

Solving Equations with Variables on Both Sides of the Equals Sign

Section 3 - 5

Copy this problem:

$$3x + 3 = 2x + 5$$

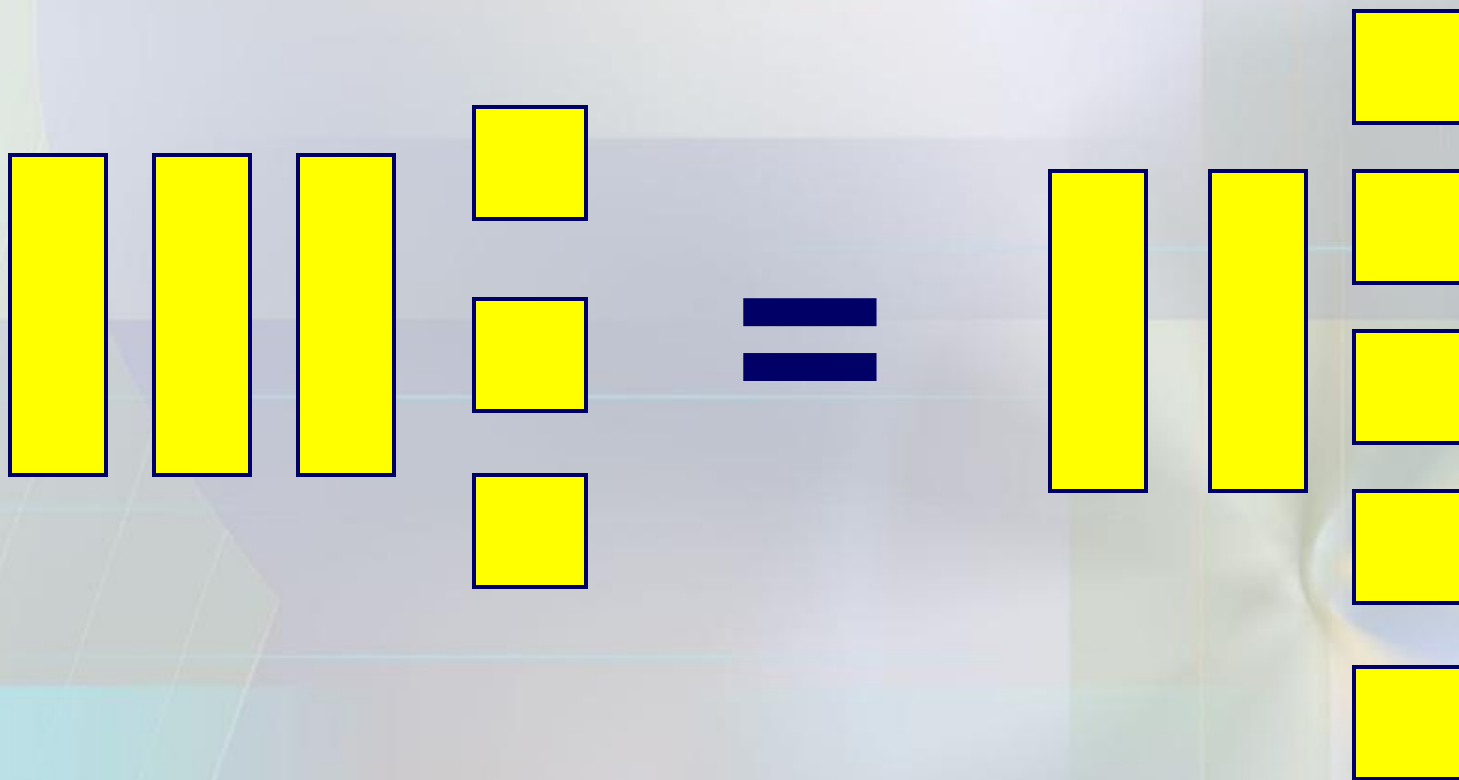
How is this problem
different from the ones
we've been doing?

Answer:

The variable x appears
on both sides of the
equation.

