Order of operations

Order of operations is a topic in pre-algebra. The acronym to remember is PEMDAS, which stands for

○ parentheses

○ exponents

○ multiplication and division

○ addition and subtraction

I'm not crazy about this subject. For one thing, it usually employs the symbols $\times$ and $\div$, which we are going to do away with in algebra. A few examples:

1

$$42 \div 7 \times 3$$

Since multiplication and division are at the same "level" in the hierarchy, and operations at the same level are carried out left-to-right:

$$42 \div 7 \times 3 = 6 \times 3 = 18$$

In algebra we would write

$$\frac{42}{7} \cdot 3$$

which is unambiguous. And if we really wanted something different, we can use brackets

$$42 \div (7 \times 3) = \frac{42}{7 \cdot 3}$$

2

Here's one with multiplication and addition:

$$6 + 7 \times 3 = 6 + 21 = 27$$

Multiplication is at a higher level than addition, so we hold off on the addition and do the multiplication first. To force the other evaluation just write brackets:

$$(6 + 7) \cdot 3 = 39$$

Remember the distributive law!

$$3 \cdot (6 + 7) = 3 \cdot 13$$

And we can split up the terms any way that will make it easier. For example

$$3 \cdot (6 + 7) = 3 \cdot (10 + 3) = 3 \cdot 10 + 3 \cdot 3 = 39$$

brackets first

$$27 \div (8 - 5)^2 = 27 \div 3^2 = 27 \div 9 = 3$$

Here, the brackets direct us to do the subtraction first. then E comes before D, so we do the square, and then the division last. In algebra we would write

$$\frac{27}{(8 - 5)^3}$$

Brackets top and bottom:

$$\left(\frac{2 + 1}{3 - 1}\right)^2 = \frac{(2 + 1)^2}{(3 - 1)^2} = \frac{3^2}{2^2} = \frac{9}{4}$$

$$(18 \div 6 \times 5) - 14 \div 7 = (3 \cdot 5) - 2 = 13$$