

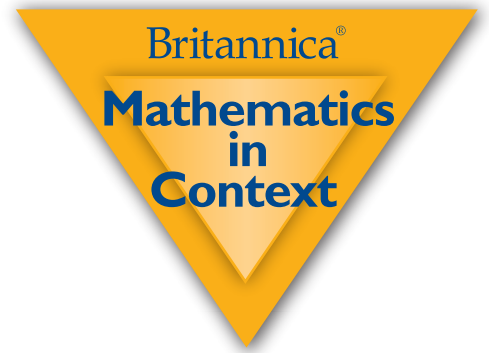
# Grade 8 TN Lesson:

## Systems of Equations II

Use with MiC unit *Graphing Equations*  
after page 41

OR

Use with MiC unit *Algebra Rules!*  
after page 32



TN Standard: MA.8.SPI 0806.3.1

Find solutions to systems of two linear equations in two variables.



## Focus On: Systems of Equations

### Solving by Substitution

The *substitution method* is especially useful when one equation is solved for a variable or can easily be solved for the variable.

**Step 1** Solve one equation for a variable.

**Step 2** Substitute the value into the other equation.

**Step 3** Solve the equation.

**Step 4** Substitute the solution into the first equation and solve for the second variable.

**Step 5** Check to be sure the solution works for both of the original equations.

$5x + 2y = 14$ $x + y = -2$ $y = -x - 2$ $5x + 2(-x - 2) = 14$ $5x - 2x - 4 = 14$ $3x - 4 = 14$ $3x = 18$ $x = 6$	<b>System</b>  <b>Step 1</b> <b>Step 2</b> <b>Step 3</b>
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$y = -x - 2 = -6 - 2 = -8$ The solution is $(6, -8)$ $5(6) + 2(-8) = 30 - 16 = 14$ check $6 + (-8) = -2$ check	<b>Step 4</b>  <b>Step 5</b>
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### Solving by Adding or Subtracting

Use the *adding or subtracting method* to eliminate one of the variables by adding the equations when the coefficients of one of the variables are opposites.

**Step 1** Write each equation in the form  $Ax + By = C$ , if necessary.

**Step 2** Multiply each side of the equations by a number so that the coefficients of one of the variables are opposites, if necessary.

**Step 3** Add the equations.

**Step 4** Solve the new equation.

**Step 5** Substitute the solution into one of the original equations and solve for the second variable.

**Step 6** Check to be sure the solution works for both of the original equations.

$3x = 9 - 2y$ $4x + 4y = 16$ $3x + 2y = 9$ $4x + 4y = 16$ Multiply by $-2$ so that the coefficients of $y$ are $4$ and $-4$ . $-2(3x + 2y) = 9(-2)$ $-6x - 4y = -18$ $+ 4x + 4y = 16$ $-2x + 0 = -2$	<b>System</b>  <b>Step 1</b>  <b>Step 2</b> <b>Step 3</b>
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$-2x = -2$ $x = 1$ $4(1) + 4y = 16$ $4 + 4y = 16$ $4y = 12$ $y = 3$ $3(1) = 9 - 2(3)$ $3 = 9 - 6$ $3 = 3$ check $4(1) + 4(3) = 4 + 12 = 16$ check	<b>Step 4</b>  <b>Step 5</b>
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# Systems of Equations

## Math Content

Students will solve systems of equations.

1. Use the substitution method to solve the equation below.

$$\begin{aligned} -5x + 8y &= 20 \\ y &= x + 1 \end{aligned}$$

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2. Use the addition or subtraction method to solve the equation below.

$$\begin{aligned} 2x - 3y &= -5 \\ -3x - 6y &= -24 \end{aligned}$$

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3. Which of these systems has an infinite number of solutions? (Hint: when a system of equations has infinite solutions, all variables will cancel when you solve the system.)

<b>A.</b> $3x + 5y = 24$	<b>C.</b> $2x + 2y = 6$
$4x - y = 0$	$x + y = 3$
<b>B.</b> $2x - 3y = -2$	<b>D.</b> $x + y = 2$
$4x + y = 24$	$x - y = 4$

4. Which of these systems has no solution? (Hint: when a system of equations has no solution, you will find a false statement, such as  $2 = 5$ , when you solve the system.)

<b>A.</b> $x + 3y = 5$	<b>C.</b> $3x - y = 2$
$2x + 6y = 12$	$x + y = 6$
<b>B.</b> $y = 3x - 2$	<b>D.</b> $2x + y = 9$
$x + y = -6$	$3x - y = 16$

5. Solve the equation below by using any method.

$$\begin{aligned} x + 4y &= 5 \\ 2x - 3y &= -12 \end{aligned}$$

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## Systems of Equations

6. Which is the solution to the following system of equations?

$$\begin{aligned}3x - 2y &= -3 \\ -3x - y &= -6\end{aligned}$$

- A.  $(-1, 3)$                       C.  $(-1, -3)$   
B.  $(1, 3)$                          D.  $(1, -3)$

7. a. Solve the system.

$$\begin{aligned}-x + y &= 7 \\ 2x + y &= 13\end{aligned}$$

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- b. A student reports the solution to part a to be “ $y = 9$ .” Is this solution correct? Explain your answer.

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8. A teacher writes the following system on the board.

$$\begin{aligned}3x - 5y &= 7 \\ x - 2y &= 3\end{aligned}$$

- a. Aretha finds the solution using the substitution method. Show her work.

- b. Brandon solves the same system using the addition or subtraction method. Show his work.

- c. Which student had less work to do? Explain your answer.

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9. The sum of two numbers,  $x$  and  $y$ , is 21. Their difference is 29.

- a. Write an equation for both statements.

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- b. Solve the system to find both numbers.

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## Systems of Equations II Answer Key

1. (4, 5)
2. (2, 3)
3. C
4. A
5. (-3, 2)
6. B
- 7a. (2, 9)
- 7b. No, a solution to a system of equations must be an ordered pair. The student also needs to report the value of  $x$ .
- 8a.  $3x - 5y = 7$   
 $x - 2y = 3$   
 $x = 2y + 3$   
 $3(2y + 3) - 5y = 7$   
 $6y + 9 - 5y = 7$   
 $y + 9 = 7$   
 $y = -2$   
 $x - 2(-2) = 3$   
 $x + 4 = 3$   
 $x = -1$   
(-1, -2)
- 8b.  $3x - 5y = 7$   
 $x - 2y = 3$   
 $-3(x - 2y) = -3(3)$   
 $-3x + 6y = -9$   
 $3x - 5y = 7$   
 $-3x + 6y = -9$ 

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 $y = -2$   
 $x - 2(-2) = 3$   
 $x + 4 = 3$   
 $x = -1$   
(-1, -2)

8c. *Sample answer:* Brandon had less work, because the value of  $y$  was easy to find with the addition/subtraction method and could be easily substituted into the other equation to find  $x$ .

9a.  $x + y = 21$

$$x - y = 29$$

9b. (25, -4)