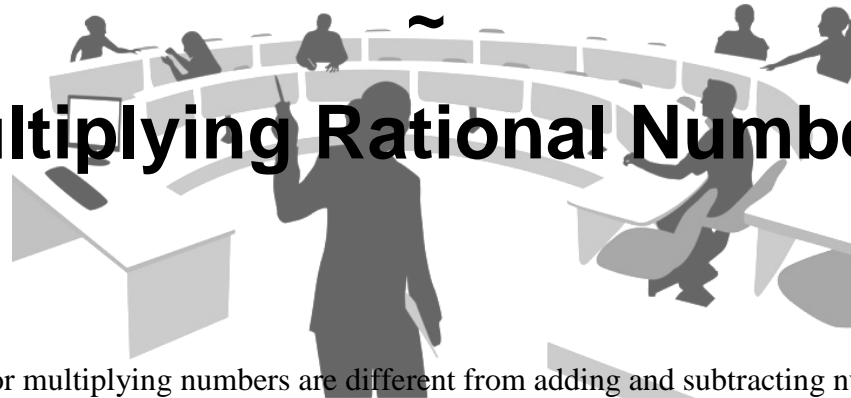
## Introduction

The rules for multiplying numbers are different from adding and subtracting numbers. You need to keep the rules for adding and subtracting numbers in your head. Keep those rules separate from the multiplying numbers rules we are about to discuss. Remember, multiplying numbers is actually a quick way of adding numbers by grouping them.

> The product of two numbers having the same sign is positive.
> The product of two numbers having different signs in negative.

The short-and-sweet is that multiplying rational numbers is just the same as all the multiplying you have done before.

**The only new additions to the rules-of-old are the following:**

    I.    A positive times a positive is a positive.
        Positive x Positive = Positive: 3 x 2 = 6

    II.    A negative times a negative is a positive.
        Negative x Negative = Positive: (-2) x (-8) = 16

    III.    A positive times a negative is a negative.
        Positive x Negative = Negative: 3 x (-4) = -12

    IV.    A negative times a positive is a negative.
        Negative x Positive = Negative: (-3) x 4 = -12

# Integer Multiplication

We can use the rules for multiplying rational numbers to solve simple and complex math problems. Let's look at several tables which will show us how these rules are use.

**Rule 1:** The product of a positive integer and a positive integer is a positive integer.

**Rule 2:** The product of a negative integers and a negative integer is a positive integer.

**Rule 3:** The product of a positive integer and a negative integer is a negative integer.

**Rule 4:** The product of a negative integer and a positive integer is a negative integer.

Look at the following tables, the integers being multiplied, and the rules used to multiply them. Remember: when two numbers are next to each other, separated by parenthesis, it means that they are being multiplied.

Example 1: Find the product of each pair of integers.

| Multiplying Integers | | |
|---|---|---|
| Integers | Product | Rule Used |
| $(^+7) (^+3) =$ | $^+21$ | Rule 1 |
| $(^+7) (^-3) =$ | $^-21$ | Rule 3 |
| $(^-7) (^+3) =$ | $^-21$ | Rule 4 |
| $(^-7) (^-3) =$ | $^+21$ | Rule 2 |

Example 2: Find the product of each pair of integers.

| Multiplying Two Integers | | |
|---|---|---|
| Integers | Product | Rule Used |
| $(^+8) (^+4) =$ | $^+32$ | Rule 1 |
| $(^+11) (^-2) =$ | $^-22$ | Rule 3 |
| $(^-14) (^+3) =$ | $^-42$ | Rule 4 |
| $(^-9) (^-5) =$ | $^+45$ | Rule 2 |

In each of the above examples, we multiplied two integers by applying the rules at the top of the page. We can multiply three integers, two at a time, applying these same rules. Look at the example below:

Example 3: Find the product of each set of integers.

