CLASS NOTES 4: ORDER OF OPERATIONS

Here are a few flies for sale on the Fly Fisher's Place website:



- 1. Suppose you purchase **3** Candyman Flies (at \$6 each) and **4** Beldar's Golden Stones (at \$3 each). How much did you spend?
- 2. Write out the math you did here (if you didn't already).

You might not know it, but you just used mathematical <u>order of operations</u>. The order of operations is a set of rules that helps everyone who encounters a line of numbers to deal with it in the same way. We read (in English) left to right, but that's not always how mathematical expressions are evaluated.

Now take a look at this expression:

3*11+2*13

- 3. What does *it* equal?
- 4. How is it similar to the Fly Fisher's Place problem you did up there? Write a sentence or two.
- 5. What if you bought **5** Candymen and **5** Golden Stones? How much wo uld *that* cost?
- 6. How does the expression **5*\$6+5*\$3** compare to what you just did? Write a sentence or two.

Here is another fly available at the Fly Fisher's Place.

 Suppose you wanted to purchase 10 each of the Candymen, Golden Stones and Copper Johns. Write out a mathematical expression to determine how much that would cost you in total. Then evaluate it.

	2 ⁷⁵
	Size
- of o	#16
	Quantity
	- 1 +
	ר אלd to Cart

8. Notice that, in the last few expenditures you calculated, you did two different mathematical operations (multiplications and additions). In which order did you do them? Write a sentence or two.

(let's <u>check-in here</u> and make sure we're all on the same page)

When you have an expression that involves both multiplication and addition (and nothing else...including no parentheses), you do all the multiplications first, and **then** the additions.

Basic Order of Operations

Do these in the listed order:

1. Multiplications

2. Additions

9. But now...what would *this* be equal to?

10*(\$6 + \$3 + \$2.75)

10. Write a sentence or two (or do some math!) to try to explain why that last expression is equivalent to the one in #7.

Sometimes in math, additions **need** to happen **before** multiplications. With parentheses, a new order of operations rule allows this to happen!

Order of Operations (revised)

1. If there are any *Parentheses*, do all the math inside them first

2. Do any Multiplications that are left

3. Then do any Additions

Let's try a few to practice. Evaluate each of these expressions. You'll probably encounter expressions like these in MTH 105!

11. **\$5 + 100*\$0.001**

12. **\$3 + 100*\$0.0014**

13. **\$0.5 + 100*\$0.006**

14. **10*10*9*10 + 10*9*10*10 + 9*10*10*10**

15. 10*(9*10+3*7)

16. **3*9*10**³

But wait! What's with the *exponent* there?

Order of Operations (*revised revision***)**

- 1. If there are any *Parentheses*, do all the math inside them first
- 2. If there are any *Exponents*, take care of them next
- 3. Do any *Multiplications* that are left
- 4. Then do any Additions

17. Try to explain why your answers for #14 and 16 are the same.

(let's <u>check-in here</u> and make sure we're all on the same page)

Let's try some with words:

18. "What is the sum of 8, 13, and 21, all divided by 3?"

19. "What's the average of 8, 13, and 21?"

20. What's the value of
$$\frac{8+13+21}{3}$$
?

21. Why are your last three answers the same?

(*let's <u>check-in here</u> and make sure we're all on the same page*)

Order of Operations (almost final revision)

1. If there are any *Parentheses*, do all the math inside them first

NOTE: Big fractions' numerators and denominators "count" as parentheses.

Ex.
$$\frac{8+13+21}{3}$$
 = (8 + 13 + 21) ÷ 3

If there are any *Exponents*, take care of them next
Do any *Multiplications* (or *Divisions*) that are left
Then do any *Additions* (or *Subtractions*)

22. What's the value of
$$\frac{12-11}{5}$$
?

23. What's the value of
$$\frac{12 \text{ inches} - 11 \text{ inches}}{5 \text{ inches}}$$
?

24. What's the value of
$$\frac{12 \text{ inches} - 11 \text{ inches}}{5}$$
?

25. What's the value of
$$\frac{(5-3)^2 + (5-5)^2 + (5-1)^2}{3-1}$$
?

26. What's the value of $\frac{(5 \text{ feet} - 3 \text{ feet})^2 + (5 \text{ feet} - 5 \text{ feet})^2 + (5 \text{ feet} - 1 \text{ foot})^2}{3-1}$?

(*let's <u>check-in here</u> and make sure we're all on the same page*)

And that's *about* as complex as things will get in the world of stats at COCC.

27. Now, go back and make sure you can do each of these in an online calculator (like Google)!

(let's <u>check-in here</u> and make sure we're all on the same page)