Mohammed Kaabar　　Solving linear Equations　　Sep. 15th, 2016
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* <u>linear Equation</u>: is a mathematical statement that has the following <u>general form</u>:

$ax + b = cx + d$ where a, b, c, and d are constants.

The above form also known as <u>1st-degree equation</u>.

* A mathematical statement of the form:

$2(x+2) = x - 2$ is an example of <u>linear equation</u>.

It's called linear because it's a first-degree equation ($\underline{\underline{x}}$ variable is to <u>power 1</u>).

* How to solve the linear Equation?

<u>Answer</u>: Find a real number that replaces the variable in the linear equation that makes the linear equation <u>true</u>. Solving linear equation is also called <u>solution</u> or <u>root of the equation</u>.

Ex1 Solve: $2(x+2)=x-2$

Solution:

Step 1: Apply what we learned from the steps of order of operation:

$$2(x+2)=x-2 \Rightarrow 2x+4=x-2$$

Step 2: Collect all terms of variable on one side, and the constants on the other side as follows:

$$2x-x=-4-2$$

$\Rightarrow \boxed{x=-6}$ This is the solution (root) of the given linear equation.

Check your solution:

Plug $x=-6$ in the given linear equation as follows:

$$2(-6+2) \stackrel{?}{=} -6-2$$

$$2(-4) \stackrel{?}{=} -8$$

$$-8 = -8 \checkmark$$

So, our solution is correct.

Ex 2 Solve: $3+4(2x-2) = -2(x+2)$

Solution:

$3+4(2x-2) = -2(x+2)$

$3 + 8x - 8 = -2x - 4$

$8x + 2x = -4 + 8 - 3$

$10x = 4 - 3$

$\frac{\cancel{10}x}{\cancel{10}} = \frac{1}{10}$

$\boxed{x = \frac{1}{10}}$ ← This is the solution (root) of our given linear equation.

Ex 3 Solve: $\frac{3}{2}(x-6) = \frac{7}{2}x - 3$

Solution: $\frac{3}{2}(x-6) = \frac{7}{2}x - 3$

$\Rightarrow \frac{3}{2}x - \frac{3 \times \cancel{6}^{3}}{\cancel{2}_{1}} = \frac{7}{2}x - 3$

$\Rightarrow \frac{3}{2}x - 9 = \frac{7}{2}x - 3$

$-9 + 3 = \frac{7}{2}x - \frac{3}{2}x \Rightarrow$

$-6 = x\left(\frac{7}{2} - \frac{3}{2}\right) \Rightarrow -6 = x\left(\frac{7-3}{2}\right) \Rightarrow$

$$\Rightarrow -6 = x\left(\frac{7-3}{2}\right)$$

$$\Rightarrow -6 = x\left(\frac{\cancel{4}^{2}}{\cancel{2}}\right)$$

$$\Rightarrow -6 = x(2) \Rightarrow \frac{\cancel{-6}^{3}}{\cancel{2}} = \frac{2x}{2} \Rightarrow -3 = x$$

So, $\boxed{x = -3}$ this is the solution (root) of our given linear equation.

Ex 4 Solve: $(x-2)(x-5) = -6(4x+7)+18+x^2$

Solution: $(x-2)(x-5) = -6(4x+7)+18+x^2$

$$\Rightarrow x^2 - 5x - 2x + 10 = -24x - 42 + 18 + x^2$$

$$\Rightarrow \cancel{x^2} - 5x - 2x + 24x - \cancel{x^2} = -42 + 18 - 10$$

$$\Rightarrow \frac{17x}{17} = \frac{-34}{17}$$

$\Rightarrow \boxed{x = -2}$ This is the solution of our given equation.

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* How to evaluate formulas?

Ex 5 Solve for the radius if given the area form of the circle.

Solution: Area of circle $= \pi r^2$ where r is the radius of the circle

To solve for r if $A = \pi r^2$, we do the following: $\frac{A}{\pi} = \frac{\cancel{\pi} r^2}{\cancel{\pi}} \Rightarrow r^2 = \frac{A}{\pi}$

then, $\boxed{r = \pm\sqrt{\frac{A}{\pi}}}$ This is the solution (root) of the given formula.

Ex 6 Solve for α if given $M = \beta\alpha + \gamma$

Solution: $M = \boxed{\beta\alpha} + \gamma$

$\Rightarrow \beta\alpha = M - \gamma$

$\Rightarrow \boxed{\alpha = \frac{M-\gamma}{\beta}}$ This is the solution (root) for the given formula