

Title slide: How to solve an equation with variables on both sides.

Slide 1:

Sometimes the unknown quantity will appear on both sides of the equation. When this occurs, an additional step is necessary in solving the equation. First, determine if we need to simplify the expressions on each side of the equation. Once both sides of the equation are simplified, we should move the variable terms to the same side of the equation. We can now follow the rules for solving a two-step equation. The first example we will solve is $4x + 8 = 6x - 10$. On the left side of the equation, $4x + 8$ cannot be simplified. On the right side $6x - 10$ cannot be simplified; therefore our first step will be to move both variable terms to the same side of the equation. We will subtract $6x$ from both sides of the equation. Make sure to line up like terms, meaning minus $6x$ should be placed directly under the term $4x$. $4x$ minus $6x$ equals negative $2x$. $6x$ minus $6x$ equals 0 therefore canceling out that term. Our equation now reads $-2x + 8 = -10$. Now, we can follow the steps for solving a two-step equation. Using inverse operations, we should subtract positive 8 from both sides of the equation. Positive 8 minus 8 equals 0 , canceling out that term. Negative 10 minus 8 equals -18 . The equation now reads $-2x = -18$. The next step is to divide both sides of the equation by negative 2 . Negative 2 divided by negative 2 reduces to 1 , leaving the variable x isolated on the left side of the equation. Negative 18 divided by negative 2 equals positive 9 . The solution to our equation is $x = 9$. To check our solution, substitute 9 for x in the original equation.

$4(9) + 8 = 6(9) - 10$, 4 times 9 equals 36 plus 8 equals 44 , 6 times 9 equals 54 minus 10 equals 44 . Since 44 equals 44 our solution is correct!

Slide 2:

The next example we are going to look at is $5(2m - 3) = 3(m + 9)$. On the left side of the equation, distribute 5 to the quantity $2m - 3$. 5 times $2m$ equals $10m$ and 5 times negative 3 equals negative 15 . We also need to distribute on the right side of the equation. 3 times m equals $3m$ and 3 times positive 9 equals positive 27 . The equation now reads $10m - 15 = 3m + 27$. Now we need to move the variable terms to the same side of the equation. We can subtract $3m$ from both sides of the equation. $10m$ minus $3m$ equals $7m$. $3m$ minus $3m$ reduces to 0 canceling out that term. The equation now reads $7m - 15 = 27$. Next we have to move the term that is added to or subtracted from the variable term, to the other side of the equation. Since the equation reads $7m$ minus 15 , we must add 15 to both sides of the equation. Adding 15 to negative 15 cancels out this term. 27 plus 15 equals 42 . The equation now reads $7m = 42$. The next step is to divide both sides of the equation by 7 . 7 divided by 7 reduces to 1 leaving m isolated on the left side of the equation. 42 divided by 7 equals 6 . The solution to the equation is $m = 6$. To check our solution, substitute 6 in for m in the original equation. $5(2(6) - 3) = 3(6 + 9)$, 2 times 6 equals 12 , minus 3 equals 9 . 5 times 9 equals 45 . 6 plus 9 equals 15 . 3 times 15 equals 45 . Since 45 equals 45 our solution is correct!

Slide 3:

For further review, please see the practice sheet that follows this podcast. This concludes the podcast, How to solve an equation with variables on both sides.