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Course: EDU 521 Date: August 9, 2010

Grade: 9 (Algebra: Factoring) Content Area: Mathematics

Topic: Factoring polynomials using the method of factoring by grouping.

**INSTRUCTIONAL OBJECTIVE**

After learning to factor polynomials using the method of factoring by grouping, students will work in groups to complete the problems in the worksheet. Each group will be assigned one problem to present to the class using SMART Notebook and students will show how they solved the problem.

**STANDARDS AND INDICATORS**

NYS LearningStandards for Mathematics, Science, and Technology- **Standard 1:  Analysis, Inquiry, and Design**

Students will use mathematical analysis, scientific inquiry, and engineering designs, as appropriate, to pose questions, seek answers, and develop solutions.

Indicators

* This will be evident when students use algebraic tiles to help them to split up polynomials into groups. Sometimes it is hard to see how to solve a problem by just looking at it, so this helps students to see how to solve the problem with objects.
* By incorporating the use of algebraic tiles to form rectangles, students will analyze the designs made and determine the need for factoring by grouping.

NYS LearningStandards for Mathematics, Science, and Technology-Standard 3: Mathematics

Students will understand mathematics and become mathematically confident by communicating 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.

Indicators

* This will be evident when students use algebraic tiles to split polynomials into groups.
* This will be evident when students look up math vocabulary and learn the steps on how to factor a polynomial by grouping.
* This will be evident when students work in groups to complete a worksheet, along with an assigned problem from that worksheet that they will present to the class.
* This will be evident when students answer the problems in the worksheet that they will complete for homework.

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NYS LearningStandards for Mathematics, Science, and Technology**- Standard 7:  Interdisciplinary Problem Solving**

Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.

Indicators

* This will be evident when students apply what they learned in class and apply it to the homework assignment.

**MOTIVATION**

Students will be given algebraic tiles at the beginning of class. Students will also be provided with a polynomial to factor. With these tiles, students will try to make all of the different tiles into a rectangle. Once they are in a rectangle, students will figure out the length and width of the rectangle. After the students figure that out, they will then split up the two factors they came up with. Those two factors will be what that polynomial looks like when it is factored by grouping.

**MATERIALS**

The materials that will be used in this lesson will be algebraic tiles, a computer that has Internet access to access a YouTube video, worksheets, pencils or pens, notebooks, SMART board, and SMART Notebook software.

**STRATEGIES**

Strategies used during this lesson include motivation, the use of Internet to watch a quick video on YouTube, direct instruction, guided practice, cooperative learning, assessment, and SMART Notebook to answer questions.

**ADAPTATIONS**

* During the motivational activity, the student with ADHD will be given fewer algebraic tiles because giving them the same amount of tiles as the rest of the class may cause them to get overwhelmed.
* Because the student with ADHD is not a great note taker, when the students learn the vocabulary words and go over the steps to factor polynomials by grouping, that student will be handed a different sheet that is completely filled in, instead of having a lot of it blank spaces to fill in. This will be helpful so Madison does not fall behind with the information being covered during the class.
* During the cooperative learning activity in groups, the student that has difficulty writing will be given a different worksheet than the rest of the class in which only the first two problems are the same on both handouts. The worksheet that they will be given will have simpler problems. The student will be assigned the first question to present to the class which will be the simplest one on the sheet. His or her group will also consist of people that all have the same mathematical ability as him or her.
* The student with ADHD will be given only 5 out of the 10 homework questions to be completed at home for homework. This is because it takes her a little longer to understand the material and they have trouble sitting for long periods of time. With the extra time, she will have more time to understand and finish those 5 problems and then she will have an extra day to complete the rest of the problems. Here the student will be able to use the Jaws for Windows Screen Reading Software to help solve the problems.
* The same student will be given the link to the YouTube video about factoring by grouping. This way the student can watch it at home either before the lesson or after the lesson and can pause the video when needed to obtain all of the information the student wants to take any note of.

