# Distributive Rule of Equality

Recall,

From multiplication that one trick to multiply large numbers is to put the number into expanded form, and multiply that way.

Ex.
$$\begin{array}{rcccc} 16 & = & 10 & + & 6 \\ \underline{\times 7} & & \underline{\times 7} & & \underline{\times 7} \\ 112 & = & 70 & + & 42 \end{array}$$

In a more abstract form, we can multiply a number by a sum (or difference) to get a product of the sum (or difference). Given three unknowns (a,b,c) , we can say the following:

$$c\,(a + b) = ca + cb$$

This is called the distributive rule of equality.

Ex. $x = 1 + 2i$ ; $y = 3x$ ; $y = ?$

$y = 3x = 3\,(1 + 2i) = 3 + 6i$ ; $y = 3 + 6i$

This can be useful to factor larger equations into more easily manipulative forms.

Ex. $x^2 + 3x = 0$ , $x = ?$

$x^2 + 3x = x\,(x + 3) = 0$

$x = 0$ , $x = -3$ (because $-3 + 3 = 0$, and anything times 0 equals 0).

To distribute the number, simply multiply it by the 1rst number, then use the proper sign (+ or -), then multiply the number by the second number, etc.

Exercises: use the distributive rule of equality on the following:

1.) $3(a + c) = ?$
2.) $a(3 + b) = ?$
3.) $-9(3 + c) = ?$
4.) $-5(t - x) = ?$
5.) $x(x + x^2) = ?$
6.) $b(x + x^2) = ?$
7.) $-c(-x - x^4) = ?$
8.) $x^3(x + x^4) = ?$

* $x^m \bullet x^n = x^{m+n}$

Try to factor the following using the above shown factoring method:

9.) $x^2 + 4x = 0$
10.) $2x^3 + x^2 = 0$