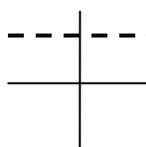
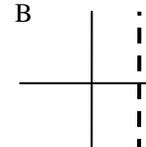
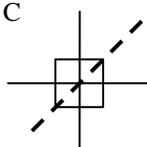
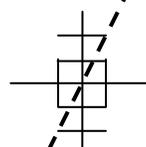


M² = Math Mediator Lesson 11: Lines: Rate of Change

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

<p>Total Recall (Warm-up) (10 minutes approx.)</p>	<p>Total Recall: 4 exercises from yesterday's lesson</p> <ol style="list-style-type: none"> If a line had a slope of -2, what would the slope of a line perpendicular to it be? Identify the slope in the following dashed lines: <div style="display: flex; justify-content: space-around; align-items: flex-start; margin-top: 10px;"> <div style="text-align: center;"> <p>A</p>  <p>(Zero)</p> </div> <div style="text-align: center;"> <p>B</p>  <p>(Infinite)</p> </div> <div style="text-align: center;"> <p>C</p>  <p>(+1)</p> </div> <div style="text-align: center;"> <p>D</p>  <p>(+2)</p> </div> </div> Which has the most slope? (Infinite is an undefined large number) What is the slope of a line perpendicular to line C above? (-1)
<p>Direct Instruction (10 minutes approx.)</p>	<p>What would be an equation for line C in the Recall? $y = x$ or $f(x) = x$ What is the slope? 1</p> <p>What would be an equation for line D above? $y = 2x$; Check with some points; such as $x = 0, 1, 2, -1$.</p> <p>What was its slope? 2 Do you notice a pattern? C has slope of 1 and the coefficient of the x term in the equation is 1. D has slope 2 with coefficient of 2.</p> <p>Plot $f(x) = x + 2$ on the same graph as C in your notes. What do you notice about the new line? It is parallel to $y = x$, so it has the same slope. Notice that this new line equation also has a 1 as a coefficient to x.</p> <p>Where did the original line C intercept or cross the y axis? At zero. Where did this new line intercept the y axis? 2</p> <p>All equations of lines can be put into a form so that the coefficient of x is the slope, and any number by itself is the y intercept. This form is called the "slope-intercept" form. It is expressed in generic form as: $y = mx + b$; where m is the slope and b is the y-intercept.</p> <p>Examples: $y = 3x - 4$; slope? 3; y-intercept? -4</p> <p>$2x - 3y = 6$; Is the slope 2? No, need to put in slope intercept form, so we need to have the y by itself on one side of the equation:</p> <p>$2x - 3y = 6$; $-3y = -2x + 6$; $y = (2/3)x + 2$ slope = $2/3$; y-intercept = 2.</p>
<p>Practice (10 minutes approx.)</p>	<p>U-DO: Put the following into slope-intercept form and identify the slope and y-intercept. Graph the line.</p> <ol style="list-style-type: none"> $6y = 12x + 24$ (A: $y = 2x + 3$; slope = 2; y-intercept = 3)

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	<p>2. $4x + 2y = 14$ (A: $y = (-2)x + 7$ slope = -2; y-intercept = 7)</p> <p>3. $6y + 3x = 3x + 18$ (A: $y = 3$; slope = zero; y-intercept = 3)</p>																			
<p>Direct Instruction and Practice (10 minutes approx.)</p>	<p>Rate of Change: Plot data from table for each country and find the slope.</p> <p>Slope = $(y_2 - y_1)/(x_2 - x_1)$</p> <p>Asia = $(510-147)/(2007-2000) = 51.86$ million users increase per year.</p> <p>What information does the slope contain? (The rate of change in internet users over the years or per year on average. All have gained, because of positive slope).</p> <p>Which country had the most change? Which had the least change? (Slope is smallest).</p>	<p>Internet Users (2000 vs. 2007) (in millions)</p> <table border="1"> <thead> <tr> <th><u>Country</u></th> <th><u>2000</u></th> <th><u>2007</u></th> </tr> </thead> <tbody> <tr> <td>Middle East</td> <td>3.7</td> <td>34</td> </tr> <tr> <td>Africa</td> <td>5</td> <td>44</td> </tr> <tr> <td>Europe</td> <td>151</td> <td>348</td> </tr> <tr> <td>Asia</td> <td>147</td> <td>510</td> </tr> <tr> <td>North America</td> <td>198</td> <td>238</td> </tr> </tbody> </table>	<u>Country</u>	<u>2000</u>	<u>2007</u>	Middle East	3.7	34	Africa	5	44	Europe	151	348	Asia	147	510	North America	198	238
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<p>Practice: (10 minutes approx.)</p>	<p>U-DO:</p> <ol style="list-style-type: none"> Rachel's height in 2000 was 4' 3". On the same date in 2008, she measured her height to be 5'9". What was Rachel's rate of growth per year as found by plotting the points and finding the slope? (Change inches to decimal by dividing each by 12. Use slope formula $(y_2 - y_1)/(x_2 - x_1)$ to find that her rate of growth was 0.1875 foot per year. How many inches per year is that? 2.25"). If bowling costs \$3.00 for each game and shoe rental is \$2.00, write an equation for the total cost for one bowler to play 'x' number of games. What is the rate of change for this bowling? (A: $y = 3x + 2$; \$3 per game) For the bowling exercise #2 above, what are the reasonable values for the number of games (domain) and cost (range)? (A: Typically, people can play 3 games and not be too sore from the physical exertion of tossing the heavy bowling ball. Some experienced bowlers may play 5 games. Cost may only allow one or two games. 1 game = \$5; 2=\$8; 3=\$11; 4=\$14; and 5=17). <p>* Notice that when we plot data points and make a line from the data points, there are points on the line that fall between the whole values used on the x-axis, whether it is years or number of games bowled or whatever. Use care and common sense when pulling points off these graphs. Does it make sense to bowl 2.4 games? Maybe, if you know the manager of the bowling alley and he will charge you by frame, but most bowling alleys charge by the game. So if you started into game 3, but did not finish, you might very well be charged for the whole game.</p>																			
<p>Wrap-up (5 minutes)</p>	<p>Wrap up closing comments and housekeeping.</p>																			

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approx.)	
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