3-2 Solving systems of equations algebraically (part 2 elimination) - Microsoft Word
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3.2. Advanced Algebra

DATE: 10/30

Solving Systems of Equations by Elimination

Target 3B. Solve a system of equations graphically and algebraically.
Target 3C. Understand the relationship between a system of equations and its number of solutions

Elimination Method: eliminate one of the variables by adding (or subtracting) the equations. When you add two true equations, the result is a new equation that is also true.

Solve each system of equations by the elimination method.

1. $4a + 2b = 15$
$-2a - 2b = -7$

Are the variables lines up? Do you have opposite numbers as coefficients of either variable in the top and bottom equation? Yes!

Yes!

opposites 2, −2 ⇒ eliminate

$\frac{2a}{2} = \frac{8}{2}$

$a = 4$

Since the answer to both questions is YES, eliminate the variable.

If the answer to question one is NO, line up the variables. If the answer to question two is NO, then follow this rule:

- CHOOSE to eliminate either variable by multiplying the top, bottom, or both equations by a number that will get you opposites on the variable you chose to eliminate.

Now, substitute 4 into top or bottom original equation. I choose the top one.

$4(4) + 2b = 15$
$16 + 2b = 15$
$-16 \quad -16$
$\frac{2b}{2} = \frac{-1}{2}$

$b = \frac{-1}{2}$

$\therefore (4, -\frac{1}{2})$ a, b

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Yes!

2. $x + 2y = 10$

$-1(x + y = 6)$

Are the variables lines up? Do you have opposite numbers as coefficients of either variable in the top and bottom equation? No!

I choose to eliminate the x-variable by multiplying the bottom equation by -1.

1, -1 opposites ⇒ eliminate

$1x + 2y = 10$

$-1x - 1y = -6$

$y = 4$

$x + (4) = 6$

$x + 4 = 6$

$-4 \quad -4$

$x = 2$

(x, y)

$(2, 4)$

Yes!

3. $5(3x - 7y = -14)$

$-3(5x + 2y = 45)$

Are the variables lines up? Do you have opposite numbers as coefficients of either variable in the top and bottom equation? No!

I choose to eliminate x by multiplying top equation by 5 and bottom equation by -3.

15, -15 opposites ⇒ eliminate

$15x - 35y = -70$

$-15x - 6y = -135$

$-41y = 205$

$\frac{-41y}{-41} = \frac{205}{-41}$

$y = 5$

$3x - 7y = -14$

$3x - 7(5) = -14$

$3x - 35 = -14$

$+35 \quad +35$

$\frac{3x}{3} = \frac{21}{3}$

$x = 7$

(x, y)

$(7, 5)$

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4. $u + v = 7$
$2u + v = 11$

yes!

Are the variables lines up? Do you have opposite numbers as coefficients of either variable in the top and bottom equation? No!

I'm going to eliminate v by multiplying bottom equation by −1.

$-1(2u + v = 11)$

$u + v = 7$
$-2u - v = -11$

$-u = -4$
$-1 \quad -1$

$u = 4$

$u + v = 7$
$(4) + v = 7$
$-4 \quad -4$

$v = 3$

u	v
4	3

5. $6p - 3q = 24$
$2p = 7 + q$
$-q \quad -q$

$2p - q = 7$

No!

Are the variables lines up? Do you have opposite numbers as coefficients of either variable in the top and bottom equation? No!

Line up variables first! Eliminate the p variable by mult. bottom equation by −3.

$6p - 3q = 24$
$-3(2p - q = 7)$ } Lined up ✓

$6p - 3q = 24$
$-6p + 3q = -21$

$0 + 0 = 3$
$0 = 3$ FALSE

∴ No solution!

Yes!

6. $2m + 4n = 6$
$2(-m - 2n = -3)$

Are the variables lines up? Do you have opposite numbers as coefficients of either variable in the top and bottom equation? No!

I will eliminate n variable. Multiply bottom equation by 2.

$2m + 4n = 6$
$-2m - 4n = -6$

$0 = 0$ TRUE → ∴ Infinite number of solutions.

Yes!

7. $2x - y = -4$
$-4x + 2y = 6$

Are the variables lines up? Do you have opposite numbers as coefficients of either variable in the top and bottom equation? No!

I will multiply top equation by 2 to eliminate y variable.

$4x - 2y = -8$
$-4x + 2y = 6$

$0 + 0 = -2$

$0 = -2$ FALSE → ∴ No solution exists.