Using algebra tiles:

$$3x + 3 = 2x + 5$$



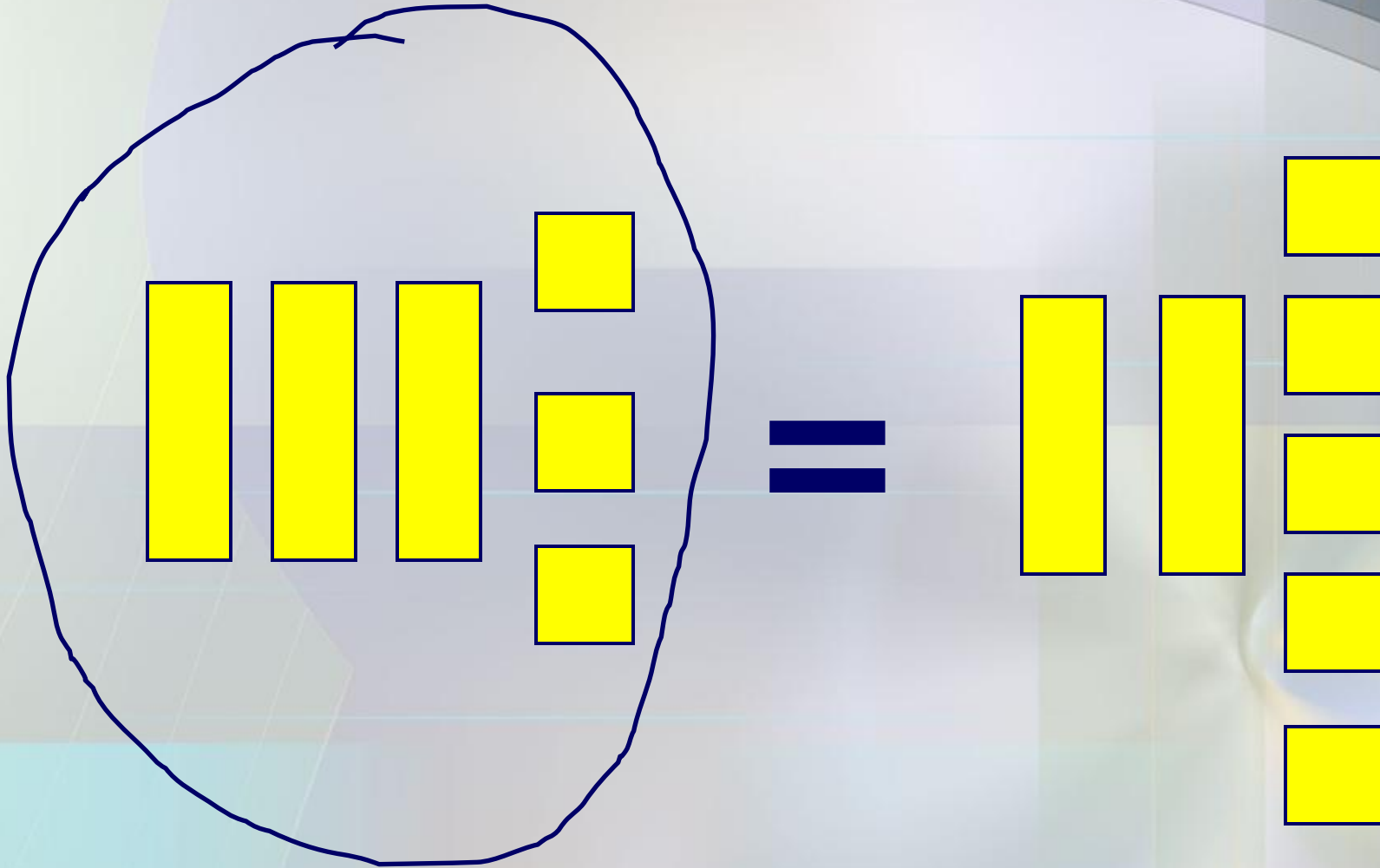
When solving equations:

- Our goal is always to get the variable (X) by itself on one side and a number by itself on the other side.
(example, $x = 5$)

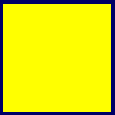
What to do:

- When there are variables on both sides, we need to decide which side we want the x to end up on.
- Look at the algebra tile equation and circle the side where there are more x tiles.

