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## MTH 111 - Quiz 1

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Read all directions carefully. You must show all work to receive credit. No notes, book, calculators, mp3 players or phones are allowed during this quiz. Write clearly and make sure to indicate your final answer.

1. (a) Use point-slope form to find the equation of the line with slope  $\frac{2}{7}$  that goes through the point  $(-5, 12)$ .

**Solution:** The point-slope formula for a line of slope  $m$  going through the point  $(x_0, y_0)$  is

$$y - y_0 = m(x - x_0)$$

We are attempting to find the equation of a line with slope  $m = \frac{2}{7}$  and going through the point  $(x_0, y_0) = (-5, 12)$ . This means that  $x_0 = -5$  and  $y_0 = 12$ . Now we change the letter in the point-slope equation to the numbers specific to our situation. This gives

$$y - 12 = \frac{2}{7}(x - (-5)) \tag{1}$$

as the desired equation.

- (b) What is the  $y$ -intercept of this line?

**Solution:** The  $y$ -intercept is the point where the graph of the line crosses the  $y$ -axis, and therefore occurs when  $x = 0$ . Plugging this into equation 4 we get

$$y - 12 = \frac{2}{7}(-(-5)) = \frac{10}{7}$$

To find the  $y$ -coordinate of the  $y$ -intercept we solve this for  $y$ . This gives

$$y = -\frac{10}{7} + 12 = \frac{94}{7}.$$

Therefore, the  $y$ -intercept of the line is the point

$$\left(0, \frac{94}{7}\right).$$

2. A rectangular window has a length that is 20 inches more than its width. This window also has a perimeter of 100 inches.

(a) Set up an equation that will allow you to find the dimensions of the window.

**Solution:** A window is the shape of a rectangle with one side labeled as its width and one side as its length. The perimeter of a rectangle is the distance around the outside of it. Another way of saying this is that the perimeter is the length of all the sides added together. Since opposite sides of a rectangle have the same length, we get the formula

$$P = 2l + 2w \quad (2)$$

Where we have chose the letter  $P$  to represent the perimeter of the rectangle,  $w$  to represent the width, and  $l$  to represent the length.

We now translate the statement: The length is 20 inches more than the width, into a mathematical expression

$$l = 20 + w \quad (3)$$

We use this to replace the  $l$  in equation 2 with  $20 + w$  to get

$$P = 2(20 + w) + 2w = 40 + 4w$$

This has the effect of taking two equations that involve three variables, and yielding a single equation with only two variables  $P$  and  $w$ . So, since we know that in our situation the perimeter is 100, then the desired equations is

$$100 = 40 + 4w \quad (4)$$

(b) Find the dimensions of the window.

**Solution:** Most of the hard work is already done we need only to solve equation 4. This gives that  $w = \frac{100-40}{4} = 15$ . Now that we know the value of  $w$  we use equation 3 to get that  $l = 20 + 15 = 35$ . Thus the dimensions of the window are : length = 35 and width = 15.