Lesson Activity Plan Template

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| Title of Activity: |
| Exponents and Algebra |
| Grade Level: |
| Grades 5-8 and extensions for grades 2-5 |
| Mathematics Concept Standards: |
| Represent analyze, and generalize a variety of patterns with tables, graphs, word, and when possible symbolic rules. Relate and compare different forms of representation for a relationship; Develop an initial conceptual understanding of different uses of variables; |
| Learning Objectives: |
| Students will: Listen to a story about exponential growth. Journal in their own words what happens mathematically. Explore exponential growth with a handout from [www.Illuminations.nctm.org](http://www.Illuminations.nctm.org) “Grain of Sand” Together discuss: exponential growth on the Cartesian plane, express the independent and dependent variables in an algebraic expression, test the grid entries versus the algebraic sentence (ie. How do the numbers change from one successive box to the other, is there a pattern? Can you imagine a math sentence that would be true for any number? |
| Math and Literature Connection: |
| The King’s Chessboard by David Birch |
| Learn the Content: |
| Prior to introducing this lesson on exponents, students have mastered ordination, numeration, addition, subtraction, multiplication. They have heard or experienced vocabulary words: graphing, grid, pattern , numbers that are independent, numbers that are dependent, algebra, and exponent.  Read “The King’s Chessboard” pages 1-3. Discuss what the conflict is between the king and the wise man. Predict what the outcome will be from the story. Use the illuminations grid to discuss how the numbers are changing. As a group fill in the grid as far using calculators if they wish. Fill in the grid as far as they are able. Can they predict the answers for the 5th time, 10th time, 15th time, and more?  Use the journal at this point and have them write what happened in their own words. Students will generate math words, develop a grid and show the growth, and any reflections.  Reality check: Are there any other examples in life that have this type of explosive growth? Animal populations? Bacterial colonies? |
| Reinforce the Content Learning: |
| Read the student’s log entries as a way of reviewing the story of “The King’s Chessboard.” Predict how the story will end. Clue the students to watch how the bags of rice grow. Read aloud the rest of “The King’s Chessboard.”  In their journal have them draw a grid that is 20X20 as you demonstrate one on the Promethean board. Clarify the x and y axis , describe how to plot the numbers from exponential grid that they used the day before. This is where we discuss the “function” machine. When the X is ----, then the y is ------. Plot these numbers so that they can see the graphs’ shape.  Make the connection with an algebraic sentence. Demonstrate the possibilities of the simplest of sentences.  Journal the algebraic sentence and have them describe how it works. (2^n-1) |
| Consolidate the Learning: |
| Review by reading aloud volunteer’s journal writings. Clarify any questions about the grid, graphing numbers, and introductions of the “any number” math sentences (algebraic sentences)  Make an x/y table. Review functions and relate it to the story. Show how results can be deduced from any number. Monitor their progression as they write. This lesson is meant to introduce or deepen their knowledge of how all three math processes work not intimidate them. Connections can be accepted in various forms including pictures, manipulatives, verbalizations and diagrams. |
| Implement the Content: |
| Students are now asked to design and document their own Pattern Math Story, plot it on a grid and describe how the pattern occurs. It can be very simple or very complex.  Assessment: Journal writings capture exponential growth, demonstrate how numbers can be in lineal form on a Cartesian graph, and how the grid numbers can be expressed in algebraic terms. Demonstrate a Math Pattern Story and share their different ways of expressing it. |
| Variation/Extension Activities: |
| Students can use the Internet to research more about math stories with patterns. |
| Web Resources: |
| [www.gomath.com](http://www.gomath.com)  [www.mathisfun.com](http://www.mathisfun.com)  [www.lessonplanet.com](http://www.lessonplanet.com) |
| Lesson Plan Created By: |
| Bettina Mileur K-12 teacher at Twindly Bridge Charter School |
| Lesson Related References: |
| www.Illuminations.nctm.org |