Cockroach Slope
Lesson Plan

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Grade/Course: 10th /Honors Geometry
KY Standards:
MA-HS-5.1.5   Students will determine the slope and intercepts of a linear function.
MA-HS-4.1.2   Students will construct data displays for data with no more than two variables.
Kentucky Academic Expectation 1.6: Students use computers and other types of technology to collect organize and communicate information and ideas.

Objectives:
- The student will exercise their ability to quickly compute the slope and y-intercept of a line.
- The student will visually be able to determine the difference between a line with negative, positive, zero or undefined slope.
- The student will understand that when the y-intercept is zero, the equation of a line is of the form y=mx where m is the slope.
- The student will understand that when the slope is zero, the equation of the line is of the form y=b where b is the y-int.
- The student will demonstrate their capability of using a Java applet via Internet Explorer.

Resources/Materials needed:
- One computer per student with internet access
- Data Collection Sheet (attached)

Game Summary:
        The purpose of this game is to watch a cockroach crawling along a line. The student should enter the slope (and/or y-intercept) as prompted, then click Fire!. If they have entered the required information correctly, the cockroach will be exterminated.

This is an excellent activity to give students practice with finding slope as it breaks down the levels in logical steps. First the students compute only the

y-intercept. During the second level students compute only the slope. Then each level gets successively harder: lines with positive slope, lines with positive fractional slopes, lines with negative slopes, lines with negative fractional slopes, all mixed together.

Motivation

Mrs. Callahan was having a hard time getting students interested in slope. They had used slope in their previous math classes, and had not mastered the concept. Many students were confused and discouraged about learning (re-learning) the concept.

Mrs. Callahan asked me to come up with a fun, interactive way to get students interested in slope. I found this Java applet on the web and formulated an activity sheet to go along with it. I was interested, not only in making sure that the students played the game, but also in seeing how long it took them to compute each level. (That is why there is a space to record how many cockroaches were exterminated.)

Prior Knowledge

Students are expected to have a solid understanding of what slopes, y-intercepts, equations in slope intercept form are and how to compute them. The students we were working with had just finished a two-day lesson on the above information and were ready to practice. This is not a lesson to use before a student has been given the appropriate definitions and formulas as the game does not explain in depth how to determine slope or y-intercept. The game does give good hints, but they would be of little use for a student who did not have the background information.

Outline of Lesson

I.   This activity is to be done individually. I believe that group-work would be quite disruptive, especially if the class is large.

II.   Before going to the computer lab (perhaps even the class before) the teacher should go through and explain the cockroach activity. It would be best if the teacher could actually demonstrate how the game is played. The instructions should be explained in advance so that students know exactly what is expected of them. The activity should take at least 50 minutes.

III. On the day of the activity the students should be taken straight to the computer.
IV. During the activity the teacher should circulate making sure that the students are on task and not having any trouble doing what the sheet asks of them.
V. The wrap-up is the most important part of the activity:
   a. The teacher should go over the results with the student that day if possible. The teacher should review the data sheets if there is not time and then review the activity the following day.
   b. The teacher should ask such questions as:
      i. "What happens when the slope is zero?" (What does the equation look like/what does the graph look like)
      ii. "What happens when the y-intercept is zero?" (Does the line go through the origin?/What does the equation look like)
      iii. "What is the slope of a horizontal/vertical line?"
      iv. etc...
   c. The teacher should give students a chance to share something that they learned.

Mrs. Callahan actually spent the day after the activity in class going through the game where she projected it onto the screen in her classroom. The students struggled with it in the computer lab, and she went through several of the levels herself in front of the class discussing her thought process.

Note: I highly suggest you try this activity before giving it to your students. It takes a short time to get used to, and will make the classroom activity go much more smoothly. If you have the capability to project the computer screen to the class, it would be very helpful to walk them through the first level and explain your thought process.

