Review

What is a system of linear equations?

Two or more linear equations

What is a solution to a system of linear equations?

A coordinate pair (x, y) that makes the system true
Solutions to Linear Systems

\[ x + 2y = 5 \]
\[ 2x - 3y = 3 \]

Is \((1, 3)\) a solution to this system? \(\text{NO}\)

\[ 1 + 2(3) = 1 + 6 = 7 \neq 5 \]

Is \((3, 1)\) a solution to this system? \(\text{YES!}\)

\[ 3 + 2(1) = 5 = 5 \]
\[ 2(3) - 3(1) = 6 - 3 = 3 = 3 \]
Solving a Linear System using Graph and Check

Step 1: **WRITE** each equation in **Slope-Intercept** form.

Step 2: **GRAPH** both equations on the same **Coordinate Plane**.

Step 3: **Find** the coordinates of the **Intersection**.

Step 4: **CHECK** the coordinates algebraically. (Plug the point into each **equation** of the system.)
Solve Graphically:

\[ y = x - 2 \]
\[ y = -3x + 2 \]
Steps for solving systems of equations: Substitution

Step 1: Solve one of the equations for one of its variables.

Step 2: Substitute the expression from Step 1 into the other equation to solve for the other variable.

Step 3: Substitute the value from Step 2 into the revised equation from Step 1 and solve.

Step 4: Check the solution in each of the original equations.
Solve by substitution:

\[\begin{align*}
2x - y &= -1 \\
2x + y &= -7
\end{align*}\]

\[
\begin{align*}
-2x \rightarrow -2x \\
\overline{y = -7 - 2x}
\end{align*}
\]

\[
\begin{align*}
y &= -7 - 2(-2) \\
y &= -7 + 4 \\
y &= -3
\end{align*}
\]

\[
\begin{align*}
2x - (-7 - 2x) &= -1 \\
2x + 7 + 2x &= -1 \\
4x + 7 &= -1 \\
4x &= -8 \\
x &= -2
\end{align*}
\]

\((-2, -3)\)
Elimination:

Step 1: Arrange the equations with like terms in column.

Step 2: Multiply one or both of the equations by a number to obtain coefficients that are opposites for one of the variables.

Step 3: ADD the equations from Step 2. Combining like terms will eliminate one variable. Solve for the remaining variable.

Step 4: Substitute the value obtained in Step 3 into either of the original equations and solve for the other variable.

Step 5: Substitute the solution in each of the equations.
Solve by Elimination:

\[\begin{aligned}
&2(3x + y = 3) \\
&7x + 2y = 1 \\
&\underline{+6x-2y=-6} \\
&\underline{x = -5}
\end{aligned}\]

\[\begin{aligned}
&3(-5)+y=3 \\
&-15+y=3 \\
&\underline{+15} \quad \underline{+15} \\
&y=18
\end{aligned}\]

\((-5,18)\)
One  None  $0 \infty$
Solutions

If each variable equals a number there is: one

If a number equals itself there are: \( \infty \)

If a number equals another number there are: none
Important reminders

If the inequality has a ≤ or ≥ use a: **SOLID**

If the inequality has a < or > use a: **DOTTED**

If the inequality is ≤ or < you shade: **Below ↓**

If the inequality is ≥ or > you shade: **Above ↑**
\[ y < -3x - 1 \]
\[ y \geq \frac{1}{2}x - 2 \]

Dotted below

\[ 0 \leq -3(x) - 1 \] \[ 0 \leq -1 \] Solid above

\[ 0 \geq \frac{1}{2}(x) - 2 \]
\[ 0 \geq -2 \]