MAAPC20S Systems of Linear Relations Lesson 1

Lesson One – Developing Properties of Linear Systems

A ***system of linear equations*** is a set of two or more linear equations ($y = mx + b$) with the same variables (x and y).

The ***solution of the system of linear equations*** is the set of all ordered pairs that satisfies the equations. In other words, it is the point where the two lines intersect.

There are 3 types of systems of linear equations:

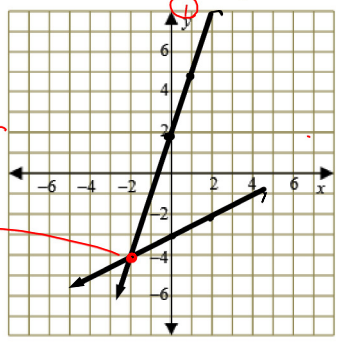
- Independent
- Inconsistent
- Dependent

Independent Systems: systems of equations that intersect at 1 point. They have 1 ordered pair that is the solution.

Example: Graph: ① $y = 3x + 2$ (m = 3, y-int)

② $\frac{2y}{2} = \frac{x}{2} - \frac{6}{2}$

$y = \frac{1}{2}x - 3$ ($m = \frac{1}{2}$, y-int)



Soln
Point of intersection
(−2, −4)

Check (x, y) (−2, −4)

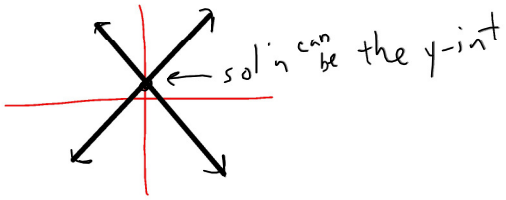
① $y = 3x + 2$
$-4 = 3(-2) + 2$?
$-4 = -4$ ✓

② $2y = x - 6$
$2(-4) = -2 - 6$?
$-8 = -8$ ✓

This is the only point in common on both lines ∴ the only point which will make both eqns true.

The lines in this type of system have different slopes ~~and y-intercepts~~, and intersect at 1 point. This point is the solution to the system.

Independent



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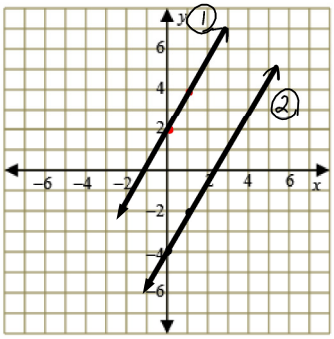
Inconsistent Systems: These are systems of equations that intersect at 0 points. They have no solution.

Example: Graph: ① $y = 2x + 2$ (m: 2/1, y-int)

② $y = 2x - 4$ (y-int)



same slope ($m = 2$)
∴ lines are parallel (∥)
and will not cross

No sol'n

The lines in this type of system are parallel. They have the same slope and different y-intercepts. There is no solution to this system of equations since the lines never intersect.

There won't be any common points found on both lines
∴ no point will make both eqns true

Inconsistent

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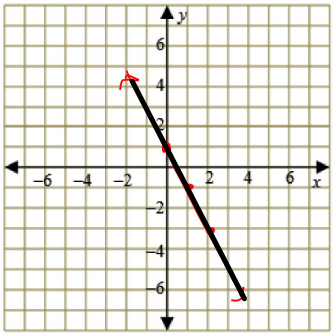
Dependent Systems: These are systems of equations that intersect at all points. They have an infinite number of solutions.

Example: Graph: $\frac{3y}{3} = \frac{-6x}{3} + \frac{3}{3}$

$y = -2x + 1$

$y = -2x + 1$

same eqn → same line (in different forms)



∴ sol'n an infinite # of sol'ns along the line $y = -2x + 1$

Actually, both the lines are the same. Since they have the same slope and the same y-intercept, they are ***coincident lines,*** and have an infinite number of solutions.

✳ **Summary: Three types of systems**

Consistent

1. Independent system/intersecting lines (ONE solution)
2. Dependent system/coincident lines/infinite number of solutions (INFINITE)
3. Inconsistent systems/parallel lines/no solution (NONE)

Assignment: ~~Pg 448; 1, 5, 6, 7, 8, 10, 11~~ Ps 409 # 3 Ps 448 # 5 worksheet