Lesson Plan - Linear Review

Prepared by: Eric Miller  
Date of lesson: September 15\textsuperscript{th}, 2008  
Time frame: 80 min 
Number of students and grade level: grade 8 approx. 25 students 

New York State Learning Standard 3: Mathematics: Students will understand mathematics and become mathematically confident by communication and reasoning mathematically, by applying mathematics in real-world settings and by solving problems through the integrated study of number systems, geometry, algebra, data analysis, probability, and trigonometry.

Pre-assessment: The class consists of approx. 25 eighth graders, whose cognitive abilities range from low to high. The students are familiar with slope and y-intercept. They have had practice, last year, finding both and writing an equation.

Specific objectives:  
At the end of this lesson, students will be able to:  
1. Describe the equation of any linear line located on a coordinate grid

Materials: projector, Green Globs (Equation Grapher and Line & Quadratic Graphs), laptop or computer, internet access, handout for students, loose leaf paper, pen/pencil

Procedures: 
Motivation/Introduction: Start with using the National Library of Virtual Manipulatives Grapher applet. Located at: http://nlvm.usu.edu/en/nav/frames_asid_109_g_3_t_2.html?open=activities&from=category_g_3_t_2.html 

1) Type in the box $f(x) = ax$  
2) Discuss what changing the “a” value in the equation does to the graph. (5 min)  
3) Now type in the box $f(x) = x + b$ and click on the “b” button on the bottom of the applet.  
4) Discuss what changing the “b” value in the equation does to the graph. (5 min)

Steps: 1) Start Green Globs and the Equation Grapher program  
   a) Handout the Linear Review sheet (2 min)  
   b) Type in $y = ax$ and discuss what happens to the graph when the “a” value is 0 and gets larger. Then, what happens when the “a” value gets smaller. (10 min)  
   c) Type in $y = x + b$ and discuss what happens to the graph when the “b” value is 0 and gets larger. Then, what happens when the “b” value gets smaller. (10 min)
d) Now try some equations in the form of $y = ax + b$, until you are satisfied that the students are understanding the connection between “a” and “b” and the equation. Type a variety of questions in this form and ask the students to describe what the linear graph is going to look like. Where is it going to start (y-intercept)? Is the graph going up or going down? Is it steep or not? (15 min)

2) Start the **Linear and Quadratic Graphs program** of Green Globs, while **students get out 1 piece of loose leaf paper**.

   a) Select Lines and begin with easy and work up. (3 min)
   b) Solve for equations using the graph given (25 min)
   - As the equations come up, give the students about 4-5 min minutes to come up with an equation and write it down on their piece of paper and make a sketch.
   - Ask for the solution, to make sure all students have the correct answer (2 min)

**Conclusion:**
Students should write down on a piece of paper a summery of what they learned today (3 min)
What happens when we change $y = ax$?

“$a$” is positive. Another name for “$a$” is called the ____________.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Description</th>
<th>Sketch</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = 0x$</td>
<td>The line starts at ______ and is _________________</td>
<td></td>
</tr>
<tr>
<td>$y = 1x$</td>
<td>The line starts at ______ and is _________________</td>
<td></td>
</tr>
<tr>
<td>$y = 2x$</td>
<td>The line starts at ______ and is _________________</td>
<td></td>
</tr>
<tr>
<td>$y = 5x$</td>
<td>The line starts at ______ and is _________________</td>
<td></td>
</tr>
</tbody>
</table>

“$a$” is negative.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Description</th>
<th>Sketch</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = -1x$</td>
<td>The line starts at ______ and is _________________</td>
<td></td>
</tr>
<tr>
<td>$y = -2x$</td>
<td>The line starts at ______ and is _________________</td>
<td></td>
</tr>
<tr>
<td>$y = -3x$</td>
<td>The line starts at ______ and is _________________</td>
<td></td>
</tr>
</tbody>
</table>
\[ y = -5x \]

The line starts at _____
and is ________________

**Summary:** When the value of “a” is positive the line is going _______.

When the value of “a” is negative the line is going _______.

What happens when we change \( y = x + b \)?

“b” is positive. Another name for “b” is called the ____________.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Description</th>
<th>Sketch</th>
</tr>
</thead>
</table>
| \( y = x + 0 \) | The line starts at _____
and is ________________ | |
| \( y = x + 1 \) | The line starts at _____
and is ________________ | |
| \( y = x + 2 \) | The line starts at _____
and is ________________ | |
| \( y = x + 5 \) | The line starts at _____
and is ________________ | |

“b” is negative.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Description</th>
<th>Sketch</th>
</tr>
</thead>
</table>
| \( y = x - 1 \) | The line starts at _____
and is ________________ | |
\[ y = x - 2 \] The line starts at ______
and is _________________

\[ y = x - 3 \] The line starts at ______
and is _________________

\[ y = x - 5 \] The line starts at ______
and is _________________

**Summary:**

When the value of “b” is positive the line starts at a ______ value.

When the value of “b” is negative the line starts at a ______ value.

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**What happens when we change \( y = ax + b \)?**

<table>
<thead>
<tr>
<th>Equation</th>
<th>Description</th>
<th>Sketch</th>
</tr>
</thead>
</table>
| \( y = 0x + 2 \) | The line starts at______
and is _________________ |        |
| \( y = 0x - 2 \) | The line starts at______
and is _________________ |        |
| \( y = x + 0 \) | The line starts at______
and is _________________ |        |
| \( y = -x +0 \) | The line starts at______
and is _________________ |        |
<table>
<thead>
<tr>
<th>Equation</th>
<th>Line Starts At</th>
<th>Line Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = x + 4$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y = -x + 4$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y = 2x + 1$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y = -2x - 1$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y = -2x - 1$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y = 3x + 5$</td>
<td></td>
<td></td>
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</tbody>
</table>

**Summary:**

When the value of “a” changes, the ________________

________________________________________________________________________

When the value of “b” changes, the ________________

________________________________________________________________________