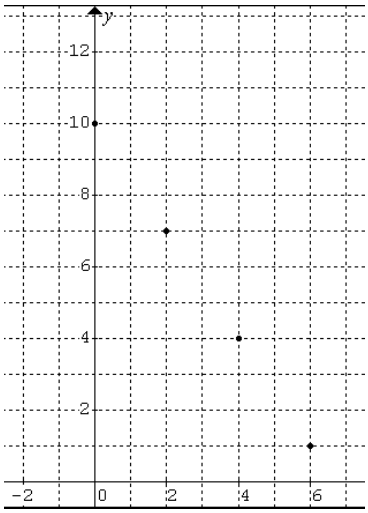
Other Forms of Linear Equations

Example 1: In the cafeteria, burgers cost $3.00 and fries cost $2.00. Taylor has collected $20.00 from his friends to buy lunch for them. Taylor spends all the money he has. Determine all possible combinations of burgers and fries Taylor could have purchased.



The possible pairs (burgers, fries) are:

(0, 10), (2, 7), (4, 4), and (6, 1)

The relationship is graphed, right.

Now let's develop the equation, first, from the original problem.

Let x be the number of burgers Taylor buys, and let y be the number of fries. To calculate the total cost of his food:

$3 × (number of burgers) + $2 × (number of fries) = $20 or $\boxed{3x + 2y = 20.}$

Now let's get it from the graph.

The slope is $-\frac{3}{2}$ and the y-intercept is 10. So the equation is $\boxed{y=-\frac{3}{2}x+10}$.

These equations look a bit different. Are they really the same? We can use some algebra to check!

$3x - 3x + 2y = 20 - 3x$ Get the y term by itself by subtracting $3x$ from both sides.

$2y = -3x + 20$

$\frac{2}{2}y=-\frac{3}{2}x+\frac{20}{2}$ Divide both sides by 2 to get y by itself.

$y=-\frac{3}{2}x+10$ Presto!

Example: Re-arrange to slope-y-intercept form:

a) $3x + 4y = 12$

$$3x - 3x + 4y = -3x + 12$$
$$4y = -3x + 12$$
$$\frac{4}{4}y = \frac{-3}{4}x + \frac{12}{4}$$
$$y = -\frac{3}{4}x + 3$$

b) $2x - y - 10 = 0$

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