| Multiplying Three Integers | | |
|---|---|---|
| Integers | Product of First Two Integers and the Third | Product |
| $(^+5) (^+3) (^+2) =$ | $(^+15) (^+2) =$ | $^+30$ |
| $(^+8) (^+2) (^-5) =$ | $(^+16) (^-5) =$ | $^-80$ |
| $(^-6) (^+3) (^+4) =$ | $(^-18) (^+4) =$ | $^-72$ |
| $(^-9) (^-3) (^+2) =$ | $(^+27) (^+2) =$ | $^+54$ |
| $(^-4) (^-3) (^-5) =$ | $(^+12) (^-5) =$ | $^-60$ |

Summary: Multiplying two integers with like signs yields a positive product, and multiplying two integers with unlike signs yields a negative product. We can multiply three integers, two at a time, applying these same rules.

# Multiplying Rational Numbers
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Student Practice Worksheet

Name_____Date_____Grade_____

Answer the following questions about multiplying rational numbers:

Find the product of the rational numbers.

1.  $(-3)(-4)$

2.  $-8(7)$

3.  $5(-7)$

4.  $2\left(-\frac{5}{7}\right)$

5.  $\left(-\frac{3}{4}\right)\left(\frac{7}{8}\right)$

6.  $\left(-\frac{4}{5}\right)\left(-\frac{5}{6}\right)$

7.  $(6.8)(-1.3)$

8.  $(-5)(7)(-3)$

9.  $\left(-\frac{2}{3}\right)(-9)$

10.  $\left(\frac{3}{5}\right)(-6)(-15)$

11.  $\left(\frac{2}{3}\right)(-4)(9)$

12.  $(-5)(7)(-12)(0)$

13.  $\left(\frac{3}{8}\right)(-24)(5)(3)$

14.  $(-3.6)(0.057)$

15.  $(-1.32)(-5)(2.1)$

16.  $\left(\frac{5}{6}\right)\left(-\frac{5}{6}\right)(-9)$

17.  $\left(-\frac{1}{2}\right)\left(\frac{7}{12}\right)\left(-\frac{4}{5}\right)$

18.  $\left(\frac{8}{9}\right)\left(\frac{3}{5}\right)\left(-\frac{1}{4}\right)$

19.  $\left(\frac{7}{8}\right)(-16)(-7)\left(-\frac{1}{14}\right)$

20.  $(5)(-3)(-1)(-4)$

21.  $\left(\frac{5}{16}\right)(-2)(-4)\left(-\frac{4}{5}\right)$

(Student Worksheet Continued)
Simplify each expression:

22.  $5s(-6t)$

23.  $6x(-7y) + (-15xy)$

23.  $7x(-3y) + 3x(-4y)$

24.  $(-5a)(-2b) - (-8a)(6b)$

25.  $6(3m - m) + 3(m + 2m)$

26.  $6(-2x) - 14x$

27.  $5(-4n) - 25n$

28.  $5(2x - x)$

29.  $-7(3d + d)$

30.  $-2a(-3c) + (-6y)(6r)$

31.  $7m(-3n) + 3s(-4t)$

Evaluate each expression if $m = -\frac{2}{3}$, $n = \frac{1}{2}$, and $p = -3$:

32.  6mn

33.  np

34.  $n^2(m + 2)$

35.  $p^2 + m$

36.  $m + \frac{p}{5}$

37.  $p(m + n)$

38.  $2(p + 4) - (m + n)$

39.  $6p + m - m$

40.  $\frac{m+n}{n}$

Multiplying Rational Numbers
~
Student Practice Worksheet
<span style="color:red">Answer Key</span>

Name_____ Date_____ Grade_____

Answer the following questions about multiplying rational numbers:

Find the product of the rational numbers.

