Bellwork:

Graph the line \( y = \frac{2}{3}x - 7 \).

*If you had the inequality \( y > \frac{2}{3}x - 7 \) would you shade above or below?

\[ 0 > -7 \]

### 2.5 Systems of equations day 1

**OBJ:** Today we will solve systems of equations by graphing or substitution

**Solving system of equations by graphing**

1. **Step #1:** Graph the first line using \( y \)-intercept and slope
2. **Step #2:** Graph the second line using \( y \)-intercept and slope
3. **Step #3:** Find where the lines intersect. This is the solution to the system of equations

Example 1:

\[
\begin{align*}
y &= \frac{1}{2}x - 4 \\
y &= -3x + 3
\end{align*}
\]

Solution: \((2, 3)\)

Example 2:

\[
\begin{align*}
y &= \frac{3}{2}x - 1 \\
y &= -\frac{1}{2}x - 5
\end{align*}
\]

Example 3:

\[
\begin{align*}
y &= \frac{1}{4}x + 2 \\
y &= \frac{1}{4}x - 1
\end{align*}
\]

Parallel, no solution

Example 4:

\[
\begin{align*}
y &= \frac{1}{4}x + 2 \\
y &= -\frac{1}{4}x - 1
\end{align*}
\]

Parallel, no solution
Solving system of equations by graphing

\[
\begin{align*}
    y &= 2x - 1 \\
    y &= \frac{3}{2}x + 4
\end{align*}
\]

\[(2,3)\]

Solving Systems of Equations by Substitution

GOAL: Substitute one equation into the other

Step #1: Pick the equation that has a variable that has a coefficient of 1

Step #2: Solve for variable (get x or y by itself)

Step #3: Substitute right side of equal sign into other equation.

Step #4: Equation will be in terms of one variable

Step #5: Solve for variable.

Step #6: Plug value into 2nd equation to solve for remaining variable.

DON’T FORGET TO SOLVE FOR X AND Y

Example 1: Solve system of equations by substitution

\[
\begin{align*}
    x &= 4y + 1 \\
    x &= 4y + 1 \quad \text{Goal: Subsitute one equation into the other} \\
    2x - 2y &= 13
\end{align*}
\]

\[y = \frac{8x}{2} = 4\]

\[x = 8 \quad y = 4\]

\[\left(\frac{8}{2}, \frac{4}{2}\right) = (4,2)\]

\[(0,0)\]

Application of Systems of Equations

The Johnsons and Smiths went to Runza for dinner. The Johnsons ordered 2 cheeseburgers and 2 Runzas and their bill was $16. The Smiths spent $19.25 on 4 cheeseburgers and 1 Runza. How much does a cheeseburger and a Runza cost?

a) Identify important information

b) Identify variables

2x + 2y = 16  \quad \text{Smiths 16.25  \quad x = Cheeseburgers} \\
4x + 1y = 14 \quad \text{Johnson 14  \quad y = Runzas}\n
c) Write a system of equations then solve for the price of each item.

\[\begin{align*}
    2x + 2y &= 16 \\
    4x + 1y &= 14
\end{align*}\]

Application of Systems of Equations

A test has twenty questions worth 100 points. The test consists of True/False questions worth 3 points each and multiple choice questions worth 11 points each. How many multiple choice questions are on the test?

a) Identify important information

b) Identify variables

\[\begin{align*}
    x + y &= 20 \\
    3x + 11y &= 100
\end{align*}\]

c) Write a system of equations then solve for the number of each type of question
Please finish Daily Sheet #13 and
Summary

What does the solution to a systems of equations look like? Why?