

Title: Solving two-step equations.

Materials:

Teacher notes and script (*This page.*)

Student note sheet. (*Make a copy for each student.*)

Two-Step Bingo sheet. (*Make a copy for each student.*)

Optional: Bingo chips (or scraps of colored paper) (*If you want to be able to play more than once.*)

Bingo Problem sheet. (*Teacher copies on overheads; put masking tape under answers and cut apart.*)

Previous Knowledge Needed:

Solving single step equations.

Important Concepts/Methods:

To isolate the variable, add or subtract first. Then multiply or divide to get the variable alone.

(*This is different from order of operations!! The key is to get the variable by itself.*)

Script:

Today we are going to solve two-step equations. We must “isolate the variable.” That just means we want to get the variable by itself on one side of the “=” sign.

Problem: $3x + 5 = 14$

First get rid of the 5 by subtracting 5 from both sides.

Now simplify both sides.

Now divide each side by 3 to solve for x.

Now simplify again and you have your answer.

$$3x + 5 = 14$$

$$\underline{-5 \quad -5}$$

$$\underline{3x} = \underline{9}$$

$$\underline{3} \quad \underline{3}$$

$$x = 3$$

Common Mistakes:

Students sometimes get confused with order of operations and try to divide first. Remember the goal is to get the term with the variable by itself first. So, the first step is to get rid of the constant (the plain number) by adding or subtracting that number from both sides. The last step will be to multiple or divide.

Student Problems to practice:

1. $10x + 3 = 33$

Ans: $10x + 3 = 33$

$$\underline{-3 \quad -3}$$

$$\underline{10x} = \underline{30}$$

$$\underline{10} \quad \underline{10}$$

$$x = 3$$

3. $15y + 31 = 61$

Ans: $15y - 21 = 39$

$$\underline{+21 \quad +21}$$

$$\underline{15y} = \underline{60}$$

$$\underline{15} \quad \underline{15}$$

$$y = 4$$

2. $5 = \frac{x}{3} - 14$

Ans: $5 = \frac{x}{3} - 14$

$$\underline{+14 \quad +14}$$

$$19 = \frac{x}{3}$$

$$3 \times 19 = \frac{x}{3} \times 3$$

$$57 = x$$

4. $\frac{x}{4} + 9 = 21$

Ans: $\frac{x}{4} + 9 = 21$

$$\underline{-9 \quad -9}$$

$$\frac{x}{4} = 12$$

$$4 \times \frac{x}{4} = 12 \times 4$$

$$x = 48$$

Class Assignment:

Play Bingo! Give each student a copy of “Two-Step Bingo.” Have students copy the answers listed below the bingo board in a random order into the boxes above. Make sure that they put one free space anywhere on their board. They can either check off answers with a pen or pencil or use chips to play repeatedly. (Scraps of colored paper work well in place of bingo chips.)

$3x + 5 = 14$ <p style="text-align: right;">Ans: $x = 3$</p>	$-8m - 12 = 20$ <p style="text-align: right;">Ans: $x = -4$</p>
$10 = \frac{x}{4} + 5$ <p style="text-align: right;">Ans: $x = 20$</p>	$\frac{h}{12} - 5 = -17$ <p style="text-align: right;">Ans; $h = -144$</p>
$9p + 11 = -7$ <p style="text-align: right;">Ans: $p = -2$</p>	$12 = 9x - 6$ <p style="text-align: right;">Ans: $x = 2$</p>
$36 = -3y + 12$ <p style="text-align: right;">Ans: $y = -8$</p>	$5x + 9 = 39$ <p style="text-align: right;">Ans: $x = 6$</p>
$\frac{p}{3} - 2 = -56$ <p style="text-align: right;">Ans: $p = -162$</p>	$-4 = \frac{x}{2} + 5$ <p style="text-align: right;">Ans: $x = -18$</p>

$3 + 2x = 21$ <p style="text-align: right;">Ans: $m = 98$</p>	$-15 - 11w = 18$ <p style="text-align: right;">Ans: $w = -3$</p>
$-45 = \frac{m}{-2} + 4$ <p style="text-align: right;">Ans: $x = 9$</p>	<p>If $2a + b = 7$, then $a = \underline{\quad?}$.</p> <p style="text-align: right;">Ans: $a = \frac{7 - b}{2}$</p>
<p>If $3b - 1 = a$, then $b = \underline{\quad?}$.</p> <p style="text-align: right;">Ans: $b = \frac{a + 1}{3}$</p>	<p>If $4b - a = 7$, then $a = \underline{\quad?}$.</p> <p style="text-align: right;">Ans: $a = -(7 - 4b)$ or $4b - 7$</p>

Ideas that I'm going to study and learn.

