CMST SCOLLARCITY Lesson Plan Template-Lesson Plan using **TI Technologies**
(Due Tuesday, July 27th)

Submit as hard copy AND electronically through ANGEL

Name: Mike Peters
Grade level(s)/Subject taught: Grades 9-12 / Algebra (A) and Geometry (A)
Objectives: (Remember…*How will the modeling tool help the student better learn the objective?)*   The objective of the lesson is for students to understand what effects the coefficients a, b,   and c have on the graph of a standard quadratic equation of the form y=ax^2+bx+c. The   first lesson will investigate what the coefficient a does.

Items to include in your TI Technologies lesson plan: (use *your* area/discipline/concepts).

For the math teacher:
1. *Write* the Mathematical Concept or "key idea" that TI Technologies will be used to teach: (e.g. Students use mathematical modeling/ multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships)

Students will understand that for a parabola: 1. Changing the value of "a" changes the width of the opening of the parabola and that the sign of "a" determines whether the parabola opens upwards or downwards.   2. Changing the value of "b" will move the axis of symmetry of the parabola from side to side; increasing b will move the axis in the opposite direction.   3. Changing the value of "c" will move the vertex of the parabola up or down and "c" is always the value of the y-intercept.

My vision of the lesson.

<u>Launch:</u>

To get the lesson started, I would like to project a number of pictures of parabolas from real life on the screen and get the students thinking about different ways parabolas occur in real life. The pictures should include arches, throwing a ball, shooting a cannon ball, fat parabolas, skinny parabolas, umbrellas, graphs of parabolas.

<u>Mini-lesson:</u>

From the launch discussion the teacher would tell the students that all of these shapes are parabolas and that all parabolas are described mathematically by a quadratic equation. Inquire about understanding of the meaning of quadratic, and then provide the following for student's notebooks:

1. A quadratic equation has at least one term with an x^2 term and no terms with a higher degree exponent.
2. The standard form of a quadratic equation is $y = ax^2 + bx + c$.

Explain:

Today you will be working in groups of four and using the graphing calculators to discover answers to the following questions that will be asked to answer at the end of the lesson:

(Write these on an overhead projection sheet and project them on the screen)

1. Describe what happens to the graph when the value of "a" is made larger.
2. Explain how to change the equation to make the arms of the parabola closer together.
3. Is there anyway that I can make the graph of the equation $y = ax + 1$ into a straight line.
4. Explain what makes the graph of a parabola a "smiley face", that is open upward, and what makes it a "frowning face", that is open downwards?

Directions to the groups:

Each group will be responsible for handing in at the end of the period the results of the actions described below.

- The group should show their results on a sheet/s of paper with a proper heading just like the following:

<u>Group Assignment-- Investigating "a"</u>

Your group number

Name of Group member 1

Name of Group member 2

Name of Group member 3

Name of Group member 4

Today's date

- Your group will be graded on how completely and neatly you do each of the five tasks below. Each group member will receive the same grade.
- When the group papers are completed, the teacher will pick **any** 4 students at random from the entire class to answer for the class one of the questions

shown on the overhead. I will give the class a rubric to use to grade for how well each of the four students answer and explain to the class their question. Notice that the rubric gives extra points to the student for using a diagram or graph to clarify their answer.

- A take home test with the four questions above will be given at the end of the period.

Actions for the groups to do: (Have these instructions written on a sheet that can be given to each group)

Use your graphing calculator to find different graphs of the equation $y = ax + 1$.

Note: Screen shots of the correct graph from the calculator follow each question

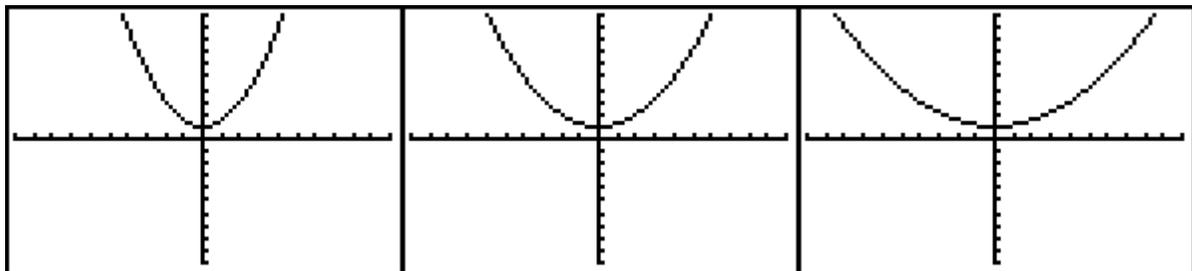1. Sketch and label the graphs that result when *a* is 1,2, and 5
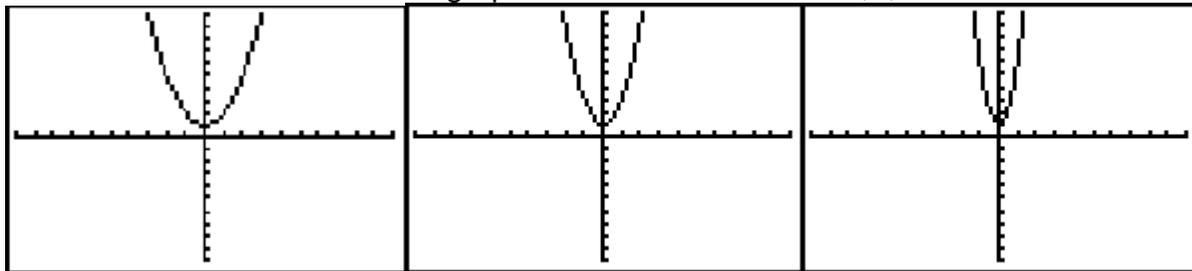
$$y = x^2 = 1 \qquad\qquad y = 2x^2 + 1 \qquad\qquad y = 5x^2 = 1$$

