Sec 3-2

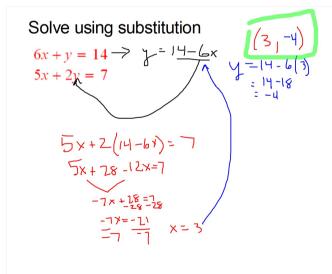**Solving systems of equations using Algebra:**

Substitution
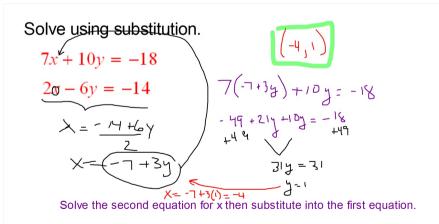
Best if at least one equation is already solved for one of its variables

Elimination

Best if both equations are in Standard Form

Solve each system of equations.

1.

$y = 2x + 4$

$(-7, -10)$

$y = -3x - 31$

$Y = 2(-7) + 4$

$2x + 4 = -3x - 31$

$-4 -4$

$+3x +3x$

$\dfrac{5x}{5} = \dfrac{-35}{5}$

2.

$y = -3x + 7$

$4x - 5y = 22$

$(3, -2)$

$4x - 5(-3x + 7) = 22$

$-3(3) + 7$

$4x + 15x - 35 = 22$

$+35 35$

$19x = 57$

$x = 3$

Solve using substitution

$6x + y = 14 \rightarrow y = 14 - 6x$

$5x + 2y = 7$

$(3, -4)$

$y = 14 - 6(3)$

$= 14 - 18$

$= -4$

$5x + 2(14 - 6x) = 7$

$5x + 28 - 12x = 7$

$-7x + 28 = 7$

$-28 -28$

$\dfrac{-7x}{-7} = \dfrac{-21}{-7}$

$x = 3$

Solve using substitution.

$7x + 10y = -18$

$2x - 6y = -14$

$(-4, 1)$

$7(-7 + 3y) + 10y = -18$

$x = \dfrac{-14 + 6y}{2}$

$-49 + 21y + 10y = -18$

$+49 +49$

$x = (-7 + 3y)$

$31y = 31$

$y = 1$

$x = -7 + 3(1) = -4$

Solve the second equation for x then substitute into the first equation.

Solve this system of equations using Substitution:

$y = \boxed{3x - 5}$

$18x - 6y = -24$

NO SOL

$18x - 6(3x - 5)$

$18x - 18x + 30 = -24$

$30 = -24$

Solve this system of equations using Substitution:

$y = -2x + 3$

$10x + 5y = 15$

The solution to this system of equations would be: Many Solutions

$15 = 15$

Would you try to solve this system of linear equations with substitution?

$6x + 7y = 106$

$3x - 5y = -32$

Probably not because to solve either equation for one of its variables would introduce fractions to the problem

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Together you and I have $227.   You have one less than twice as much as I do. Write and solve a system of equations to find out how much money each of us has.

$Y = \$$ you have

$I = \$$ I have

$Y = 2I - 1$

$Y + I = 227$

$2I - 1 + I = 227$

$3I - 1 = 227$

$Y = \$151$

$I = \$76$

- When you add or subtract the two equations and one of the variables is eliminated thus allowing you to solve for the other variable.
- Sometimes you need to multiply one or both of the equations by a constant in order to eliminate a variable.

Solve each system of equations using Elimination.

1.

$$4A + 9B = 37$$
$$- 7A + 9B = 31$$

Subtract the equations to eliminate B.

2.

$$6P + 8Q = 54$$
$$+ -6P + 7Q = 36$$

Add the equations to eliminate P.

3.

$$9C + 12D = 21$$
$$3(10C + 4D = -14)$$

Multiply the second equation by 3 then subtract to eliminate D.

4.

$$2(6M - 7N = 86)$$
$$3(4M + 3N = -4)$$

Multiply the top equation by 2 and the bottom equation by 3 then subtract to eliminate M.

5.

$$3(10X - 14Y = 44)$$
$$2(15X - 21Y = 66)$$

$$30x - 42y = 132$$
$$- 30x - 42y = 132$$
$$0 = 0$$

MANY SOLUTIONS

In your piggy bank there is only dimes and quarters. You counted a total of 40 coins and there is is $7.30. Write and solve a system of equations to find the number of each kind of coin.

$D = \#$ DIMES
$Q = \#$ COTRS

$.10(D + Q = 40)$
$.10D + .25Q = 7.50$
$- .10D + .10Q = 4$

22 quarters
18 dimes

$.15Q = 3.30$
$\overline{.15} \quad \overline{.15}$
$Q = 22$