Lesson Plan
Lesson 9: Is That Your Final Answer?
Mathematics High School Math II

Unit Name: Unit 1: Extending the Number System

Lesson Plan Number & Title: Lesson 9: Is That Your Final Answer?

Grade Level: High School Math II

Lesson Overview: The objective of this lesson is to provide students with a summary activity for the unit. as adapted from the Transition Math lesson created by Myrtle Holland on the WV Teach 21 website, Lesson 13 – Awesomely Radical Review . Each of the lessons in the unit suggested games as a method of engaging student learning and interest. With partners or in small groups, students create their own games to demonstrate mastery of the lesson vocabulary and skills. Upon completion, these will be shared with the class. After the presentations, students can play each other's games and provide feedback to their creators.

Focus/Driving Question: What are complex numbers? How do they relate to polynomials? How does my knowledge of radicals and exponents connect to knowledge of complex numbers and polynomials?

West Virginia College- and Career-Readiness Standards:

M.2HS.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. (e.g. We define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.)

M.2HS.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.

M.2HS.3 Explain why sums and products of rational numbers are rational, that the sum of a rational number and an irrational number is irrational and that the product of a nonzero rational number and an irrational number is irrational. Instructional Note: Connect to physical situations, e.g., finding the perimeter of a square of area 2.

M.2HS.4 Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.

M.2HS.5 Use the relation $i^2 = -1$ and the commutative, associative and distributive properties to add, subtract and multiply complex numbers. Instructional Note: Limit to multiplications that involve i^2 as the highest power of i.

M.2HS.6 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract and multiply polynomials. Instructional Note: Focus on polynomial expressions that simplify to forms that are linear or quadratic in a positive integer power of x.

Manage the Lesson:

Step 1: Launch the lesson by reminding students of the various games and activities they have participated in throughout the unit's development. Explain to them the task for the lesson will be for

students to create their own unit review game and present to the class. Be prepared to show them examples of additional games such as Jeopardy, Concentration or Tarsia Puzzles, etc. Ask them if they can think of any other board or card games that might be adapted to reviewing the unit.

Step 2: Point to the word wall and remind them to include the unit vocabulary in their game. Review the words on the wall with the students verifying everyone's comprehension of the vocabulary. Use the opportunity to provide clarification if students are unclear as to the meaning of any words on the wall.

Step 3: Build upon student knowledge of the unit by reviewing each standard taught through teacher facilitation by reminding students of each lesson's objective. Ask for students to create examples of the objective being reviewed. Encourage students to look at their work from each lesson in the unit to provide examples if they have difficulty generating responses.

Step 4: Students will demonstrate their knowledge through the development of a unit review game and presentation to the class. The Game Task chart is explained to students as a method of organizing their product.   The combination of materials listed can be adapted to your students learning styles and abilities. For example, breaking the assignment into shorter tasks can guide your instruction and provide informal assessment on student mastery. Students can decide what format to present their game; computer-based or craft materials such as posters, etc. These websites can be shown and discussed with students during the planning process.

Some ideas for game development:

PowerPoint Game Templates - http://www.elainefitzgerald.com/gametemplates.htm (includes templates for many games such as Jeopardy)

Concentration Game Template - http://www.mimioconnect.com/content/lesson/concentration_game_template (mimio connect game template)

SMARTboard Game Templates - http://ms.ardsleyschools.org/resources/smartboard-game-templates

Free Printable Board Game Templates - http://www.squidoo.com/board-game-templates (printable board game templates for Monopoly and Chutes and Ladders)

Step 5: Group Reflection and summarization of the learning experience can be addressed by using the Final Evaluation handout. Each group completes the handout and then it is used as a starting point for a whole group discussion. Upon completion, the instructor collects the responses and uses them to consider the lesson's effectiveness. What changes should be made to the lesson to improve its use? How was it successful?

Academic Vocabulary Development:

Connect the unit word wall to review the unit vocabulary and develop student examples as a method of assessing student comprehension.

Launch/Introduction:

Students will be developing their own review game for the unit and presenting their designs to the class.

Investigate/Explore:

The Game Task chart is presented and discussed with students for game development.

Summarize/Debrief:

Students will be asked to present their game designs to the class. After presentations, groups can trade games as a review of the unit.

Materials:

Graphing Calculator, Word Wall Materials (construction paper, markers), foldable (white copy paper or notebook paper, markers or colored pencils, scissors), optional-computers
Game Task
Final Evaluation

Career Connection:
Business and Marketing Cluster, Engineering and Technical Cluster, Health Cluster- All have careers where multiple unknowns need representation which can be accomplished by using variable expressions in the form of polynomials. Engineering and Technical Cluster and Science and Natural Resources Cluster use complex and imaginary numbers when calculating electrical impedance

Lesson Reflection:
Students and the teacher discuss their games and what they learned from the process. Each group works together to complete the Final Evaluation handout for the instructor to review and reflect upon. Are there any concepts they remain unclear on? Address student misconceptions and connect to the learning objectives by reteaching concepts as needed.

Group Task: Your team is asked to develop a review game for the unit being studied. It is your job to decide on the type of game and develop the questions for your game. Working together, you will need to decide on a name for your game that reflects what you have designed. Your team should include at least 5 categories from the unit. Each category should contain at least 4 different point levels (easy to hard questions). All work completed on this project should be evenly distributed, meaning everyone works! All problems for the game include solutions as part of the game design. The following chart is created for your team to keep track of the elements in your game.

Game Components	Vocabulary includes a minimum of two words and definitions	Level One	Level Two	Level Three	Level Four
Equivalent Expressions	1) 2)	Problem: Solution:	Problem: Solution:	Problem: Solution:	Problem: Solution:
Rewrite expressions as radicals and rational exponents	1) 2)	Problem: Solution:	Problem: Solution:	Problem: Solution:	Problem: Solution:
Simplify complex numbers using i^2 = −1 and know the standard form of a complex number	1) 2)	Problem: Solution:	Problem: Solution:	Problem: Solution:	Problem: Solution:
Solve complex number expressions using addition, subtraction and multiplication	1) 2)	Problem: Solution:	Problem: Solution:	Problem: Solution:	Problem: Solution:
Solve polynomials using addition, subtraction and multiplication	1) 2)	Problem: Solution:	Problem: Solution:	Problem: Solution:	Problem: Solution:

Modified from the lesson by Myrtle Holland

Some websites that you may want to consider:

http://www.elainefitzgerald.com/gametemplates.htm includes templates for many games such as Jeopardy

http://www.mimioconnect.com/content/lesson/concentration_game_template mimio connect game template

http://ms.ardsleyschools.org/resources/smartboard-game-templates SMARTboard game templates

http://www.squidoo.com/board-game-templates printable board game templates for Monopoly and Chutes and Ladders

Be creative and find the game that you can have fun with!

Final Project Group Evaluation/Reflection

Names of Group Members   Date _____

_____

_____

_____

_____

We learned the following about mathematics:
We believe our group was most effective doing:
We believe our group was least effective doing:
As a group, we learned how to implement new skills in presentation/technology:
As a group, we enjoyed doing:
As a group, we disliked doing:

We believe the learning experience could be improved by: