[Order of operations example]

Order of operations refers to the set of rules around how strings of calculation should be approached. It's helpful for two purposes: firstly, so that there is no ambiguity when equations are used in written communication, and secondly, to minimize the need for notation like brackets. Being concise and elegant in mathematics is considered important, even though at first it always seems to make things seem more complicated and arbitrary.

Whether writing or reading mathematics, you could understand why an over-reliance on brackets might make things more complicated.

Before going through an example, let's focus on a couple of simple strategies and things to pay attention to.

Rather than thinking of an order over the whole string of calculations, think of it as blocks of addition and subtraction. These are the operations that will be done last, and we immediately break down the problem into smaller problems if we think of each of these blocks as terms that we'll evaluate first.

One operation that can cause confusion, particularly because we might not actually come across it until later, is the order or powers. These need to be done before multiplication, so 3 x 5^2 requires us to square the 5 first, and then multiply by 3. It's short for 3 x 5 x 5, so it would also be fine to multiply 3 x 5 and then multiply by 5 again, but we shouldn't confuse it with (3x5)^2, because this would be 3 x 5 x 3 x 5.

Then we also need to take special care with negative signs here. -3^2 means – (3^2) not (-3)^2. We could think of this as the same as -1 x 3^2, but it's more of a convention of notation. there's no particularly good reason for it – it's just a convention that at some stage important people must have agreed to.

So when we have

-4^2 +2x5^2 – 6/3 - 2 / 3 x 5 + 4(4-2)^2

We firstly break it down into our different blacks.

Then we can look at it term by term, as started before, -4^2 is the negative of 4^2, so this is -16.

With 2 x 5^2, we square 5 first, then multiply by 2, to give + 50

6/3 is 2 so this is minus 2 (might be easiest to apply the negative at the end in this case but it's the same as adding -6/3).

2 / 3 x5 we have to do in order. It's NOT 2/15, but rather, 2/3 multiplied by 5, fractions makes it easier 10/3 or 3 and a 1/3

Then with this last term, we solve what's inside the brackets 4-2 is 2, square it, to give 4, and then multiply it by the 4.

Now we're just left with the addition.

- 16 + 50 – 2 -10/3 and then add 16.

With a sequence like this we can use our commutativity associativity rules to cancel out the 16s, and this will just give us 51 and a third.