Important Concepts . . .

Preview Review

Mathematics   Grade 9   TEACHER KEY

W1 - Lesson 4:   Order of Operations

Important Concepts of Grade 9 Mathematics

Materials Required

Paper
Pencil
Calculator

No Textbook Required

This is a stand-alone course.

Mathematics Grade 9
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Preview/Review Concepts
for
Grade Nine Mathematics
Teacher Key

W1 – Lesson 4:

Order of Operations

OBJECTIVES

By the end of this lesson, you will be able to:

- Solve problems involving operations with rational numbers.

- Solve a given problem by applying the order of operations without the use of technology.

- Solve a given problem by applying the order of operations with the use of technology.

- Identify the error in applying the order of operations in a given incorrect solution.

GLOSSARY

BEDMAS: An acronym used to apply the order of operations.
(Brackets, Exponents, Division/ Multiplication, Addition/Subtraction)

Sum: The answer that results when numbers are added.

Difference: The answer that results when numbers are subtracted.

Product: The answer that results when numbers are multiplied.

Quotient: The answer that results when number are divided.

Dividend: The number that is being divided by another number.

W1 – Lesson 4: Order of Operations

Materials required:

- Paper, Pencil, and Calculator

Part 1: Adding and Subtracting Rational Numbers

Rational numbers can be added or subtracted. The use of a calculator can be helpful.

Example 1– Adding and Subtracting Integers

When adding or subtracting integers, apply these strategies:

- Look for pairs of opposite integers that can cancel each other out.

- Try rearranging the question so that the positive and negative integers are grouped together. Add the positive integers and the negative integers separately, then add the results together.

- Use a calculator with a sign change key.

  $(46) + (34) + (–20) + (–26)$ $(20) – (30)$
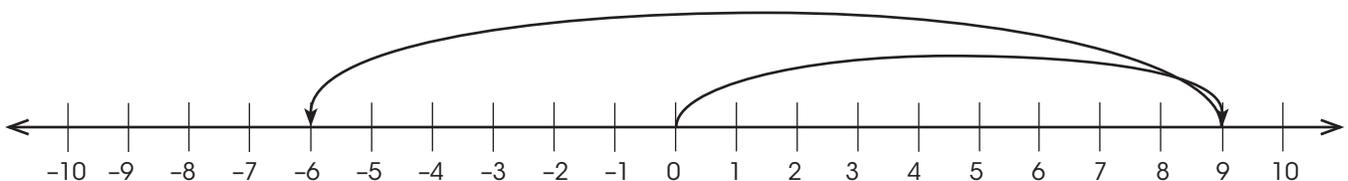 $= 34$ $= –10$

To show this on a number line, remember to move right when dealing with positive numbers, and to move left when dealing with negative numbers.

Example 1

Example: $(+9) + (–15)$

Example 2 – Adding and Subtracting Fractions

To evaluate, use equivalent fractions to ensure the denominators are the same.

For example,

$$\frac{13}{15} - \frac{5}{10}$$

Step 1: Find the lowest common multiple of the denominators (this will be the loweest common denominator).

> 10: 10, 20, 30, 40, . . .
> 15: 15, 30, 45 . . .
>
> The LCD of 10 and 15 is 30.

Step 2: Find the equivalent fractions with the lowest common denominator.

$$\frac{5}{10} \square \frac{3}{3} = \frac{15}{30} \qquad \frac{13}{15} \square \frac{2}{2} = \frac{26}{30}$$

Step 3: Subtract the two fractions.

$$\frac{26}{30} - \frac{15}{30} = \frac{11}{30}$$

> Remember to leave the denominator the same!

Step 4: Simplify if possible. The final answer should be in simplest form.

Example 3 – Adding and Subtracting Decimals

When adding or subtracting decimal numbers, it is important to stack up the decimals, then find the sum or difference.

$$3.75 + 3.5 = \begin{array}{r} 3.75 \\ +3.5 \\ \hline 7.25 \end{array} \qquad 10.20 - 4.5 = \begin{array}{r} 10.2 \\ -\ 4.5 \\ \hline 5.70 \end{array}$$

Practice Questions

1. Add the following fractions.

    a. $\dfrac{1}{8} + \dfrac{3}{8} =$

    $\dfrac{4}{8} = \dfrac{1}{2}$

    b. $\dfrac{1}{10} + \dfrac{2}{5} =$

    $\dfrac{5}{10} = \dfrac{1}{2}$

    c. $5\dfrac{1}{6} + 3\dfrac{3}{4} =$

    $8\dfrac{11}{12}$

2. Subtract the following fractions.

    a. $\dfrac{7}{8} - \dfrac{1}{8} =$

    $\dfrac{6}{8} = \dfrac{3}{4}$

    b. $\dfrac{9}{10} - \dfrac{3}{5} =$

    $\dfrac{3}{10}$

    c. $2\dfrac{3}{5} - \dfrac{3}{8} =$

    $2\dfrac{9}{40}$

3. Add the following decimal numbers.

    a. 132.254 + 21.22 =

    153.474

    b. 2.26 + 0.334 + 6 =

    8.594

    c. −200 + 25 + −7=

    −182

    d. 80 + 25 − −50=

    155

4. Find the difference.

    a. 6.05 − 4.251 =

    1.799

    b. 4.08 − 1.9 =

    2.18

    c. 1 − −61 =

    62

    d. 30 − 36 =

    −6

Part 2: Multiplying and Dividing Rational Numbers

Rational numbers can also be divided or multiplied. A calculator can be used to find the product or quotient.

