2.1

equation - a statement that two algebraic expressions are equal.

(ex) $5x+4=19$
$7x^2-10x+3=8.5$ } equations

(non-ex)
$10x+8$
$9.2y$ } not equations

Solving an equation - finding the number(s) that make an equation true

solutions - the number(s) that make an equation true.

(ex) Is 3 a solution to $5x+4=19$

let $x=3$

$5(3)+4 \stackrel{?}{=} 19$

$15+4 \stackrel{?}{=} 19$

$19=19$ so YES, 3 is a solution.

Is 5 a solution to $5x+4=19$

$5(5)+4 \stackrel{?}{=} 19$

$25+4 \stackrel{?}{=} 19$

$29 \neq 19$ So No, 5 is NOT a soln.

The Addition Property of Equality

Adding a number to both sides of an equation does not change the solution(s).

If $a=b$ then $a+c=b+c$

Ex. We decided that 3 was a solution to $5x+4=19$

If we add 1, for example, to both sides 3 will still be a solution.

$5x+4+1=19+1$ add 1 to both sides

$5x+5=20$ simplify: $4+1=5$, $19+1=20$

check if 3 is a soln.

$5(3)+5 \stackrel{?}{=} 20$

$15+5 \stackrel{?}{=} 20$

$20=20$ Yes, 3 is still a soln.

This will work with any number, not just 1.

We can use this to solve linear equations.

Linear equation = looks like $ax+b=c$

no $\sqrt{}$, or squares, cubes, etc. just an x!

To solve a linear equation you want to get x alone on one side of the equation.

(ex) Solve $x-10=2$

We know we can add any number to both sides. Choose the number carefully, if we add 10 to both sides we'll get

$$x-10+10=2+10$$

$$\boxed{x=12}$$

check:

$$12-10 \stackrel{?}{=} 2$$

$$2=2 \checkmark$$

so $x=12$ is the soln

You can subtract any # from both sides too!

(ex) Solve $8=x+5$

If we subtract 5 from both sides, we get

$$8-5=x+5-5$$

$$\boxed{3=x}$$

check:

$$8 \stackrel{?}{=} 3+5$$

$$8=8 \checkmark$$

Could be messier numbers

(ex) $-\frac{3}{4} = x + \frac{1}{2}$

subtract $\frac{1}{2}$ from both sides

$-\frac{3}{4} - \frac{1}{2} = x + \frac{1}{2} - \frac{1}{2}$

$-\frac{3}{4} - \frac{2}{4} = x$

$\boxed{-\frac{5}{4} = x}$ (or $-1.25 = x$)

check:

$-\frac{3}{4} \stackrel{?}{=} -\frac{5}{4} + \frac{1}{2}$

$-\frac{3}{4} \stackrel{?}{=} -\frac{5}{4} + \frac{2}{4}$

$-\frac{3}{4} = -\frac{3}{4}$ ✓

Combining like terms

(ex) $4x + 7 - 3x - 3 = 19 + 3$

$x + 4 = 22$ ← like terms combined

$-4 \quad -4$ ← subtract 4 from both sides

$\boxed{x = 18}$

check:

$4(18) + 7 - 3(18) - 3 \stackrel{?}{=} 19 + 3$

$22 = 22$ ✓ ← calculator!

We can add/subtract the same variable term to/from both sides (just like we did with numbers)

(ex) $4x + 6 = 5x$

$-4x \quad -4x$

$\boxed{6 = x}$

check: $4(6) + 6 \stackrel{?}{=} 5(6)$ $\quad 24 + 6 \stackrel{?}{=} 30$ $\quad 30 = 30$ ✓

Messier!

(ex) $8.2x + 17.3 = 6.42 + 7.2x$

$-7.2x \qquad\qquad -7.2x$ ← subtract 7.2x both sides

$x - 17.3 = 6.42$

$+17.3 \quad +17.3$ ← add 17.3 to both sides

$\boxed{x = 23.72}$

check:

$8.2(23.72) - 17.3 \stackrel{?}{=} 6.42 + 7.2(23.72)$

$177.204 = 177.204$ ✓ ← calculator!