1. $(-3)(-4)$

   <span style="color:red">12</span>

2. $-8(7)$

   <span style="color:red">-56</span>

3. $5(-7)$

   <span style="color:red">-35</span>

4. $2\left(-\frac{5}{7}\right)$

   <span style="color:red">$-\frac{10}{7}$</span>

5. $\left(-\frac{3}{4}\right)\left(\frac{7}{8}\right)$

   <span style="color:red">$-\frac{21}{32}$</span>

6. $\left(-\frac{4}{5}\right)\left(-\frac{5}{6}\right)$

   <span style="color:red">$\frac{20}{30} = \frac{2}{3}$</span>

7. $(6.8)(-1.3)$

   <span style="color:red">-8.84</span>

8. $(-5)(7)(-3)$

   <span style="color:red">105</span>

9. $\left(-\frac{2}{3}\right)(-9)$

   <span style="color:red">6</span>

10. $\left(\frac{3}{5}\right)(-6)(-15)$

    <span style="color:red">54</span>

11. $\left(\frac{2}{3}\right)(-4)(9)$

    <span style="color:red">-24</span>

12. $(-5)(7)(-12)(0)$

    <span style="color:red">0</span>

13. $\left(\frac{3}{8}\right)(-24)(5)(3)$

    <span style="color:red">-135</span>

14. $(-3.6)(0.057)$

    <span style="color:red">-0.2052</span>

15. $(-1.32)(-5)(2.1)$

    <span style="color:red">13.86</span>

16. $\left(\frac{5}{6}\right)\left(-\frac{5}{6}\right)(-9)$

    <span style="color:red">$\frac{25}{4}$</span>

17. $\left(-\frac{1}{2}\right)\left(\frac{7}{12}\right)\left(-\frac{4}{5}\right)$

    <span style="color:red">$\frac{7}{30}$</span>

18. $\left(\frac{8}{9}\right)\left(\frac{3}{5}\right)\left(-\frac{1}{4}\right)$

    <span style="color:red">$-\frac{2}{15}$</span>

19. $\left(\frac{7}{8}\right)(-16)(-7)\left(-\frac{1}{14}\right)$

    <span style="color:red">-7</span>

20. $(5)(-3)(-1)(-4)$

    <span style="color:red">-60</span>

21. $\left(\frac{5}{16}\right)(-2)(-4)\left(-\frac{4}{5}\right)$

    <span style="color:red">-2</span>

(Student Worksheet Continued – Answer Key)

Simplify each expression.

22. $5s(-6t)$

    -30st

23. $6x(-7y) + (-15xy)$

    -57xy

23. $7x(-3y) + 3x(-4y)$

    -33xy

24. $(-5a)(-2b) - (-8a)(6b)$

    58ab

25. $6(3m - m) + 3(m + 2m)$

    21m

26. $6(-2x) - 14x$

    -26x

27. $5(-4n) - 25n$

    -45n

28. $5(2x - x)$

    5x

29. $-7(3d + d)$

    -28d

30. $-2a(-3c) + (-6y)(6r)$

    6ac – 36ry

31. $7m(-3n) + 3s(-4t)$

    -21mn – 12st

Evaluate each expression if m = $-\frac{2}{3}$, n = $\frac{1}{2}$, and p = $-3$:

32. 6mn

    -2

33. np

    $-\frac{3}{2}$

34. $n^2(m + 2)$

    $\frac{1}{3}$

35. $p^2 + m$

    $\frac{25}{3}$

36. $m + \frac{p}{5}$

    $-\frac{19}{15}$

37. $p(m + n)$

    $\frac{1}{3}$

38. $2(p + 4) - (m + n)$

    $\frac{13}{6}$

39. $6p + m - m$

    $-\frac{58}{3}$

40. $\frac{m+n}{n}$

    $-\frac{1}{3}$

Multiplying Rational Numbers
~
Student Practice Worksheet
Rubric

| Criteria | | | | | |
|---|---|---|---|---|---|
| | 4 | 3 | 2 | 1 | 0 |
| Mechanics | No math errors | No major math errors or serious flaws in reasoning | May be some serious math error or flaws in reasoning | Major math errors or serious flaws in reasoning | Blank answers |