Example 1 – Multiplying and Dividing Integers

Apply the following sign rules when multiplying or dividing integers:

- An even number of negative signs will yield a positive answer.
- An odd number of negative signs will yield a negative answer.

$-4 \times -3 = 12$ There are an **even** number of negative signs.
So the product is **positive**.

$6 \times -8 = -48$ There are an **odd** number of negative signs.
So the product is **negative**.

Example 2 – Multiplying and Dividing Fractions

To multiply fractions, it is finding a fraction of a fraction. When multiplying fractions numerically, remember these steps:

- Convert any mixed numbers into improper fractions.

- Simplify the numerators and denominators. To do this, divide the numerators and denominators by a common factor.

- Multiply the numerators.

- Multiply the denominators.

- If an improper fraction results, change it into a mixed number.

- Simplify if possible. The final answer should be in simplest form.

$$\frac{5}{7} \square \frac{4}{8} = \frac{20}{56}$$

$$\frac{20}{56} \text{ becomes } \frac{5}{14}$$

When dividing fractions, follow these steps:

- Convert any mixed numbers into improper fractions.

- Multiply the first term by the reciprocal of the second term. The reciprocal is the "flip" of the fraction or number.

- Multiply the numerators.

- Multiply the denominators.

- If an improper fraction results, change it into a mixed number.

- Simplify if possible. The final answer should be in simplest form.

$$\frac{3}{4} \mid \frac{1}{5} = \frac{3}{4} \square \frac{5}{1} = \frac{15}{4}$$

$$\frac{15}{4} \text{ becomes } 1\frac{3}{4}$$

Example 3 – Multiplying and Dividing Decimals

When multiplying decimals, multiply as they were whole numbers. Then go back and put in the decimal after applying this rule:

- Count the number of decimal places in the first number
- Count the number of decimal places in the next number
- Add these up the get product.

$11.3 \times 6.77 = 76.501$ There is one decimal in the first factor and two decimals in the second factor. The product will then have three decimal places. Check it on your calculator.

Practice Questions

1. Multiply the following integers.

   a. $-5 \times -6 =$ _____ ***30*** _____

   b. $-3.2 \times 3.1 =$ _____ ***-9.92*** _____

   c. $-0.3 \times -12 \times -4 =$ _____ ***-14.4*** _____

   d. $(10)(-10)(10)(-10) =$ _____ ***10 000*** _____

2. Divide the following integers.

   a. $\dfrac{-20}{-4} =$ _____ ***5*** _____

   b. $-3.2 \div 0.8 =$ _____ ***-4*** _____

   c. $-1.2 \div -0.6 =$ _____ ***2*** _____

   d. $-100 \div -0.05 =$ _____ ***2000*** _____

3. Find the product.

   a. $13.7 \times 3.1 =$ _____ ***42.47*** _____

   b. $8.1 \times 4.31 =$ _____ ***34.911*** _____

   c. $\dfrac{2}{3} \times \left(-\dfrac{3}{5}\right) =$ _____ $-\dfrac{\mathbf{6}}{\mathbf{15}}$ _____

   d. $\left(-2\dfrac{3}{5}\right) \times \dfrac{3}{8} =$ _____ $-\dfrac{\mathbf{39}}{\mathbf{40}}$ _____

4. Find the quotient.

   a. $87.5 \div 6.3 =$ _____ ***13.8 ...*** _____

   b. $10.2 \div 3.5 =$ _____ ***2.914 ...*** _____

   c. $\left(-\dfrac{3}{8}\right) \div \dfrac{9}{4} =$ _____ $-\dfrac{\mathbf{12}}{\mathbf{72}}$ _____

   d. $\left(-1\dfrac{3}{4}\right) \div \left(-1\dfrac{1}{3}\right) =$ _____ $\dfrac{\mathbf{21}}{\mathbf{16}} = \mathbf{1}\dfrac{\mathbf{5}}{\mathbf{16}}$ _____

Part 3: Order of Operations with Rational Numbers

Operations must be completed in a particular order: BEDMAS.

1. Do the operations inside the brackets first.
2. Then do any exponents.
3. Do multiplication and division as they occur from left to right.
4. Do addition and subtraction as they occur from left to right.

