Date: _____

Unit 1: Number Sense

Lesson #3: Order of Operations (This will be 3 days online

It is very important to understand that the order of operations outlined by BEDMAS applies to ALL forms of mathematical expressions.

Whether we are working with whole numbers, integers, fractions, or algebraic terms, we MUST follow the appropriate order of operations!!!

Order of Operations

Brackets ( )
Exponents n^x
Divide ÷ } in the order they appear
Multiply x }
Add + } in the order they appear
Subtract -

Breaking BEDMAS into its Parts

It is very important that you are able to **identify the operation** that is being represented when you look at an expression.

Brackets are usually the first thing that create confusion. Remember that 'B' tells you to simplify the stuff inside the brackets as much as you can. If you only have one number inside brackets, there is nothing else that you can do.

ex/ What would you do first to simplify (-2 + 5) - (-3)?

start here

$= 3 + 3$

ex/ What do the brackets in the statement (3)(-5) indicate? How is this different from the 'B' in BEDMAS?

same as $3 \times (-5)$

Brackets beside each other mean multiplication

Exponents come next. What does an exponent represent? For example, what does $(4)^3$ mean?

$(4)^3 = (4)(4)(4) = 64$

→ repeated multiplication

'E' tells us to apply the exponent to the term it is attached to. Another tricky part of exponents comes when we introduce integers. You MUST remember that the exponent applies to the term it is connected to. If you want to apply it to the sign of the term, you have to use brackets!

ex/ Try -3^2 and $(-3)^2$ on your calculator. How are the answers different?

$-(3 \times 3) = -9$ $\quad (-3)^2 = (-3) \times (-3) = 9$ → different signs

ex/ Simplify $(-2 - (-3 + 2))^4 - (-2)^3$. Show your work!

$= (-2 - (-1))^4 - (-8)$

$= (-2 + 1)^4 + 8$

$= (-1)^4 + 8$

$= 1 + 8 = 9$

$(-2)^3 = (-2)(-2)(-2) = -8$

$(-1)^4 = (-1)(-1)(-1)(-1) = 1$

Another tricky thing about 'E' comes when we introduce fractions. Remember that the meaning of an exponent is still the same, no matter what the base is.

ex/ Write $\left(\frac{2}{3}\right)^3$ in expanded form, then simplify.

Shortcut: Apply the exponent to the top and the bottom of the fraction!

The tough stuff is taken care of now. Division and Multiplication come next, **in the order they appear from left to right!**

What are some ways that we can represent division?

- fraction - / - ÷

What are some ways that we can represent multiplication?

- ( )( ) - dot - x - 2y ← multiplication

ex/ Evaluate $-3(4 - 6)^2 \div (5 - 2)$. Show your work!

$= -3(-2)^2 \div 3$

$= -3(4) \div 3$

$= -12 \div 3$

$= -4$

$(-2)^2 = (-2)(-2)$

$= 4$

do this then divide

ex/ Evaluate $\left(\frac{(5)(6) \div 3}{-2}\right)^4$. Show your work!

$= \left(\frac{30 \div 3}{-2}\right)^4$

$= \left(\frac{10}{-2}\right)^4$

$= (-5)^4$

$= 625$

$(-5)^4 = (-5)(-5)(-5)(-5)$

$= 625$

$(-5)^{\times 4}$

The last step is to complete any Addition and Subtraction, again **in the order that they appear from left to right!** It is important to remember that the sign in front of a number is attached to it, so if you decide to reorganize terms the signs need to move too!

Continue to combine signs and apply integer rules as you were before - order of operations does not change the operations themselves!

ex/ Evaluate $-2[5^2 - (-10)(-2)] + (-3) - (-5)$. Show your work!

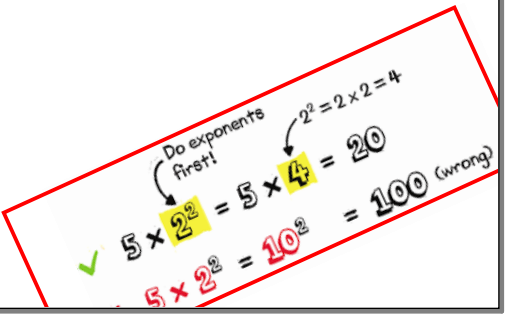
$= -2[25 - 20] - 3 + 5$

$= -2(5) + 2$

$= -10 + 2$

$= -8$

ex/ Evaluate $\left(-\frac{2}{5}\right)^2 \left(\frac{5}{8}\right) - \frac{1}{2} + \frac{3}{4} \div \frac{1}{8}$. Show your work!



Expectations when Evaluating Expressions Using BEDMAS

- Steps will be shown so that it is possible to follow the solution. The focus is on the process, not the product! The right answer is not the only goal here.
- **Fractions MAY NOT be turned into decimals**. The only time that decimals are acceptable is when the question contains them to start, or if it is a real-world problem involving measurement or money.
- Work must be organized and legible. Each line must have one equals sign, and work is arranged vertically.
- Multiple steps can be done in one line of work, as long as the process is evident.
- Calculators will be accessible, but should not be relied upon. Again, the process is very important, and understanding operations with regular numbers will make operations with complex relations much easier to understand as you progress through mathematics courses!

Practice Problems

Evaluate each of the following by applying the appropriate order of operations. Show your steps!

- $(-3-2(-4))^2+(20\div(8-4))^2$

$=(-3+8)^2+(20\div 4)^2$

$=(5)^2+(5)^2$

$=25+25$

$=50$

- $\dfrac{(-3)^4+(5)(-2)-8^2}{3-(4-6)^2}$

$=\dfrac{81-10-64}{3-(-2)^2}$

$=\dfrac{7}{3-4}$

$=\dfrac{7}{-1}$

$=-7$

Tomorrow

$$\frac{4}{5}-\frac{2}{3}(-2)-\left(\frac{3}{10}\right)$$

$$\frac{3}{25}(-2+(-3))^3-(-2)(5)+\left(\frac{3}{2}\right)^2$$