

INTRODUCTION TO ALGEBRA

Moving Numbers Around and Solving for X

Back in my day, Math 11 was just called “Algebra.”

Algebra is really just moving numbers around to solve **ONE** part of the question.

$$16 = X + 15 \quad <<< \text{Algebra is “Solving For X”}$$

$$1 = X + 9 \quad <<< \text{Still “Solving for X”}$$

Basically: “What does X have to be to make this question work?”

You could guess and check – but that would be slow, especially if you are not good at Math.

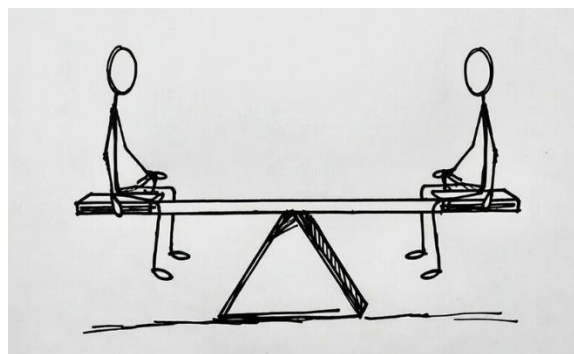
I’m not good at guessing.

For guys like me, there is an easier, fool-proof way to KNOW what X has to be – it’s called “Algebra.”

Mr. Wellwood’s Algebra Secret #1:

A math equation needs to be balanced.
Whatever is on one side of the equation
MUST balance what is on the other side.

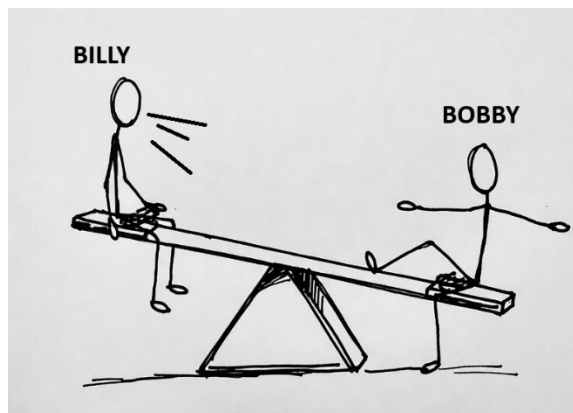
Like a teeter-totter.



If Billy woofs his cookies, he's now **LIGHTER** than Bobby. The teeter-totter is now *unbalanced*.

Bobby's side of the teeter-totter will lower, and he'd probably get some puke on him.

Or.... Or Bobby could woof his cookies too, and they'd be equal again!



Mr. Wellwood's Algebra Secret #1:

To balance things, we usually need to **ADD** or **SUBTRACT** or **MULTIPLY** or **DIVIDE** to move things around. We work in **OPPOSITES**.

OPPOSITES

The opposite of
POSITIVE is **NEGATIVE**

The opposite of
ADDING is **SUBTRACTING**

Mr. Wellwood's Algebra Secret #2:

Whatever you do to **ONE SIDE** of the equation, **YOU MUST DO** to the other side of the equation.

It's like punching Siamese Twins – you are really punching both of them.

Example 1 (easy):

$$16 = X + 15$$

<<<< I need to get X all by himself
The 15 is easy to get rid of, it's just being added.
Let's subtract that 15 **FROM BOTH SIDES**

$$16 = X + 15$$

$$\textcolor{red}{-15} \quad \textcolor{red}{-15}$$

$$1 = X$$

<<<< Keep the "=" lined up vertically!

<<<< Draw a **BOX** around your answer to make it easy to find

To Check: if we put "1" into the X, do we have equal numbers on both sides?

$$16 = (1) + 15$$

$$16 = 16$$

Yes!

Example 2 (still easy):

$$18 = n - 9$$

<<<< I need to get **n** all by himself
The 9 is easy to get rid of, it's just being
subtracted.
Let's add that 9 **TO BOTH SIDES**

$$\begin{array}{r} 18 = n - 9 \\ +9 \qquad +9 \end{array}$$

$$27 = n$$

<<<< Keep the "=" lined up vertically!

<<<< Draw a BOX around your answer to
make it easy to find

OPPOSITES

The opposite of
POSITIVE is
NEGATIVE

The opposite of
ADDING is
SUBTRACTING

Check: if we put "27" into the n, do we have equal numbers on both sides?

$$18 = (27) - 9$$

$$18 = 18$$

Yes!

Example 3 (harder, but not really any harder at all):

$$\frac{n}{9} = 20$$

<<<< I need to get **n** all by himself
The 9 is easy to get rid of, it's just being divided.
Let's multiply that 9 **TO BOTH SIDES**

$$\frac{9 \times n}{9} = 20 \times 9$$

<<<< Keep the "=" lined up vertically!

$$\frac{\cancel{9} \times n}{\cancel{9}} = 180$$

"CANCEL" the 9's on the left, and
MULTIPLY on the right

$n = 180$	<<<< Draw a BOX around your answer to make it easy to find
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OPPOSITES

The opposite of
DIVIDING is
MULTIPLYING

The opposite of
UP is DOWN

The opposite of
DOWN is UP

Check: Yes - if we put "180" into the n.... $180 \div 9 = 20$ $20 = 20$

We have equal numbers on both sides!

Example 4 (harder still... or IS it??):

$$58 = 14n + 2$$

<<<< I need to get **n** all by himself
The 2 is easy to get rid of, it's just being added.
Let's subtract that 2 **FROM BOTH SIDES**

$$\begin{array}{rcl} 58 & = & 14n + 2 \\ -2 & & -2 \end{array}$$

<<<< Keep the "=" lined up vertically!

$$56 = 14n$$

Let's divide the 14 **FROM BOTH SIDES**

$$\frac{56}{14} = \frac{\cancel{14}n}{\cancel{14}}$$

CANCEL the two 14's.....

$4 = n$	 do math, and draw a box around your answer
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Check: if we put “4” into the n , do we have equal numbers on both sides?

$$58 = 14 \times (4) + 2$$

$$58 = 56 + 2$$

$$58 = 58$$

Yes!

INVISIBLE MATH: (<https://www.amazon.ca/dp/B09SSFLLBK>)

$5 = +5$	If it's not a “–” it's always “+”; no need to say “+”
$24 = 24.0$	We don't always show the extra zeros
$x = 1x$	If there's only <u>one</u> x , just put x
$5 = \frac{5}{1}$	All whole numbers are over 1
$a \times b$ $a * b$ $a \cdot b$ $a(b)$ ab	All mean “multiply”
$a \div b$ a/b $\frac{a}{b}$ b $a \overline{)b}$	All mean “divide”
$79^0 = 1$	Anything “to the power of 0” is 1
$9^1 = 9$	Anything “to the power of 1” is itself
$3y = 3 * y$	We're too lazy to put the “times” in there
$-x = -1x$	The negative can be on the variable (x) or on the number (1) = same thing; doesn't matter
$\sqrt{4} = {}^2\sqrt{4}$	We're too lazy to put a “2”. ${}^3\sqrt{4}$ is <i>cube</i> root – what THREE numbers multiplied together give you 4?
$\frac{1}{x} = x^{-1}$	Means the same thing. Think of “-1” as “under ground” – it goes on the denominator