Names (pair) _____ Date _____

Systems with a Parameter and Three Unknowns

Example: $x + y = 2,\ 2x + ay = 4$

From the first: $x = 2 - y$; substitute: $4 - 2y + ay = 4$, so $(a - 2)y = 0$.

$a \neq 2$: $y = 0, x = 2$, one solution.

$a = 2$: $0 = 0$, the same line, infinitely many solutions.

Remember

After removing one unknown we get $k \times y = c$. If $k \neq 0$, the system has **one** solution; if $k = 0$ and $c \neq 0$, **none** (parallel lines); if $k = 0$ and $c = 0$, **infinitely many** (the same line).

1 IN PAIRS Solve the system $2x + y = 3,\ ax + y = 1$ for the given values of a. For which a is there no solution?

a	Solution
0	
1	
2	
-1	

No solution for $a =$ ☐

2 ON YOUR OWN For which m does the system $mx + 2y = 4,\ 3x + y = 2$ have infinitely many solutions? Hint: multiply the second equation by 2.

$m =$ ☐

Names (group) _____ Date _____

3 ON YOUR OWN **Three unknowns.** Subtract the first two equations to get y straight away. Then solve the system with two unknowns.

$$\begin{aligned} x+y+z&=6\\ x-y+z&=2\\ 2x+y-z&=1 \end{aligned}$$

$(x, y, z) =$ ☐

4 IN A GROUP CHALLENGE Add all three equations. What do you get?

$$\begin{aligned} x+y&=5\\ y+z&=7\\ x+z&=6 \end{aligned}$$

$(x, y, z) =$ ☐

5 IN A GROUP Three numbers add up to 22. The first is 2 more than the second, and the third is twice the first. What are the numbers?

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★ ON YOUR OWN **Exit card.** For which a does the system $x + y = 1, 2x + 2y = a$ have no solution?

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