2. Sketch the graphs when *a* is $\dfrac{1}{2}$, $\dfrac{1}{4}$, and $\dfrac{1}{8}$.

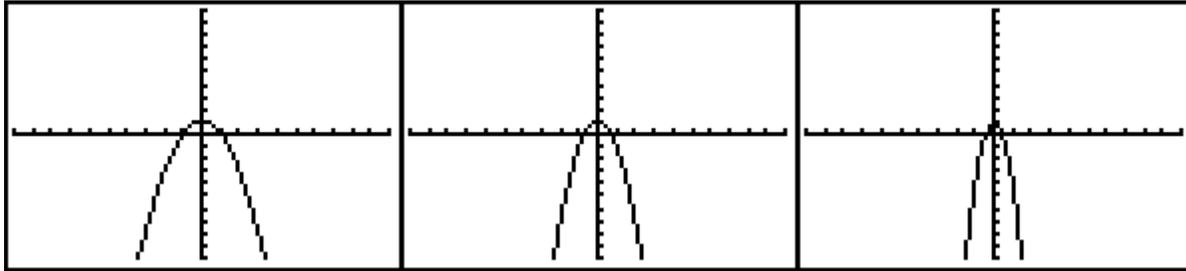$$y = \frac{1}{2}x^2 + 1 \qquad\qquad y = \frac{1}{4}x^2 + 1 \qquad\qquad y = \frac{1}{8}x^2 + 1$$

3. Answer the question, "What happens to the graph when "*a*" becomes a smaller and smaller fraction?
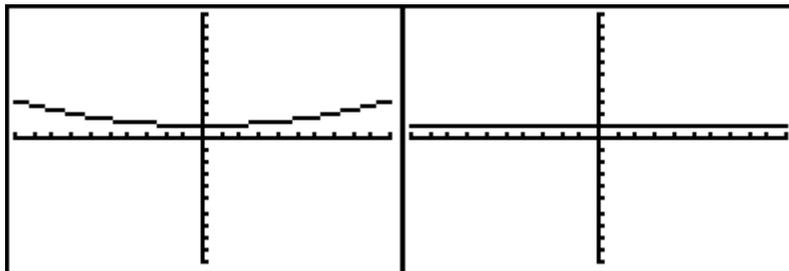
$$y = \frac{1}{50}x^2 + 1 \qquad\qquad y = \frac{1}{1000}x^2 + 1$$

4. Sketch the graphs that result when *a* has the values -1, -2, and -5.

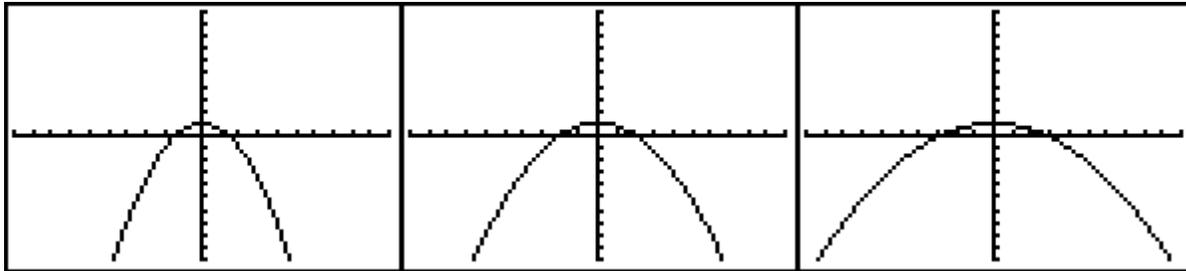|		
$y = -x^2 + 1$	$y = -2x^2 + 1$	$y = -5x^2 + 1$

5. What will happen to the graphs when *a* has the values $-\frac{1}{2}, -\frac{1}{4} \, and -\frac{1}{8}$?

$y = -\frac{1}{2}x^2 + 1$	$y = -\frac{1}{4}x^2 + 1$	$y = -\frac{1}{8}x^2 + 1$

(During the group work, the teacher will be going around to each group observing and helping when needed)

When the groups have all handed in their papers showing their sketches of graphs for the five questions above, the teacher will draw names and ask four students, one at a time, to answer one of the original four questions from the beginning of the lesson.

Rubric for students to use to grade student answers.

Factor	4 Points	3 Points	2 Points	1 Point	Total Pts
Completeness	The answer given is complete and accurate.	The answer given is completer but contains a minor mistake	The answer given is not complete and has several mistakes.	The answer is very incomplete and completely incorrect.	
Clarity	A correct diagram or graph or other visual aid is used to clarify the answer and it is correctly explained	A diagram or graph is used but has some errors or is difficult to understand.	An incorrect or inappropriate diagram is used that does not help to explain the answer.	No diagram or visual aid is used to help explain the answer given	
Delivery	Student speaks clearly and loudly enough to be understood by the audience.	Student answer is somewhat difficult for the some class members to hear or understand	Student does not speak clearly or loudly for the class to understand or hear.	Student mumbles the delivery of the answer.	