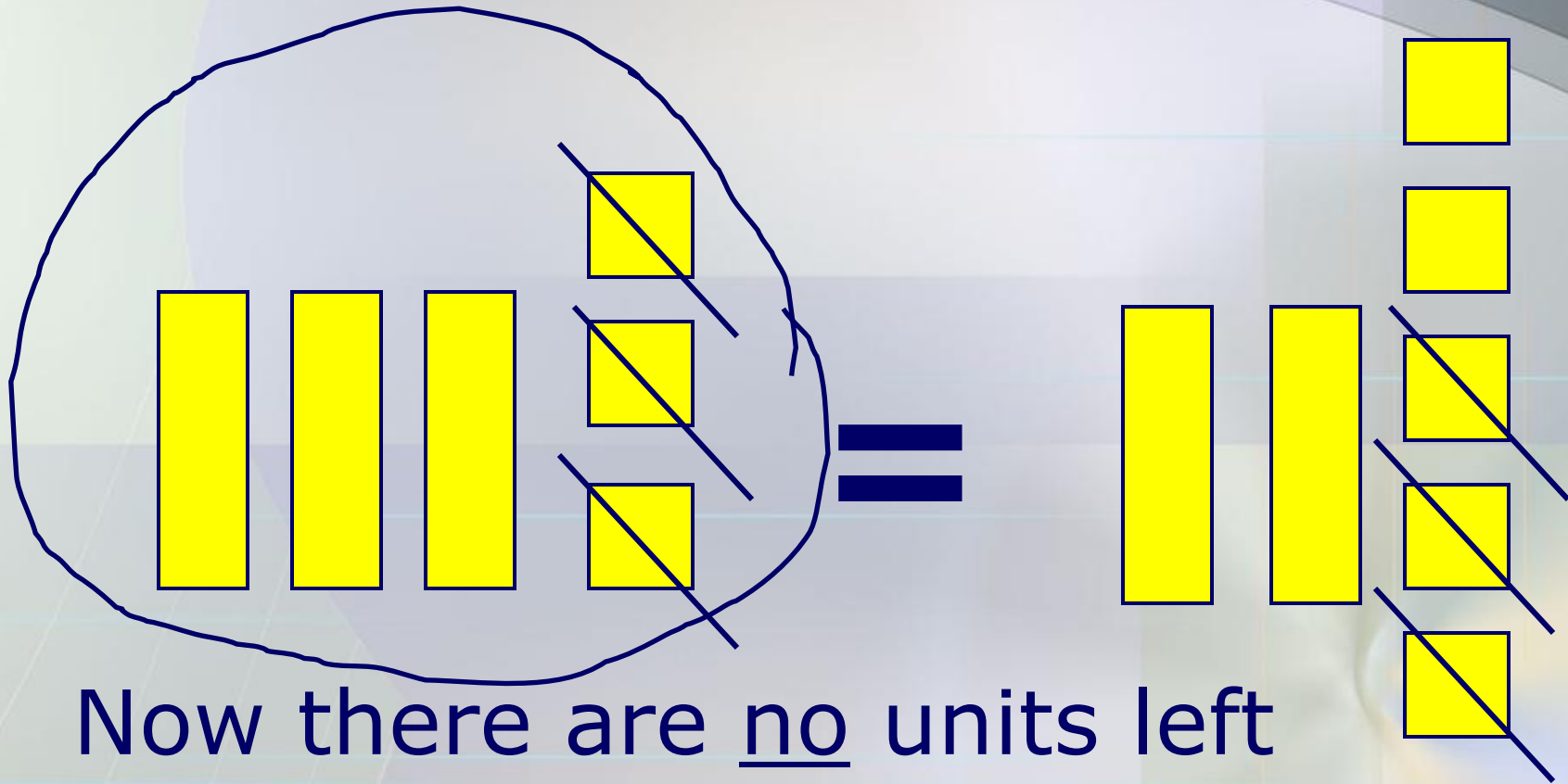
Like this:



Next:

- Cross out units () on both sides of the equation (the same number on each side)...
- Until there are no units remaining on the side that you have circled.

Like this:

