Simple Equations Solving and Python User Defined Function

-Shomi Ahmed

Figure Source : PBS Learning Media (https://www.pbslearningmedia.org/resource/muen-math-ee-writingalgequ/writing-algebraic-equations/#.WuDbtNPwYb0)

An **equation** is a statement with equality sign (=). For example-

$$4x - 7 = 5$$

Expression

Terms

Figure Source :

Here, the unknown quantity is known as variable.

- $\boxed{y + 1 = 2}$
- $\boxed{2z + 3 = 5}$

Above are also equations with varibales y & z respectively. Mainly, the small letters x, y, z are used as variables.

The format of a simple equation is $\boxed{ax + b = c}$, where, a, b, c are known as co-efficients.

To Do :

- Write 5 equations using each of x, y & z .

Process of Solving Equation :

The process of finding the value of the unknown is called solution and the value is called the root of the equation.

Steps-

1. $ax + b = c$ -Check equation if they are in this format or not. If not, take help from next steps to get this format.
2. $ax + b - b = c - b$ -Get rid of **b** by adding $\pm\mathbf{b}$ on both sides. Here, $-\mathbf{b}$ is added.
3. $ax = c - b$
4. $\dfrac{ax}{a} = \dfrac{(c-b)}{a}$ -Now get rid of **a** by dividing both sides by **a**.
5. Therefore, $x = \dfrac{(c-b)}{a}$ -Finally, the value of **x** is found.

You can also check out this video for an awesome explanation.

(https://www.youtube.com/watch?v=l3XzepN03KQ)
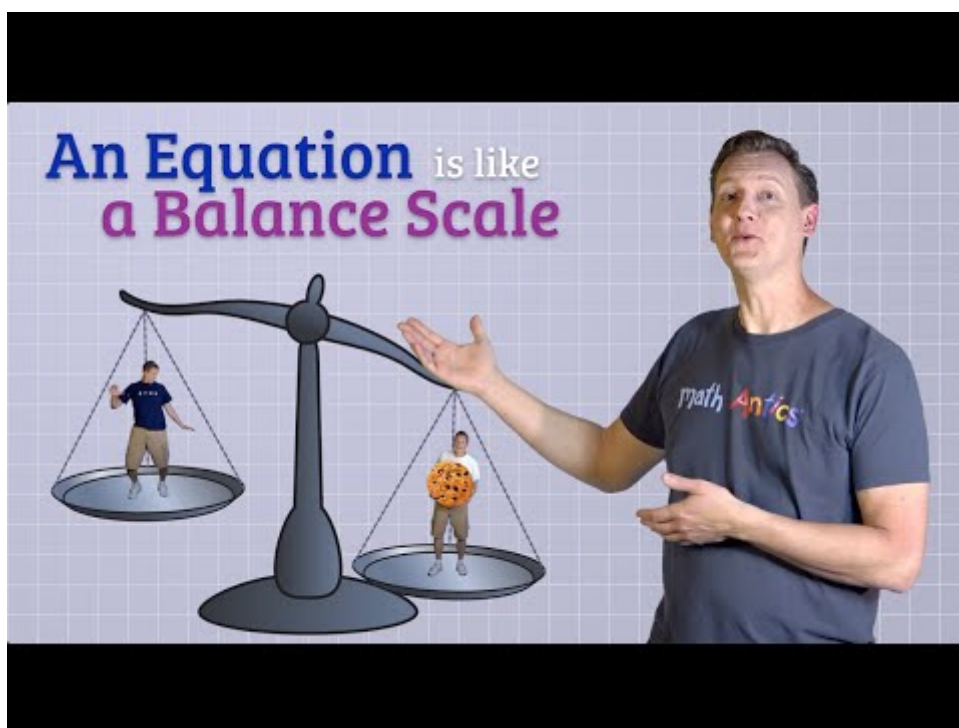
Now let's solve some equations-

A. $x + 1 = 2$

Solution

1. $x + 1 = 2$ - Check if it is in $ax + b = c$ format or not? Yes.
2. $x + 1 - 1 = 2 - 1$ - Get rid of 1 by adding -1 on both sides.
3. Finally, $x = 1$

Verification

Let's take the Left Hand Side (LHS) of equation **A** and use the value of $\boxed{x = 1}$. So,

$\boxed{LHS = 1 + 1 = 2 = RHS}$ (**Verified**)

This video can help you solving/understanding next problems.

