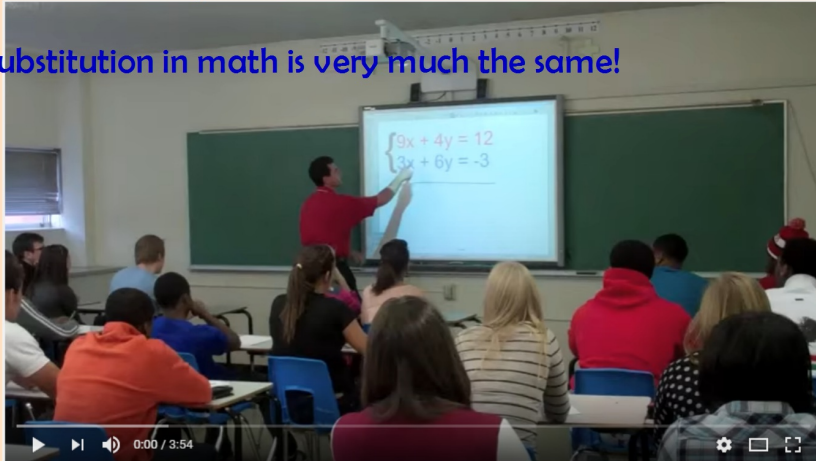


## 7.2 Solving Systems by Substitution

A substitute teacher takes the place of a regular teacher if that teacher has to be absent. The substitute teacher goes in the same classroom as the regular teacher, and does the same job as the regular teacher.

Substitution in math is very much the same!



Let's practice substitution.

$$\begin{array}{l}
 y = 2x + 2 \\
 2x + 2 = -3x - 8 \\
 +3x \quad +3x \\
 5x + 2 = -8 \\
 -2 \quad -2 \\
 5x = -10 \\
 \frac{5x}{5} = \frac{-10}{5} \\
 x = -2
 \end{array}$$

$$\begin{array}{l}
 y = 2x + 2 \\
 y = 2(-2) + 2 \\
 y = -4 + 2 \\
 y = -2
 \end{array}$$

$$\begin{array}{l}
 y = -3x - 8 \\
 -2 = -3(-2) - 8 \\
 -2 = 6 - 8 \\
 -2 = -2
 \end{array}$$

$(-2, -2)$

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And even more...

$$\begin{array}{l}
 y = x + 1 \\
 x + 1 = 2x - 1 \\
 -2x \quad -2x \\
 -x + 1 = -1 \\
 -1 \quad -1 \\
 \frac{-x}{-1} = \frac{-2}{-1} \\
 x = 2
 \end{array}$$

$$\begin{array}{l}
 y = x + 1 \\
 y = (2) + 1 \\
 y = 3
 \end{array}$$

$$\begin{array}{l}
 y = 2x - 1 \\
 3 = 2(2) - 1 \\
 3 = 4 - 1 \\
 3 = 3
 \end{array}$$

$(2, 3)$

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$$\begin{array}{l}
 -3x + y = -2 \\
 y = (x + 6) \\
 -3x + (x + 6) = -2 \\
 -2x + 6 = -2 \\
 -6 \quad -6 \\
 -2x = -8 \\
 \frac{-2x}{-2} = \frac{-8}{-2} \\
 x = 4
 \end{array}$$

$$\begin{array}{l}
 -3x + y = -2 \\
 -3(4) + (10) = -2 \\
 -12 + 10 = -2 \\
 -2 = -2
 \end{array}$$

$$\begin{array}{l}
 y = x + 6 \\
 y = (4) + 6 \\
 y = 10
 \end{array}$$

$(4, 10)$

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Note: If you get a true statement like  $5=5$ , then the system has **infinite solutions**.

If you get a false statement like  $5=1$ , then the system has **no solution**.

$$6x - 3y = 6$$

$$y = (2x + 5)$$

$$6x - 3y = 6$$

$$y = 2x + 5$$

$$6x - 3(2x + 5) = 6$$

$$6x - 6x - 15 = 6$$

$$-15 \neq 6$$

never true  
no solution  
parallel lines

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$$y = (3x - 6)$$

$$-3x + y = -6$$

$$y = 3x - 6$$

$$-3x + y = -6$$

$$-3x + (3x - 6) = -6$$

$$0x - 6 = -6$$

$$-6 = -6$$

always true  
infinite solutions  
Same lines

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homework:  
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