Name __KEY__

Illustrative Mathematics

Lesson 17: Systems of Linear Equations and Their Solutions

Cool Down: No Graphs, No Problem

Mai is given these two systems of linear equations to solve:

System 1:

$$\begin{cases} 5x + y = 13 \\ 20x + 4y = 64 \end{cases}$$

System 2:

$$\begin{cases} 5x + y = 13 \\ 20x = 52 - 4y \end{cases}$$ → not standard form

$$\begin{array}{l} +4y \quad +4y \\ \hline 20x + 4y = 52 \end{array}$$ → standard form version

She analyzed them for a moment, and then—without graphing the equations—said, "I got it! One of the systems has no solution and the other has infinitely many solutions!" Mai is right!

Which system has no solution and which one has many solutions? Explain or show how you know (without graphing the equations).

System 1

(*-4) $5x + 1y = 13$ → $-20x - 4y = -52$
(same) $20x + 4y = 64$ → ⊕ $20x + 4y = 64$
$$\overline{ 0x + 0y = 12}$$
$$\boxed{0 = 12}$$

→ This is never true.

There is __no solution__ to System 1.

System 2

(*-4) $5x + 1y = 13$ → $-20x - 4y = -52$
(same) $20x + 4y = 52$ → ⊕ $20x + 4y = 52$
$$\overline{ 0x + 0y = 0}$$
$$\boxed{0 = 0}$$

→ This is always true.

There are __infinitely many__ solutions for System 2.