Learning Goals

1. To determine the equation of a line when given 2 points on a line.

2. To determine the equation of a line when given 1 point and the y-intercept.

3. To understand that the only information required for the equation of a line is the slope (m) and the y-intercept (b).

5.4 - Using Points to Determine the Equation of a Line

Key Ideas: You can determine the equation of a line in the form $y = mx + b$ if:

1. You know two points on the line, or;

2. One point and the slope.

Given Two Points

1. Solve for the slope using the equation, m = $\frac{y_2 - y_1}{x_2 - x_1}$

2. Plug one point in for x and y in the equation, y = mx + b and solve (isolate) for "b".

3. Plug your calculated values for "m" and "b" into the equation y = mx + b.

Example One

Determine the equation of the line that passes through the points A(2, 9) and B(1, 13).

x_1, y_1 x_2 y_2

1. Solve for the slope (m).

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{13 - 9}{1 - 2} = \frac{4}{-1} = -4$$

2. Solve for "b" by plugging m for x + y.

$y = -4x + b$ B(1, 13) (x, y)

$13 = -4(1) + b$

$13 = -4 + b$

$+4$

$17 = b$

3. Plug "m" + "b" into the eqn.

$y = -4x + 17$

Given One Point and the Slope

1. Plug the given slope into the equation y = mx + b as well as the one point for x and y to solve for "b".

2. Plug your value for m and calculated value for b into the equation y = mx + b.

Example Two

Determine the equation of the line that has a slope of 4 and passes through the point (2, 6).

x_1 y_1

1. Solve for "b" by plugging in for x & y.

$y = mx + b$

$m = 4$ (given in question)

$6 = 4(2) + b$

$6 = 8 + b$

8

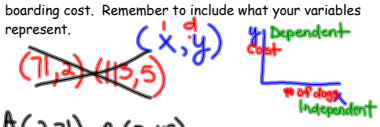
$-2 = b$

2. Plug in "m" & "b" into the eqn.

$y = 4x - 2$

Example Three

Ken's Kanine Kennel costs $71 for 2 dogs and $113 for 5 dogs. Julie wants to know the daily cost to board her 3 dogs. Determine the equation that describes the relationship between the number of dogs and the daily boarding cost. Remember to include what your variables represent.



A(2,71) B(5,113)
x_1 y_1 x_2 y_2

1. Calculate the slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{113 - 71}{5 - 2}$$

$$= \frac{42}{3}$$

$$= 14$$

2. Solve for "b" by plugging in for x + y.

A(2,71)
x_1 y_1

$y = mx + b$
$71 = 14(2) + b$
$71 = 28 + b$
$-28 \quad -28$
$43 = b$

3. Plug "m" + "b" into the eqn.

$y = 14x + 43$

y = cost
x = # of dogs

4. Plug x = 3 into eqn + solve for y.

$y = 14(3) + 43$
$= 85$

Complete: p. 290 - 292 #1 - 4, 5ac, 6a, 7a, 11.