

3.1 ~ Lines in the Coordinate Plane

PROBLEMS 13 - 15: FIND THE VALUE OF K AND WRITE THE EQUATION OF THE LINE DESCRIBED.

13. A line passes through the points $(k + 10, -2k - 1)$ and $(2, 9)$ and has a y-intercept of 10.

Step 1: Use the given point, $(2, 9)$, and y-intercept, 10, to find the numerical slope of the line. Plug these values into $y = mx + b$ and solve for m.

$$\begin{aligned}x = 2, y = 9, b = 10 \quad & 9 = m \cdot 2 + 10 \\ & -1 = 2m \\ & -\frac{1}{2} = m\end{aligned}$$

You now have everything you need to write the equation of the line described.

$$y = -\frac{1}{2}x + 10$$

Step 2: Plug the given point, $(2, 9)$, and the point with the k-values, $(k + 10, -2k - 1)$, into the slope formula. $x_1 \quad y_1 \quad x_2 \quad y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2k - 1 - 9}{k + 10 - 2} = \frac{-2k - 10}{k + 8}$$

Step 3: Set the slope from step 1 equal to the slope from step 2. These form a proportion. To solve a proportion, use the Cross Product Property. This is how you will find k.

$$\text{Slope from step 1: } -\frac{1}{2} \quad -\frac{1}{2} = \frac{-2k - 10}{k + 8}$$

$$\begin{aligned}\text{Slope from step 2: } \frac{-2k - 10}{k + 8} \quad & -1(k + 8) = 2(-2k - 10) \\ & -k - 8 = -4k - 20 \\ & 3k = -12 \\ & k = -4\end{aligned}$$