

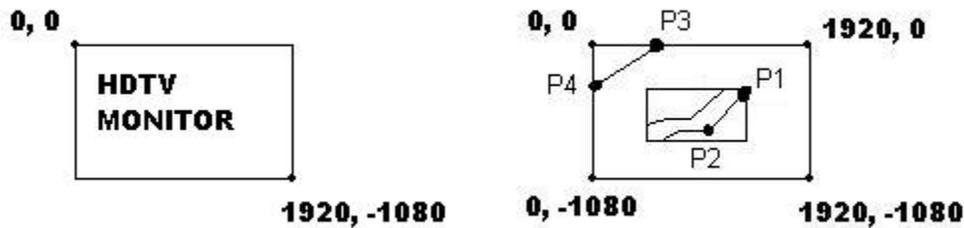
# M<sup>2</sup> = Math Mediator Lesson 12: Equations from Graphs

**\*NOTE: This lesson requires some prep and materials: See the second and next to last items.**

<p>Total Recall (Warm-up) (5 minutes approx.)</p>	<p>Total Recall: 2 exercises from yesterday's lesson</p> <ol style="list-style-type: none"> <li><math>y = 2x + 3</math> what is the slope? What is the y-intercept? (A: 2, 3)</li> <li><math>3y + 10 = 6x + 19</math> Plot it. Slope? Y-intercept? (A: 2, 3) Look familiar?</li> </ol>
<p>Direct Instruction (10 minutes approx.)</p> <p><b>Warmup for CA Std 2.0</b></p>	<p>Last lesson and in today's Total Recall, we took equations and plotted them, found the slope and the y-intercept. Today, we will learn to take a line and points on a line to make an equation and determine the rate of change.</p> <p>If you go into marketing as a career or business promotion or sales within a company, you will often get data from accountants at the end of a fiscal year such as this: In 2007 the net earnings were \$150 million. In 2006 the net earnings were \$120 million. Using this data, What was the percent growth in earnings over the year? This can be calculated by finding the slope. First, let's plot the data: make an x-y graph or use graph paper and plot the two points and then connect them. People in companies and stock holders like to see charts and lines that are "high and to the right" which show that the company is growing in earnings. To find the slope of the line, use the slope equation for two given points: <math>\text{slope} = (y_2 - y_1)/(x_2 - x_1) = (150 - 120)/(2007 - 2006) = 30/1 = 30</math> million dollar growth per year.</p> <p>U-DO:</p> <ol style="list-style-type: none"> <li>What is the yearly growth for a company with a reported income of \$30 million in 2002 and \$180 million in 2007?</li> <li>What is the yearly growth for a company with a reported income of \$20 million in 2005 and \$18 million in 2007?</li> </ol>
<p>Direct Instruction: (15 minutes approx.)</p>	<p>On a computer screen or HDTV monitor, there are columns and rows (this makes up an array) of color pixels or dots. Typical numbers for the columns x rows are 640 x 480; 800 x 600; 1024 x 768; 1600 x 1200; or 1920 x 1080. Each pixel is a color cell, and the more pixels, the better the definition and viewing experience. The trade off is the amount of information needed to tell each pixel what color it needs to be. The more pixels, the more information, or bandwidth or data rate speed there needs to be to make it work properly.</p> <p>The first number from the columns x rows is the number of pixels going across your screen. This number is larger because of widescreen formats used predominantly. The second number is the number of pixels going from top to bottom. This array of pixels forms an x-y or column-row grid; with the y axis as the left side of the screen and the x-axis as the top of the screen, except that the numbers on the x axis go positive as you count down from the top of the screen.</p> <p>A typical usage for these screens and pixels are video games. In a company that makes and sells video games, they have people called graphical designers and programmers. These people develop artwork and video feed instructions in</p>

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order to display specific images onto the screen.



The pictures above show the x-y coordinates of how the pixels on a HDTV monitor screen are arranged. The second picture shows a couple of patterns that are to be displayed on the screen. Let's say that P2 was at (1024, -540) and P1 was (1280, -270). The line between the two points is straight, so a graphical designer would like to write an equation for the line and use it to manipulate all the pixels along that line to display the line on the screen. Otherwise, the graphical designer would have to identify each individual pixel to light them. With a linear equation, a computer software code can be written to calculate all the points or pixels on the line.

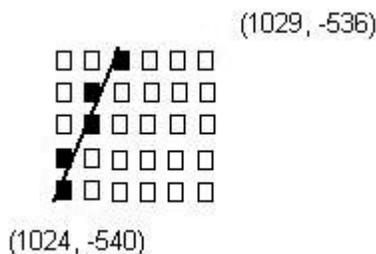
$$P1 = (1280, -270) \text{ and } P2 = (1024, -540)$$

$$\text{Slope} = (y_2 - y_1)/(x_2 - x_1) = (-540 - (-270))/(1024 - 1280) = -270/-156 = 45/26$$

**\*\*Point-Slope Form**  $y - y_1 = m(x - x_1)$

$$y - (-270) = (45/26)(x - 1280) \text{ or simplified to: } y = (45/26)x - 1945.4$$

Therefore, starting at pixel P2 (1024, -540) and using the slope by going up 1.73 rows and over one row, a set of pixels can be lit up to display the line as shown below:



**\*\* Graphic designers work with various patterns and pixel manipulations to get the best visual display.**

Practice  
(20 minutes  
approx.)

Use the following points and the Point-Slope Form to create linear equations:

1. (-3, 5); (2, -10)
2. (3, 8); (1, 4)
3. (1020, -270); (840, -210)
4. In the example, P3 = (270, 0) and P4 = (0, -405). Use the point slope form to create a linear equation for the line connecting these points.

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	<p>(A: <math>y = 1.5x - 405</math>)</p> <p>5. The slope of a line is <math>1/3</math> and it passes through point <math>(0, -50)</math>. What is the linear equation for this line? A: <math>y = (1/3)x - 50</math></p> <p>6. Given two points on a line, find the linear equation for the line. <math>(200, -50); (0, -100)</math>? A: <math>y = (1/4)x - 100</math></p> <p>7. What is the linear equation for a line with slope <math>0.5</math> and passing through point <math>(384, -810)</math>? A: <math>y = 0.5x - 1002</math></p>
Wrap-up (5 minutes approx.)	Wrap up closing comments and housekeeping.