Quiz Grading Rubric:

| Problem | Total points of Correct Answer | | Problem | Total points of Correct Answer | |
|---|---|---|---|---|---|
| 1. | | | 21. | | |
| 2. | | | 22. | | |
| 3. | | | 23. | | |
| 4. | | | 24. | | |
| 5. | | | 25. | | |
| 6. | | | 26. | | |
| 7. | | | 27. | | |
| 8. | | | 28. | | |
| 9. | | | 29. | | |
| 10. | | | 30. | | |
| 11. | | | 31. | | |
| 12. | | | 32. | | |
| 13. | | | 33. | | |
| 14. | | | 34. | | |
| 15. | | | 35. | | |
| 16. | | | 36. | | |
| 17. | | | 37. | | |
| 18. | | | 38. | | |
| 19. | | | 39. | | |
| 20. | | | 40. | | |

Total: _____
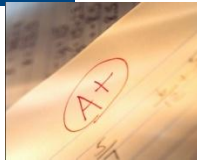
Multiplying Rational Numbers
~
Quiz

Name_____Date_____Grade_____

Find the product of the rational numbers.

1.    $(-5)(7)(-12)(0)$

2.    $\left(\frac{3}{8}\right)(-24)(5)(3)$

3.    $\left(\frac{8}{9}\right)\left(\frac{3}{5}\right)\left(-\frac{1}{4}\right)$

4.    $\left(\frac{7}{8}\right)(-16)(-7)\left(-\frac{1}{14}\right)$

Simplify each expression.

5.    $6x(-7y) + (-15xy)$

6.    $6(3m - m) + 3(m + 2m)$

7.    $5(2x - x)$

8.    $-2a(-3c) + (-6y)(6r)$

Evaluate each expression if $m = \frac{3}{2}$, $n = -\frac{5}{4}$, and $p = -\frac{1}{3}$:

9.    $n^2(m + 2)$

10.    $m + \frac{p}{5}$

11.    $2(p + 4) - (m + n)$

12.    $\frac{m+n}{n}$

Multiplying Rational Numbers
~
Quiz
Answer Key

Name_____Date_____Grade_____

Find the product of the rational numbers.

1.  $(-5)(7)(-12)(0)$

    0

2.  $\left(\frac{3}{8}\right)(-24)(5)(3)$

    -135

3.  $\left(\frac{8}{9}\right)\left(\frac{3}{5}\right)\left(-\frac{1}{4}\right)$

    $-\frac{2}{15}$

4.  $\left(\frac{7}{8}\right)(-16)(-7)\left(-\frac{1}{14}\right)$

    -7

Simplify each expression.

5.  $6x(-7y) + (-15xy)$

    -57xy

6.  $6(3m - m) + 3(m + 2m)$

    21m

7.  $5(2x - x)$

    5x

8.  $-2a(-3c) + (-6y)(6r)$

    6ac – 36ry

Evaluate each expression if $m = \frac{3}{2}$, $n = -\frac{5}{4}$, and $p = -\frac{1}{3}$:

9.  $n^2(m + 2)$

    $\frac{175}{32}$

10.  $m + \frac{p}{5}$

    $\frac{43}{30}$

11.  $2(p + 4) - (m + n)$

    $\frac{84}{12} = 7$

12.  $\frac{m+n}{n}$

    $-\frac{1}{5}$

Multiplying Rational Numbers
~
Quiz
Rubric

| Criteria | | | | | |
|---|---|---|---|---|---|
| | 4 | 3 | 2 | 1 | 0 |
| Mechanics | No math errors | No major math errors or serious flaws in reasoning | May be some serious math error or flaws in reasoning | Major math errors or serious flaws in reasoning | Blank answers |

Quiz Grading Rubric:

| Problem | Total points of Correct Answer | | Problem | Total points of Correct Answer | |
|---|---|---|---|---|---|
| 1. | | | 7. | | |
| 2. | | | 8. | | |
| 3. | | | 9. | | |
| 4. | | | 10. | | |
| 5. | | | 11. | | |
| 6. | | | 12. | | |

Total:_____