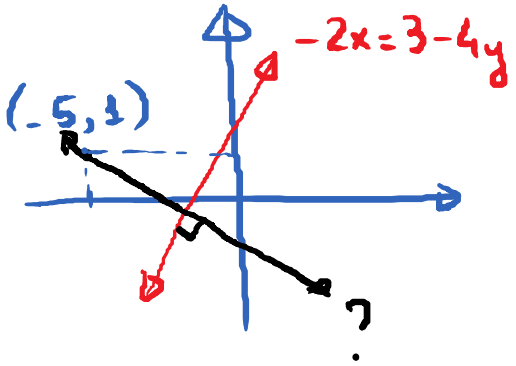
E.g. Find the slope-intercept equation of the line containing the point $(-5, 1)$ and perpendicular to the line

$$-2x = 3 - 4y.$$



Step 1: $-2x = 3 - 4y$

$\rightarrow -2x - 3 = -4y$

$\rightarrow -4y = -2x - 3$

$\rightarrow y = \frac{1}{2}x + \frac{3}{4}$

Slope $= \frac{1}{2}$.

Step 2: Slope of the line we want : -2

(negative reciprocal b/c perpendicular)

$y - 1 = -2(x - (-5))$ (Pt-Slope)

$y - 1 = -2(x + 5)$

$y = -2x - 10 + 1$

$$\boxed{y = -2x - 9}$$

(2) Applications

E.g. The average monthly expenses of a company is given by

Year	Average Monthly Expenses
2009	$20,000
2011	$19,000

in a year

Q1: Let t = # of years since 2000.

y = expenses.

Find a linear function y in terms of t that fits this data.

Q2: Use this function to predict the expenses in the year 2020?

Q1: Data points

t	y	
9	20000	$\longrightarrow (9, 20000)$
11	19000	$\longrightarrow (11, 19000)$

Find the linear model. $y = mt + b$.

Step 1: Find Slope $m = \dfrac{19000 - 20000}{11 - 9} = \dfrac{-1000}{2} = \boxed{-500}$

Step 2: Point-Slope Form:

$$y - 20000 = -500 \cdot (t - 9)$$

$$y - 20000 = -500t + 4500$$

$$\boxed{y = -500t + 24500}$$

Q2: The year 2020 corresponds to $t = 20$.

Expenses in 2020: $y = -500 \cdot (20) + 24500$

$$\boxed{y = 14500}$$

E.g. Suppose buyers are willing to buy 100 items of a product when the price of each item is $10.

They are only willing to buy 70 items when the price per item is $12.

Q1: Find a linear function the expresses the # of items buyers are willing to buy as a function of the price per item.

Let p = the price per item

Let q = the # of items buyers are willing to buy at price p

Q2: Use this function to predict the # of items buyers are willing to buy when the price per item is $15.

Q1: Data Points

p	q	
10	100	$\rightarrow (10, 100)$
12	70	$\rightarrow (12, 70)$

Find the linear function $q = mp + b$

Step 1: Find Slope $m = \frac{70 - 100}{12 - 10} = \frac{-30}{2} = -15$

Step 2: Point-Slope Form:

$$q - 100 = -15(p - 10)$$

$$q = -15p + 150 + 100$$

$$\boxed{q = -15p + 250}$$

Q2: Find q when p = 15.

$$q = -15 \cdot 15 + 250 = \boxed{25}.$$

E.g. In 2005, the # of students participating in sports at a college was 150. In 2010, the number had risen to 320.

Q1: Find a linear function that fits the data.

Let x = # of years since 2005.

N = # of students participating in sports during year x.

Q2: Use this function to predict the # of students participating in sports in 2018.

Q1: Data points

x	N	
0	150	$\longrightarrow (0, 150)$
5	320	$\longrightarrow (5, 320)$

Step 1: Find Slope $= \frac{320 - 150}{5 - 0} = 34$

Step 2: $N = 34x + 150$

Q 2: Find N when $x = 13$

$N = 34 \cdot 13 + 150 = 592$