Chapter 31

ORDERS: OPERATIONS

The ORDER OF OPERATIONS is an order agreed upon by all mathematicians (and math students!) that should be closely followed. Follow this order:

 1^{8T} Any calculations inside parentheses or brackets should be done first. (This includes all grouping symbols, such as (), $\{$ $\}$, and [].)

200 Exponents, roots, and absolute value are calculated left to right.

Multiplication and division—whichever comes first when you calculate left to right.

476 Addition and subtraction—whichever comes first when you calculate left to right.

Lots of people use the mnemonic "Please Excuse My Dear Aunt Sally" for PENDAS (Parentheses, Exponents, Multiplication, Division, Addition, and Subtraction) to remember the order of operations, but it can be VERY misleading. You can do division before multiplication as long as you are calculating from left to right—the same thing goes for addition and subtraction. Also, because other calculations like roots and absolute value aren't included, PEMDAS isn't totally foolproof.

EXAMPLE:

First, multiply the 3 and 2 together.

Then add.

EXAMPLE:
$$6 + (12 \div 4) - 2$$
 Start with the

calculation inside the parentheses first.

$$= 6 + (3) \cdot 2$$

Next, multiply the 3 and 2 together.

Then add.

EXAMPLE:
$$3^2 - 4(6+1) - 2$$
 Start with the exponent and the calculations inside the parentheses.

$$=9-4(7)-2$$
 Next, multiply.

Whenever you have two sets of parentheses or brackets nested inside one another, CALCULATE THE INNERMOST SET OF PARENTHESES OR BRACKETS FIRST, then work outward.

EXAMPLE:
$$(14 \div (9 - 2) + 1) \cdot 6$$
 Start with the calculations inside the innermost parentheses: $9 - 2 = 7$.

=
$$(14 \div 7 + 1) \cdot 6$$
 Next, divide inside the brackets: $14 \div 7 = 2$.

For 1, fill in the blanks:

According to the order of operations, follow this order:	
First, do any calculations inside parentheses or	
(This includes all grouping symbols, such as (), { },	
and [].) Then, calculate exponents, roots, and	
Next, do multiplication and division (it doesn't matter	
whether you doo	r multiplication first, as long
as you calculate from	to). Then, do
addition and subtraction (it doesn't matter whether you	
	first as long as you calculate
from to).	• •

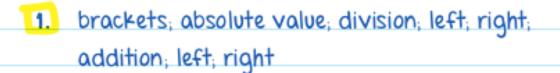
For 2 through 10, simplify the following expressions:

- 2. 4+8 2
- 3. 2+6+8²
- <u>4.</u> 9+(9-4•2)
- 5. 4² + (19 15) 3

1.
$$(6-3)^2-(4+-3)^3$$

9.
$$\frac{27}{-3}$$
 + $(12 \div 4)^3$

CHECK YOUR AUSWERS





2. 20

3. 72

4. 10

5. 28

6. 30

7. 8

8. 443

9. 18

10. 71

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