

Simultaneous Equations Investigation

Divide your class into several groups, write the following systems of linear equations on the board and ask each group to solve one of the systems:

$2x + 3y = 4$	$x + 2y = 3$	$3x + 4y = 5$	$10x + 11y = 12$
$5x + 6y = 7$	$4x + 5y = 6$	$6x + 7y = 8$	$13x + 14y = 15$

Ask each group to report its solution. Students will note that the systems have the same solution, $x = -1, y = 2$

Now hand out the following worksheet:

THINK – Working individually

You have seen that each of the systems on the board has the same solution: $x = -1, y = 2$. Based on these results write another system of equations whose solution is $x = -1, y = 2$ and check that this really is the solution of your system.

Generalize the phenomenon above and state it as a conjecture.

Test your conjecture on at least two other systems of equations. Refine your conjecture, if needed.

PAIR – Working with your partner

Share your conjecture with your partner. State a conjecture that you both accept.

SHARE – Working in your group of four

Use algebra to show that your conjecture is correct.

SUPER CHALLENGE

Does your answer give **all** the systems whose solution is $x = -1$ and $y = 2$? If so, show that this is the case. If not, find all the systems of linear equations whose solution is $x = -1, y = 2$ and justify that you have all such systems.

Write your answer using the concept of "if and only if" and in an equivalent form using the concept of "necessary and sufficient."

Can you find a similar problem using 3 equations and 3 unknowns? You may wish to use a Computer Algebra System to assist.