

<b>Lesson Title: Order of Operations</b>		<b>Pre 5.1</b>
<b>Utah State Core Standard and Indicators</b> Algebra Standards 1-2 Process Standards 1-5		
<b>Summary</b>		
In this lesson, students will first use the calculator to derive the order of operations. Then they problem solve to arrive at the same solution by placing parenthesis in 4 different numeric problems.		
<b>Enduring Understanding</b>	<b>Essential Questions</b>	
Just like any language, Algebra involves basic principles which we all use in order to communicate and understand each other well.	Why do we need an order of operations? Why is our “order of operations” in the order it is?	
<b>Skill Focus</b>	<b>Vocabulary Focus</b>	
<ul style="list-style-type: none"> <li>Using Order of Operations</li> </ul>		
<b>Assessment</b>		
Allow small groups of students to work on the Order of Operations Group Problem Solving, Reviews, Quizzes and Tests (See below)		
<b>Materials:</b> TI-73 Calculators		
<b>Launch</b>		
<b>Explore</b>		
<b>Summarize</b>		
<b>Apply</b>		

**Directions:**

This site has some good information for order of operations.

<http://rinkworks.com/brainfood/eq.shtml>

The teacher directs students in small groups and moderates the large group discourse about the calculator inquiry. Students should prepare to present their findings about order of operations and algebraic properties.

For Order of Operations Problem Solving, suggest to students they find several solutions to each example by placing parenthesis in different places. The key to this is in the last problem and in knowing how to divide using fractions. The teacher may have to intercede if students aren't getting the answer of 45 for the last problem.

You might use the practice included below for starters.

**Pre 5.1a****Order of Operations  
Calculator Inquiry**

Do the following problems without the calculator. Then check on the calculator.

<b>Problem</b>	<b>Student Answer</b>	<b>Calculator Answer</b>	<b>What are the steps the calculator used to get the answers?</b>
$12 - 5 + 4 * 3$			
$2 * 5 - 6 + 2 * 0$			
$16 \div 8 \div 4$			
$16 \div (8 \div 4)$			
$12 \div 2 + 9 * 2$			
$(8 - 2) / (2+1)$			
$2(5 + 9)$			
$2 * 5 + 2 * 9$			
$8 - 2^3 + 1$			
$-3^2$			
$100/5 * 2$			
$100/5(2)$			

What do we learn from the calculator about Order of Operations?

Why is it important to use the Order of Operations?

## Pre 5.1b

## Problem Solving

### Order of Operations

Insert parentheses, if needed, in each of the following expressions so the answer for all problems will be the same.

Suggestion: Find all the possibilities for each problem by placing parenthesis in different places.

**Prove your answer by showing your work!**

$$4 + 3 * 7 - 4$$

$$2 * 5 - \frac{1}{2} * 10 * 9$$

$$2 * 3 + 3 * 5$$

$$3^2 \div \frac{1}{3} + 3 * 6$$

**How will you remember to use Order of Operations?**

## Order of Operations practice, review or quizzes

I. Simplify the following

$21 + 9 \div 3 + 9 \underline{\hspace{2cm}}$

$4[3^3 - 5(8 - 6)] \div 2 + 11 \underline{\hspace{2cm}}$

Make the following expressions equal to 21 by placing parenthesis.

$4 + 5 \cdot 3 - 6$

$15 \div 5 + 2 \cdot 4 + 10$ 

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II. Simplify the following

1)  $24 \div 3(5 - 3)$       2)  $2^3[(15 - 7) \div 2]$

3) Make the following expressions equal to 35 by placing parenthesis.

$8 - 3 \cdot 9 - 2$

$15 + 10 \cdot 8 \div 4$ 

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III. Order of Operations problem solving

Insert the proper operation signs (+, -,  $\times$ ,  $\div$ ) and grouping symbols, when needed, to make each sentence true.

$4 \quad 2 \quad 1 = 1$

$4 \quad 2 \quad 1 = 2$

$4 \quad 2 \quad 1 = 3$

$4 \quad 2 \quad 1 = 4$

$4 \quad 2 \quad 1 = 5$

$4 \quad 2 \quad 1 = 6$