**DIFFERENTIATION OF INSTRUCTION**

* Visual and spatial learners will benefit from viewing the YouTube video on factoring by grouping. They will also benefit from the motivational activity which involves using blocks to split up like terms into similar groups which will help them to better understand how to factor certain things by grouping them. The visual learners will also benefit from seeing the steps listed in a chart.
* Students who learn best by reading will benefit looking up the vocabulary words “greatest” and “common factor”. These students will also benefit from reading the different steps on the handout about factoring by grouping.
* Auditory learners will benefit from listening to the group presentations about factoring polynomials by grouping. They will also benefit from listening to the short YouTube video about factoring a polynomial by grouping.
* Students who learn best by speaking will benefit from presenting their group problem using the SMART Notebook. They can also benefit by taking a leadership role within the group. Students who learn best by interacting with others will learn best by participating within the group to help solve the problems on the worksheet.

**DEVELOPMENTAL PROCEDURES**

1. First, students will start off the lesson by doing the motivation that is listed above. This is helpful because it will help the students to become more familiar with how to be able to split up like terms into groups.
2. After that activity is completed, students will do a review about what the greatest common factor is. The greatest common factor is a key component within factoring by grouping; therefore it is important to go over how to find the GCF when factoring polynomials. First I will ask the students “Does anyone remember what a greatest common factor is?” Students will then be given the following example-

 EXAMPLE: 6x2y3 - 8x2y2  + 10x4y4

As a class, we will go over step by step how to factor this using the greatest common

factor. While doing the problem, we will also touch on the word “greatest” and the words

“common factor”.

1. Next, students will learn the steps to facilitate factoring by grouping. Students will be given a worksheet that has the notes but many blank spaces will be left for the kids to write down the steps and any other important information they want to write down during the lesson. The steps to factoring by grouping are:
* First, remove the GCF if possible.
* Group terms with common factors.
* Remove the GCF of each group.
* Rewrite the expression.
1. Students will then watch a video from YouTube that is about four minutes long but students will only watch the first problem get answered. This shows how to solve a problem using the steps mentioned earlier in class. Students should take notes if necessary. After the video, we will do a couple of short problems as a class.
2. Students will be given a worksheet after that has 10 questions on it (See attached page for worksheet). They will be split up into groups and given a problem to work on. The students will have about ten minutes to work on that problem step by step to come up with an answer that they can agree on as a group. Once all groups are done, each group will present to the class using SMART Notebook, how they found their answer. Each group will come up one at a time to SMART Notebook. They will write out the polynomial they got and using the pens, they will solve the given problem.
3. Students will be given another worksheet to be completed for homework. (See Independent Practice)

**ASSESSMENT**

* Once students finish the worksheet, they will hand it in the last two questions on a separate sheet of paper. Those two questions will be graded as part of their class participation grade and handed back to them with all of the corrections made on it.
* The group presentations on SMART Notebook will be assessed to make sure the students followed the steps to solve the problem and answered the problem correctly.

**INDEPENDENT PRACTICE**

Students will be given another worksheet that will be done for homework. We will go over the answers to the problems in class the next day.

**FOLLOW-UP- ACADEMIC INTERVENTION & ACADEMIC ENRICHMENT**

Academic Intervention: Students will use the Internet Hotlist, <http://www.kn.att.com/wired/fil/pages/listalgebrarb.html>, and once they get to that page, they will open the link Connexions under Factoring by Grouping. Students will review the information about factoring by grouping and then they will do the exercise questions which are further down on the page. Students will answer exercises 1-20 on a separate sheet of paper. Students will bring them into class and a classmate will check to see how many exercises the student answered correctly. This website gives the students a lot of reinforcement and the questions are good practice for the students who are still struggling with the material.

Academic Enrichment: Students will be given a packet that has harder problems and at the end has a word search for the students to complete. Students will have to solve more challenging problems and find the correct answer in the word search.

**TEACHER REFERENCES**

Ellis, W, & Burzynski, D. (2009, May 31). *Cnx.org*. Retrieved August 1, 2010 from

<http://cnx.org/content/m21901/latest/>

New York State Education Department. (n.d.). *New York State learning standards*. Retrieved August 7, 2010, from <http://www.emsc.nysed.gov/nysatl/standards.html>

*Youtube.com*. (2010, April 10). Retrieved August 1, 2010 from <http://www.youtube.com/watch?v=YaCpeoxGa4E>