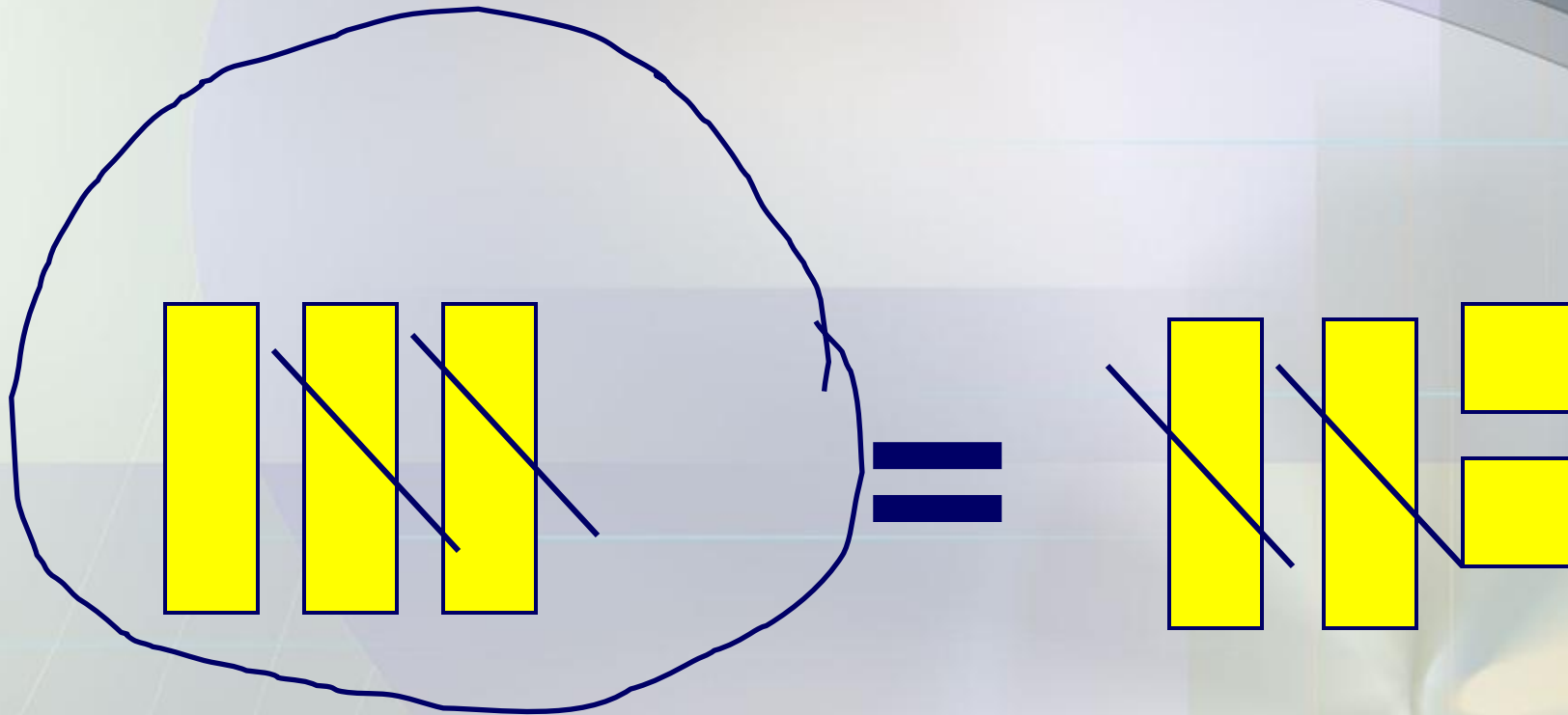


Now there are no units left on the side we have chosen for x .

Next:

- Cross out x 's on the side that is NOT circled (the side where you don't want x to be).
- Cross out the same number of x 's on the circled side.

Like this:

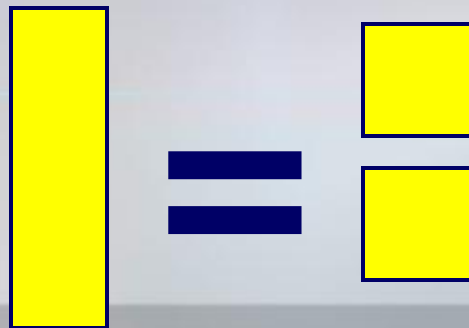


Two x's got crossed out on the right so cross out 2 on the left.

Finished!

- We're finished because we have one x by itself on the circled side.
- The solution is

$$X = 2$$



What's new:

- When solving equations with the variable on both sides, always pick the side where you want x to stay. I usually pick the side that has the larger coefficient of the variable (but it doesn't matter.)

Example: $x + 4 = 2x + 5$

Next:

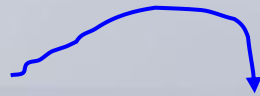
- Then add or subtract to get the units away from that side.

$$\begin{array}{r} x + 4 = 2x + 5 \\ - 5 \qquad - 5 \\ \hline x - 1 = 2x \end{array}$$

Next:

- Then look at the other side and add or subtract x from both sides to get x away from that (other)side.

other side



$$x - 1 = 2x$$

$$-x \quad \quad -x$$

$$-1 = x$$

In other words:

- **You are collecting your variables on one side and your numbers on the other side.**

Try these:

- $7 + 3x = 7x - 9$
- $7x + 12 = 13x$
- $2x - 4 = x$
- $10x + 17 = 4x - 1$
- $8n - 4 = 3(2n - 8)$