Solving Simultaneous Linear Equations

Short Description: Learn the elimination method for solving two simultaneous linear equations in a real-world context in this Math Shorts video.

Long description: In this video, learn the elimination method for solving two simultaneous linear equations in a real-world context. In the accompanying classroom activity, students watch the video, solve a pair of simultaneous linear equations, and write a word problem to fit the equations. In order to facilitate introduction to and practice with the elimination method, students work with simple linear equations. To get the most from this lesson, students should be comfortable solving linear equations in one variable, presented as real-world and algebraic problems.

Activity Text

Learning Outcomes
Students will be able to:
- use the elimination method to solve two simple simultaneous linear equations
- write word problems to match two simultaneous linear equations
- define the mathematical term below

Common Core State Standards: 8.EE.C.8.b

Vocabulary: Simultaneous equation

Materials: Per student: pencil, paper, Problem Cards activity sheet; for teacher only: Problem Cards Solutions answer key

Preparation: Make two or more copies of the Problem Cards activity sheet. Cut out each problem and group them by challenge level. Each student will need one problem card.

Procedure
1. Introduction (5–10 minutes, whole group)
Distribute pencils and paper. Record $a + s = \$6$ on the board. Explain that this reflects buying one apple (a) and one sandwich (s) for a total of $6, and ask, What could the apple and sandwich each cost?

Gather several suggestions and establish that there are infinitely many solutions.

Record $3s = \$15$, and ask, Suppose that you buy three more sandwiches for $15. What does one sandwich cost? What does s equal?

Prompt the class to solve for s, substitute the value of s in $a + s = \$6$, and solve for a.

Next, record on the board:

$2n + p = \$5$
$n + p = \$3$

Explain that these *simultaneous equations* reflect buying two notebooks (*n*) and one pack of pencils (*p*) for $5, and one notebook and one pack of pencils for $3.

Give pairs a moment to attempt the problem, acknowledging that it may be a challenge.

Gather any solution strategies that students suggest; if no one mentions subtracting to eliminate *p*, demonstrate this yourself.

Finally, pose the more challenging problem that students will encounter in the video:
$2r + 2g = 40$
$3r + g = 50$

Give students a few minutes to attempt it, and let them know that they will see a video that demonstrates a solution strategy.

2. Watch the Video (10 minutes, whole group)
Show students the video, pausing as follows:

- 0:50—Ask students, How would you write "one red plus one green is 20" algebraically? How do you know that $r + g = 20$ has the same solution as $2r + 2g = 40$?
- 1:03—Ask, What can we find out by subtracting the green?
- 1:33—Give students a moment to find the value of *g*, with $r = 15$.

3. Solving Simultaneous Equations (10 minutes, pairs)
Write on the board:
$4x + 2y = 20$
$x + y = 7$

Ask students to suggest contexts that the expression could model. If needed, prompt for a variety of situations (e.g., tickets at different prices, number of legs in a family of pets and people). Then, work through the problem with the class. Ask them to check that the solutions fit both equations.

Give each pair a problem card at an appropriate level of challenge. Explain that they will write and solve a word problem to fit the equations on the cards.

4. Conclusion (5 minutes, whole group)
Ask for volunteers to read their word problems out loud. Highlight the range of situations that simultaneous linear equations can describe.

Wrap up by prompting students to summarize what they learned today. Ask them:

- What are simultaneous equations?

- What is one way to solve them?
- How do you know that the solution fits both equations?

Activity Extension: Have students trade and solve each other's word problems.