Lesson Seed 8.EE.C.7a Equations with Different Solutions (Sorting)

(Lesson seeds are ideas for the domain/cluster/standard that can be used to build a lesson.
An effective lesson plan requires more components than presented in a lesson seed.)

Domain: Expressions and Equations
Cluster: Analyze and solve linear equations and pairs of simultaneous linear equations.
Standard: 8.EE.C.7.a – Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).

Purpose/Big Idea:

- Students will make connections between the structure of an equation and its number of solutions (one, infinite, or none)
- Look for and make use of structure

Materials:

- *Equation Sort Cards*
- White boards or scrap paper may be needed for finding solutions to the equations
- Writing Prompt (copies for each group; or displayed on overhead or presenter)

Activity:

- Group students
- Students will be given a set of equations that, when solved, yield either one solution (x = a), no solutions (a = b, where a and b are different numbers), or infinite solutions (a = a)
- Ask students to group the equations into categories (levels of scaffolding shown below can be used based on student needs in your room and levels of frustration in your room)
    - Tell students that they groups are related to the solutions of the equations
    - Tell students that there are three groups
    - Tell students that there are an equal number of cards in each group
    - Give the students generic examples of the solutions in each category {one solution (x = a); no solutions (a = b, where a and b are different numbers); or infinite solutions (a = a)}
- When most groups have finished their sort, students should respond to a writing prompt to help them prepare for the group discussion. For example, "Why did you group the equations the way you did? In your answer include any links that you see between the original structure of an equation and its number of solutions. Also include any strategies your group used to determine which group each equation fell into."
- Reflect on this activity using the guided questions below. Make a chart as a class of the key characteristics of each set of equations, and the strategies that students can use to determine the category a particular equation falls into

Guiding Questions:

- Tell the class the characteristics your group used to create each set of equations.

- How much do you need to simplify and solve an equation in order to determine the number of solutions it has?
- What key structures in the original equation drive the number of solutions it will have?

A. $6m - 2 = m + 13$	B. $4y + 9 = 4y - 7$	C. $3c + 2 = 3c + 2$
D. $3(x - 4) = 2x + 6$	E. $-8j + 14 = -2(4j - 7)$	F. $18x - 5 = 3(6x - 2)$
G. $-8a + 10 = 2(5 - 4a)$	H. $9x + 3x - 10 = 3(3x + x)$	I. $4x - 10 = x + 3x - 2x$
J. $\frac{2}{3}(6x+3) = 4x+2$	K. $a - 6 = 8 - (9 + a)$	L. $3(n - 1) = 5n + 3 - 2n$
M. $8(h - 1) = 6h + 4 + 2h$	N. $3(2y + 3) = 6y + 9$	O. $\frac{7}{8}w = \frac{1}{2}w + \frac{3}{4}w$

ANSWER KEY

A. $6m - 2 = m + 13$ **$m = 3$** **one solution**	B. $4y + 9 = 4y - 7$ **$16 = 0$** **no solution**	C. $3c + 2 = 3c + 2$ **$c = c$** **infinite solutions**
D. $3(x - 4) = 2x + 6$ **$x = 18$** **one solution**	E. $-8j + 14 = -2(4j - 7)$ **$j = j$** **infinite solutions**	F. $18x - 5 = 3(6x - 2)$ **$1 = 0$** **no solution**
G. $-8a + 10 = 2(5 - 4a)$ **$a = a$** **infinite solutions**	H. $9x + 3x - 10 = 3(3x + x)$ **$-10 = 0$** **no solution**	I. $4x - 10 = x + 3x - 2x$ **$x = 5$** **one solution**
J. $\frac{2}{3}(6x+3) = 4x+2$ **$x = x$** **infinite solutions**	K. $a - 6 = 8 - (9 + a)$ **$a = 2.5$** **one solution**	L. $3(n - 1) = 5n + 3 - 2n$ **$0 = 6$** **no solution**
M. $8(h - 1) = 6h + 4 + 2h$ **$0 = 12$** **no solution**	N. $3(2y + 3) = 6y + 9$ **$y = y$** **infinite solutions**	O. $\frac{7}{8}w = \frac{1}{2}w + \frac{3}{4}w$ **$w = 0$** **one solution**