LINES IN THE CARTESIAN PLANE
EQUATION OF A LINE

\[ y = ax + b \]

- \( a = \text{slope} \) (rate of change)
- \( \frac{\text{rise}}{\text{run}} \)
- \( b = \text{y-intercept} \) (initial value)
GETTING AN EQUATION, GIVEN 2 POINTS

(1) WRITE OUT \( y = ax + b \)

(2) FIND SLOPE \[ a = \frac{y_2 - y_1}{x_2 - x_1} \]

(3) INTO \( y = ax + b \), PLUG IN THE VALUE FOR “a” WITH ONE SET OF COORDINATES FOR \((x, y)\) AND SOLVE FOR “b”

(4) WRITE THE FINAL RULE IN "y = ax + b" FORM

NOTES/EXAMPLES/REMINDERS
GETTING AN EQUATION, GIVEN 2 POINTS...

\[ a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{16 - (-6.5)}{3 - (-2)} = \frac{22.5}{5} = 4.5 \]

\[ y = ax + b \]

\[ 16 = 4.5(3) + b \]
\[ 16 = 13.5 + b \]
\[ -13.5 = -13.5 \]
\[ 2.5 = b \]

\[ y = 4.5x + 2.5 \]
**X AND Y INTERCEPTS**

- **y-intercept (initial value)**: the y-value when x = 0
- **x-intercept (zero)**: the x-value when y = 0

NOTES/EXAMPLES/REMINDERS
PARALLEL LINES

PARALLEL LINES
SAME SLOPE, DIFFERENT Y-INTERCEPT

Parallel lines that also have the same y-intercept are called coincident lines (drawn the same)

Parallel lines: no solution (they never cross)
Coincident lines: infinite solutions (they touch everywhere)

FOR BOTH LINES:
\[ a = \frac{2}{3} \]

\[ y = \frac{2}{3} x + 10 \]

\[ y = \frac{2}{3} x + 5 \]

NOTES/EXAMPLES/REMINDERS
PERPENDICULAR LINES

PERPENDICULAR LINES

SLOPES ARE NEGATIVE RECIPROCALS

\[
\text{slope line 1} = -2, \quad \text{slope line 2} = \frac{1}{2}
\]

NOTES/EXAMPLES/REMINDERS
SOLVING SYSTEMS OF EQUATIONS

1. PUT BOTH EQUATIONS IN $y = ax + b$ FORM
2. MAKE EQUATIONS EQUAL EACH OTHER (no “$y$”s)
3. SOLVE FOR “$x$”
4. PLUG “$x$” INTO EITHER EQUATION AND SOLVE FOR “$y$”

Remember, the solution is the point where the two lines cross $(x, y)$. In a word problem, there is an answer for “$x$” and “$y$”!

All systems of equations have one solution, except parallel lines (no solution) and coincident lines (infinite solutions)

NOTES/EXAMPLES/REMINDEERS