Something to think about: Many of the students were discouraged at first with this activity because the cockroaches move fairly fast up and down the line. They were worried that if they did not compute the slope fast enough that they would lose a level. The game allows nearly 20 cockroaches to accumulate on the line before abandoning the level. Even then, the student will be able to play the level over. Just assure your students that they have plenty of time to compute each step. The hints are often very helpful, as they highlight the key coordinates on the axis.*

-Suggestion for follow up:
Several bell-ringers could be created for follow up on this activity. One idea I would like to see is on an exam or quiz, a screen-shot of the game when there are 10-12 cockroaches on the line (so that the line can be seen in a still frame). The teacher could simply ask the equation of the line so that the activity is not forgotten about later, and the students can have a little sense of enjoyment while taking the exam/quiz. (Teachers could even come up with some other object to put on the line, such as pencils, etc.)

Lesson Source

I developed this activity and the data collection sheet based on the Java applet at:

http://hotmath.com/hotmath_help/games/kp/kp_hotmath_sound.swf

Mode of Instruction
        This activity should follow a unit on slope. This is a good supplemental activity before an exam. The mode of instruction is student self-discovery on an individual basis. Each student is responsible for their own work and learning. The teacher is only a facilitator and wrap-up leader.

Date of Implementation/ Estimated Time

Tuesday, December 2, 2008/ 50 minutes

Date Submitted to Algebra[3]

Tuesday, February 17, 2009

attachment: Cockroach Data Collection

Name(s): _____

Directions:
1. Open Internet Explorer
2. Type in the web address:
   http://hotmath.com/hotmath_help/games/kp/kp_hotmath_sound.swf
   OR: go to www.google.com and search for Cockroach, Slope and click on
   the first website that appears.
3. Click on the tab at the bottom of the screen labeled "Instructions" and
   continue clicking "Next" until you understand how to play the game.
4. Choose your weapon (the shoe is my favorite).
5. Click "Start Game"
6. Type in your name, then click "Done"
7. Click "Start New Game"
8. Complete the chart below while playing the game.
9. You should fill out the empty boxes, if there is an X, you do not have to fill it
   in.
10. Watch the cockroach then type your answer in the box, and click "Fire". After
    you finish that round click "Next".

Level I	(In this round	you	only need to find the	y-intercept)
Round	Y-intercept	Slope	Equation	# of roaches killed
1	b=	m=	y=	
2	b=	m=	y=	
3	b=	m=	y=	X
4	b=	m=	y=	X
5	b=	m=	y=	X

Q: What do you notice about the slope of a horizontal line?

A: It is always _____.

11. Click "Next Round"

Level II	(In this round	you	only need to find the	slope)
Round	Y-intercept	Slope	Equation	# of roaches killed
1	b= 0	m=	y=	
2	b= 0	m=	y=	
3	b= 0	m=	y=	X
4	b= 0	m=	y=	X
5	b= 0	m=	y=	X

Q: What do you notice about the equation of a line whose y-intercept is always zero?

A: It is always of the form y=_____.

Hint: Your slopes for Level III should always be positive

Level III	(In this round	you	need to find slope &	y-intercept)
Round	Y-intercept	Slope	Equation	# of roaches killed
1	b=	m=	y=	
2	b=	m=	y=	
3	b=	m=	y=	X
4	b=	m=	y=	X
5	b=	m=	y=	X

Draw an example of what a line with a positive slope looks like:

(You do not need to record Level IV) In this level, there may be fractions involved.

Hint: In Level V all of the slopes will be negative.

Level V	(In this round	you	need to find slope &	y-intercept)
Round	Y-intercept	Slope	Equation	# of roaches killed
1	b=	m=	y=	
2	b=	m=	y=	
3	b=	m=	y=	X
4	b=	m=	y=	X
5	b=	m=	y=	X

Draw an example of what a line with a negative slope looks like.

Bonus: What is the slope of a vertical line?

(Hint: Remember that we can never divide by zero!)

Did you like this activity?