   Remember: **B   E   D   M   A   S**
   (brackets, exponents, division/multiplication, addition/subtraction)

For example, $5 \times 6 + 4 \div 2$

1. Do 5×6 first
2. So . . . $30 + 4 \div 2$
3. Do $4 \div 2$ next
4. So . . . $30 + 2$
5. Finally do $30 + 2$
6. The answer is 32

> Show Work as…
>
> $5 \times 6 + 4 \div 2$
> $= 30 + 4 \div 2$
> $= 30 + 2$
> $= 32$

Example 1

$(2.7 \div 3) \times 6.22 + 7^2$

$= (0.9) \times 6.22 + 7^2$	brackets
$= (0.9) \times 6.22 + 49$	exponents
$= 5.598 + 49$	multiplication
$= 54.598$	addition

Practice Questions

1. Evaluate the following.

    a. $-2.3 + \left[1.5 - (-4.3)\right] \div (-0.4) = \underline{\ \ \textbf{\textit{-16.8}}\ \ }$

    b. $\dfrac{3}{4} + \dfrac{5}{8} \times \left(-\dfrac{1}{2}\right) = \underline{\ \ \dfrac{\textbf{\textit{7}}}{\textbf{\textit{16}}}\ \ }$

2. Evaluate the following.

    a. If $x = 1.6$ and $y = -3.1$, evaluate $-3x + 2y = \underline{\ \ \textbf{\textit{-11}}\ \ }$

    b. If $x = -0.7$ and $y = -2.4$, evaluate $-4y + 3x = \underline{\ \ \textbf{\textit{7.5}}\ \ }$

Lesson 4 Assignment

1. Find the sum.

    a. $-2\dfrac{2}{5} + 1\dfrac{1}{10} = \underline{\ \ -\textbf{\textit{1}}\dfrac{\textbf{\textit{3}}}{\textbf{\textit{10}}}\ \ }$

    b. $-7.4 + -4.3 = \underline{\ \ \textbf{\textit{-11.7}}\ \ }$

    c. $\left(-\dfrac{4}{5}\right) + \dfrac{2}{3} = \underline{\ \ -\dfrac{\textbf{\textit{2}}}{\textbf{\textit{15}}}\ \ }$

    d. $-12.8 - 4.5 = \underline{\ \ \textbf{\textit{-17.3}}\ \ }$

2. Find the difference.

    a. $1\dfrac{5}{8} - \left(-\dfrac{13}{5}\right) = \underline{\ \ \textbf{\textit{4}}\dfrac{\textbf{\textit{9}}}{\textbf{\textit{40}}}\ \ }$

    b. $-3.1 - -12.5 = \underline{\ \ \textbf{\textit{9.4}}\ \ }$

    c. $\left(-\dfrac{2}{5}\right) - \left(-\dfrac{3}{4}\right) = \underline{\ \ \dfrac{\textbf{\textit{7}}}{\textbf{\textit{20}}}\ \ }$

    d. $-16.3 - -5.5 = \underline{\ \ \textbf{\textit{-10.8}}\ \ }$

3. Find the product.

a. $\left(-\dfrac{3}{8}\right) \times \dfrac{9}{4} = \underline{\quad -\dfrac{27}{32} \quad}$

b. $\dfrac{5}{8} \times \left(-\dfrac{1}{2}\right) = \underline{\quad -\dfrac{5}{16} \quad}$

c. $(9.76)(-32.4) = \underline{\quad -316.224 \quad}$

d. $(1.2)(-0.8)(2.3) = \underline{\quad -2.208 \quad}$

4. Find the quotient.

a. $2\dfrac{3}{5} \mid \dfrac{3}{8} =$

$\underline{\quad 6\dfrac{14}{15} \quad}$

b. $\dfrac{5}{4} \mid \dfrac{3}{8} =$

$\underline{\quad \dfrac{40}{12} = 3\dfrac{1}{3} \quad}$

c. $2.3 \div (-4.1) =$

$\underline{\quad -0.5609 \dots \quad}$

d. $(-5.4) \div (0.9) =$

$\underline{\quad -6 \quad}$

5. Evaluate

a. If $x = -12.6$ and $y = 37.3$, evaluate $x - y$.

$\underline{\quad -49.9 \quad}$

b. If $x = -1.25$ and $y = 2.5$, evaluate $2y + 3x$.

$\underline{\quad 1.25 \quad}$

6.　Evaluate

　　a.　$\left[(-3.5)-(-1.2)\times1.3\right]+5.2-(-4.7)=$

　　　　　= –1.94 + 5.2 – –4.7
　　　　　= 7.96

　　b.　$\left(\dfrac{2}{3}+\dfrac{1}{4}\right)-\left(\dfrac{3}{2}\times\dfrac{8}{9}\right)\div\dfrac{4}{3}=$

　　　　$=\dfrac{11}{72}-\dfrac{24}{18}\times\dfrac{3}{4}$

　　　　$=\dfrac{11}{72}-\dfrac{72}{72}$

　　　　$=\dfrac{66}{72}-\dfrac{72}{72}$

　　　　$=-\dfrac{6}{72}$

　　　　$=-\dfrac{1}{12}$

　　c.　$\left[\left(-1\dfrac{1}{3}\right)+\left(2\dfrac{2}{5}\right)\right]\times\dfrac{3}{8}=$

　　　　$=\dfrac{16}{15}\times\dfrac{3}{8}$

　　　　$=\dfrac{48}{120}$

　　　　$=\dfrac{2}{5}$