B. $\boxed{2x + 1 = 9}$

Solution

1. $\boxed{2x + 1 = 9}$ - Check if it is in $\boxed{ax + b = c}$ format or not? Yes.
2. $\boxed{2x + 1 - 1 = 9 - 1}$ - Get rid of 1 by adding -1 on both sides.
3. $\boxed{2x = 8}$ - Now get rid of 2 by dividing both sides by 2.
4. $\boxed{\dfrac{2x}{2} = \dfrac{8}{2}}$
5. Finally, $\boxed{x = 4}$

Verification

Let's take the Left Hand Side (LHS) of equation **B** and use the value of $\boxed{x = 4}$. So,

$\boxed{LHS = (2 * 4) + 1 = 8 + 1 = 9 = RHS}$ (**Verified**)

C. $\boxed{3x - 1 = 8}$

Solution

1. $\boxed{3x - 1 = 8}$ - Check if it is in $\boxed{ax + b = c}$ format or not? No.
2. $\boxed{3x + (-1) = 8}$ - Now it is in $\boxed{ax + b = c}$ format.

3. $3x - 1 + 1 = 8 + 1$ - Get rid of -1 by adding 1 on both sides.

4. $3x = 9$ - Now get rid of co-efficient 3 of x by dividing both sides by 3.

5. $\dfrac{3x}{3} = \dfrac{3}{3}$

6. Finally, $x = 3$

Verification

Let's take the Left Hand Side (LHS) of equation **C** and use the value of $x = 3$. So,

$LHS = (3 * 3) - 1 = 9 - 1 = 8 = RHS$ (**Verified**)

D. $5y - 2 = 3y + 8$

Solution

1. $5y - 2 = 3y + 8$ - Check if it is in $ax + b = c$ format or not? No.

2. $5y - 2 - 3y = 3y + 8 - 3y$ - Get rid of $3y$ by adding $-3y$ on both sides.

3. $2y - 2 = 8$ - Check again if it is in $ax + b = c$ format or not? No.

4. $2y + (-2) = 8$ - Now it is in $ax + b = c$ format.

5. $2y - 2 + 2 = 8 + 2$ - Get rid of -2 by adding 2 on both sides.

6. $2y = 10$ - Now get rid of co-efficient 2 of y by dividing both sides by 2.

7. $\dfrac{2y}{2} = \dfrac{10}{2}$

8. Finally, $y = 5$

Verification

Let's use the value of $y = 5$ on both sides of equation **D**.

- $LHS = (5 * 5) - 2 = 25 - 2 = 23$
- $RHS = (3 * 5) + 8 = 15 + 8 = 23$
- Therefore, $LHS = RHS$ (**Verified**)

Solving Equation Using Python

We can use python programming language to solve an equation.

First of all, we have to create a user defined function.

- Steps
    - Declaring function by writing **def** followed by function name.
    - Declare no. of variables/arguments inside parentheses just after function name followed by collon sign.
    - Write the code to be executed
    - Finally, end the function with/without return option.

Now, let's create a user defined function to solve a simple equation.

```
In [17]:  def simple_equation(a,b,c):
              x=(c-b)/a
              return x
```

Explanation of the above code

Accoding to steps -

1. function name is **simple_equation** and arguments are **a, b & c**.

2. Then the value of x from $\boxed{ax + b = c}$ can be found by $\boxed{x = \dfrac{(c - b)}{a}}$.

3. In the third line the value of **x** has been returned.

And thus a user defined function named simple_equation has been created to find x.

Now, let's execute the function below-

```
In [19]:  r=simple_equation(2,1,9)
          print (r)

          4.0
```

Explanation of the above code

1. **simple_equation(2, 1, 9)** is going above where it has been created and replacing **a,b,c** by **2, 1, 9** respectively.

   A. Now, $x = \dfrac{(9-1)}{2} = \dfrac{8}{2} = 4.0$

   B. Then the value of $x = 4.0$ has been returned in place of **simple_equation(2, 1, 9)**.

   C. And thus $r = 4.0$

2. Now to display the result on screen **print** command has been executed.
3. Therefore, in the third line in above code we are seeing the result i.e. **4.0**

Exercise

1. Solve the following equations and verify the correctness of the solution using verification rule and python code.

   A. $x - 3 = 7$

   B. $2z + 5 = 15$

   C. $5 - x = 7$

   D. $3x - 8 = x + 2$

2. Fill up the table using the information from solution of above equations

Equations	In ($ax + b = c$) Format	a	b	c	x/y/z	Verification	By Python
x-3=7							
2z+5=15							
5-x=7							
3x-8=x+2							