

Equations – Linear

MATH by Wilson
Your Personal Mathematics Trainer
MathByWilson.com

Equations: Equations have **EQUAL SIGNS!**

IF you want a better understanding of what is going on, then you will “check” all your potential solutions!

Example:

$$2x - 4 = 6 \Rightarrow 2x = 10 \Rightarrow x = 5$$

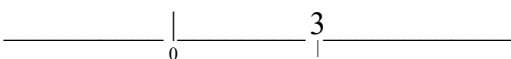
$$\text{Check: } 2(5) - 4 \stackrel{?}{=} 6 \stackrel{\text{Yes}}{=} 6$$

Without letters – except for the unknown

(1) **Question:** Find the solution of the equation $3 - (4 - 2x) = 3(x + 2) - 4x + 2$

Solution:

Step	Equation	Reason
0	$3 - (4 - 2x) = 3(x + 2) - 4x + 2$	
1	$3 - 4 + 2x = 3x + 6 - 4x + 2$	
2	$-1 + 2x = -x + 8$	
3	$x + 2x = 8 + 1$	
4	$3x = 9$	
5	$x = 3$	

Solution graph: 

(2) **Question:** Solve for x in the equation $2(5x - 3) = 7 - 2x$

Solution:

Step	Equation	Reason
0	$2(5x - 3) = 7 - 2x$	
1	$10x - 6 = 7 - 2x$	
2	$2x + 10x = 6 + 7$	
3	$12x = 13$	
4	$x = \frac{13}{12}$	

Solution graph: _____|_____ $\frac{13}{12}$ _____
0|0

(3) **Question:** Find the solution x in the equation $\frac{3}{4}x - 2 = \frac{1}{3} + 2x$

Solution:

Step	Equation	Reason
0	$\frac{3}{4}x - 2 = \frac{1}{3} + 2x$	
1	$12\left(\frac{3x}{4} - \frac{2}{1}\right) = 12\left(\frac{1}{3} + \frac{2x}{1}\right)$	Eliminate fractions with common denominator
2	$9x - 24 = 4 + 24x$	
3	$9x - 24x = 24 + 4$	
4	$-15x = 28$	
5	$x = -\frac{28}{15}$	

Solution graph: _____ $-\frac{28}{15}$ _____|_____
|0

(4) **Question:** Solve for x : $\frac{2}{1-x} = \frac{4}{3}$

Solution:

Step	Equation	Reason
0	$\frac{2}{1-x} = \frac{4}{3}$	
1	$2*3 = 4(1-x)$	
2	$6 = 4 - 4x$	
3	$4x = 4 - 6$	
4	$4x = -2$	
5	$x = -\frac{2}{4} = -\frac{1}{2}$	

Solution graph: _____ $-\frac{1}{2}$ _____ 0 _____

Note: This equation is a linear “rational” equation since the “ x ” is in the denominator but can be converted to the usual linear format.

With letters – Literal Equations

(5) **Question:** The solution x of the equation $\frac{a}{x} = \frac{b}{a}$ is $x = ?$

Solution:

Step	Equation	Reason
0	$\frac{a}{x} = \frac{b}{a}$	
1	$a^2 = bx$	
2	$\frac{a^2}{b} = x$ OR $x = \frac{a^2}{b}$	

Note: Can not graph the solution set.

(6) **Question:** The solution x of the equation $a - bx = c(2 - x)$ is $x = ?$

Solution:

Step	Equation	Reason
0	$a - bx = c(2 - x)$	
1	$a - bx = 2c - cx$	
2	$a - 2c = bx - cx$	Group all the x terms together
3	$a - 2c = x(b - c)$	
4	$\frac{a - 2c}{b - c} = x$ OR $x = \frac{a - 2c}{b - c} = \frac{2c - a}{c - b}$	

(7) **Question:** Solve the following equations:

a. $2x = 3 \Rightarrow x = \frac{3}{2}$

b. $-4x = 7 \Rightarrow x = -\frac{7}{4}$

c. ... There are an infinite number of equations like these. However, consider $ax = b$; $a \neq 0$. We have

$$ax = b \Rightarrow x = \frac{b}{a}$$

Note: We have actually solved an infinite number of equations.
This is the power of algebra!