**Algebra 1 – Unit 7** **Name:** ____________________

**Solving Linear Systems by Substitution**

*Remember…*
A solution of a system of linear equations is an ordered pair that makes *both* equations true.

**Steps for using the Substitution Method**

Step 1 - **Solve one of the equations for a variable. Chose the variable that has a** coefficient **of 1.**

Step 2 - **Substitute** the expression from Step 1 into the **other** equation and solve for the **other** variable.

Step 3 - **Substitute** the value from Step 2 into the revised equation from Step 1 and solve for the **other** variable.

Step 4 - **Write your solution as an** ordered pair.

EXAMPLE 1

$x + 6y = 16$
$x = 2y$

Step 1: Notice that the **second** equation has already been solved for x.
We can substitute 2y for x in the first equation.

$x + 6y = 16$

Step 2: **Substitute** "2y" for "x". Solve for y.

$2y + 6y = 16$

$\frac{8y}{8} = \frac{16}{8}$

$y = 2$

$x = 2y$

Step 3: Substitute the **value of y** into the equation from step 1 in order to solve for *x*.

$x = 2(2)$

$x = 4$

Answer: (4, 2)

Step 4: Write your answer as an ***ordered pair.***

EXAMPLE 2

$x + 2y = 19$
$y = x + 2$

**Step 1**: Notice that the **second** equation has already been solve for y.
We can substitute $x+2$ for y in the first equation.

$x + 2y = 19$

**Step 2**: Substitute "x + 2" for y. Solve for x.

$x+2(x+2)=19$
$x+2x+4=19$

$3x+4=19$
$-4 \quad -4$
$\frac{3x}{3}=\frac{15}{3}$
$\boxed{x=5}$

$y = x + 2$

**Step 3**: Substitute the **value of x** into one of the original equations.

$y=5+2$
$\boxed{y=7}$

Answer: $(5,7)$

**Step 4**: Write your answer as an ***ordered pair.***

EXAMPLE 3

$2x + y = 21$
$x = 3y$

**Step 1**: Notice that the **second** equation has already been solved for x.
Substitute $3y$ for x in the first equation.

$2x + y = 21$

**Step 2**: Substitute "3y" for x. Solve for y.

$2(3y)+y=21$
$6y+y=21$
$\frac{7y}{7}=\frac{21}{7}$
$\boxed{y=3}$

$x = 3y$

**Step 3**: Substitute the **value of y** into one of the original equations and solve for x.

$x=3(3)$
$\boxed{x=9}$

Answer: $(9,3)$

**Step 4**: Write your answer as an ***ordered pair.***

EXAMPLE 4

$2x + 3y = 14$
$y = x + 3$

Step 1: Notice that the **second** equation has already been solved for y. Substitute X+3 for y in the first equation.

$2x + 3y = 14$

Step 2: Substitute "x + 3" for y. Solve for x.

$2x + 3(x+3) = 14$
$2x + 3x + 9 = 14$
$5x + 9 = 14$
$-9 \quad -9$

$\frac{5x}{5} = \frac{5}{5}$
$\boxed{x = 1}$

$y = x + 3$

Step 3: Substitute the **value of x** into one of the original equations and solve for y.

$y = 1 + 3$
$\boxed{y = 4}$

Answer: (1,4)

Step 4: Write your answer as an ***ordered pair.***

EXAMPLE 5

$4x + 6y = 4$
$x = 2y - 6$

Step 1: Notice that the **second** equation has already been solved for x. Substitute 2y-6 for x in the first equation.

$4x + 6y = 4$

Step 2: Substitute 2y – 6" for x. Solve for y.

$4(2y-6) + 6y = 4$
$8y - 24 + 6y = 4$
$14y - 24 = 4$
$+24 \quad +24$

$\frac{14y}{14} = \frac{28}{14}$
$y = 2$

$x = 2y - 6$

Step 3: Substitute the **value of y** into one of the original equations and solve for x.

$x = 2(2) - 6$
$x = 4 - 6$
$x = -2$

Answer: (-2,2)

Step 4: Write your answer as an ***ordered pair.***