To solve two-step equations:

Isolate the variable:

Add or subtract first.

Then multiply or divide to get the variable alone.

(This is different from order of operations!! The key is to get the variable by itself.)

Example: $3x + 5 = 14$

Practice Problems:

1) $10x + 3 = 33$

3) $15y + 31 = 61$

2) $5 = \frac{x}{3} - 14$

4) $\frac{x}{4} + 9 = 21$

Two-Step Bingo

Directions: Write your answers from below into the table above in any random order. Don't forget to include a free space (that means you won't use one answer).

3	-4	20	6
-2	2	-8	-144
-162	-18	98	-3
9	$\frac{7-b}{2}$	$\frac{a+1}{3}$	$-(7-4b)$ or $4b-7$

$3x + 5 = 14$ $\underline{-5 \quad -5}$ $3x = 9$ $\frac{3x}{3} = \frac{9}{3}$ $x = 3$	$-8m - 12 = 20$ $\underline{+12 \quad +12}$ $-8m = 32$ $\frac{-8m}{-8} = \frac{32}{-8}$ $m = -4$
$10 = \frac{x}{4} + 5$ $\underline{-5 \quad -5}$ $5 = \frac{x}{4}$ $4 \times 5 = \frac{x}{4} \times 4$ $20 = x$	$\frac{h}{12} - 5 = -17$ $\underline{+5 \quad +5}$ $\frac{h}{12} = -12$ $12 \times \frac{h}{12} = -12 \times 12$ $h = -144$
$9p + 11 = -7$ $\underline{-11 \quad -11}$ $9p = -18$ $\frac{9p}{9} = \frac{-18}{9}$ $p = -2$	$12 = 9x - 6$ $\underline{+6 \quad +6}$ $18 = 9x$ $\frac{18}{9} = \frac{9x}{9}$ $2 = x$
$36 = -3y + 12$ $\underline{-12 \quad -12}$ $24 = -3y$ $\frac{24}{-3} = \frac{-3y}{-3}$ $-8 = y$	$5x + 9 = 39$ $\underline{-9 \quad -9}$ $5x = 30$ $\frac{5x}{5} = \frac{30}{5}$ $x = 6$

$\frac{p}{3} - 2 = -56$ $\begin{array}{r} +2 \quad +2 \\ \hline \end{array}$ $\frac{p}{3} = -54$ $3 \times \frac{p}{3} = -54 \times 3$ $p = -162$	$-4 = \frac{x}{2} + 5$ $\begin{array}{r} -5 \quad -5 \\ \hline \end{array}$ $-9 = \frac{x}{2}$ $2(-9) = \frac{x}{2} \times 2$ $-18 = x$
$3 + 2x = 21$ $\begin{array}{r} -3 \quad -3 \\ \hline \end{array}$ $2x = 18$ $\frac{2x}{2} = \frac{18}{2}$ $x = 9$	$-15 - 11w = 18$ $\begin{array}{r} +15 \quad +15 \\ \hline \end{array}$ $-11w = 33$ $\frac{-11w}{-11} = \frac{33}{-11}$ $w = -3$
$-45 = \frac{m}{-2} + 4$ $\begin{array}{r} -4 \quad -4 \\ \hline \end{array}$ $-49 = \frac{m}{-2}$ $(-2)(-49) = \left(\frac{m}{-2}\right)(-2)$ $98 = m$	<p>If $2a + b = 7$, then $a = \underline{\quad?}$.</p> $2a + b = 7$ $\begin{array}{r} -b \quad -b \\ \hline \end{array}$ $2a = 7 - b$ $\frac{2a}{2} = \frac{7 - b}{2}$ $a = \frac{7 - b}{2}$
<p>If $3b - 1 = a$, then $b = \underline{\quad?}$.</p> $3b - 1 = a$ $\begin{array}{r} +1 \quad +1 \\ \hline \end{array}$ $3b = a + 1$ $\frac{3b}{3} = \frac{a + 1}{3}$ $b = \frac{a + 1}{3}$	<p>If $4b - a = 7$, then $a = \underline{\quad?}$.</p> $4b - a = 7$ $\begin{array}{r} -4b \quad -4b \\ \hline \end{array}$ $-a = 7 - 4b$ $-(-a) = -(7 - 4b)$ $a = -(7 - 4b) \text{ or}$ $a = 4b - 7$