Lesson Plan Template

Grade: 9th Grade

Subject: Algebra

Materials: algebra tiles, notebook, pencil

Technology Needed: none

Instructional Strategies:

- ☒ Direct instruction
- ☒ Guided practice
- ☐ Socratic Seminar
- ☐ Learning Centers
- ☐ Lecture
- ☐ Technology integration
- ☐ Other (list)
- ☐ Peer teaching/collaboration/ cooperative learning
- ☒ Visuals/Graphic organizers
- ☐ PBL
- ☐ Discussion/Debate
- ☐ Modeling

Guided Practices and Concrete Application:

- ☒ Large group activity
- ☒ Independent activity
- ☐ Pairing/collaboration
- ☐ Simulations/Scenarios
- ☐ Other (list)
- ☒ Hands-on
- ☐ Technology integration
- ☐ Imitation/Repeat/Mimic

Explain:
We will try a few problems as a big group, then students will break off to try some problems on their own. They will use algebra tiles to see how to factor the polynomials.

Standard(s)

HS.A.SSE.2: Use the structure of an equation to identify ways to rewrite it.

Objective(s)

Students will learn several new techniques to help them factor polynomials. They will learn to use algebra tiles to help factor and they will also learn factoring by grouping.
"I can factor polynomials by grouping or using algebra tiles."

Bloom's Taxonomy Cognitive Level: Applying, Analyzing, Evaluating, Creating

Differentiation

Below Proficiency: The students who are below proficiency should benefit from the visual diagrams more than anyone else. By allowing these students to see a practical application of factoring and to be able to see how to quickly find the side lengths will help these students become much more comfortable factoring polynomials. They may even become comfortable working on some of the problems by themselves by the end of class. If they do not, I will be walking around to answer questions that they may have.

Above Proficiency: These students should quickly grasp factoring by grouping. They should also have a pretty good understanding of why the algebra tile method will work to factor polynomials. This means that they may also be able to evaluate this method will be most useful. They may also recognize how to use this method to factor third degree polynomials. These students will also be challenged to think about what we might do when the algebra tile method becomes more tedious.

Approaching/Emerging Proficiency: Students who are approaching proficiency will begin to see how to continue to apply this method on their own. They will see how they might draw diagrams in their notes to represent different polynomials so that they are able to factor them. The visual diagram should help these students to understand that factor is simpler than it may appear at first. These students should also grasp the ability to factor by grouping quickly if the terms are already grouped conveniently for them.

Modalities/Learning Preferences: visual diagrams using algebra tiles, real-world applications of factoring, students will work alone

Classroom Management- (grouping(s), movement/transitions, etc.)

- Students are expected to leave tiles to the side of their desk until they are needed
- Students are expected to participate in the opening exercise
- Students are expected to listen to the teacher and respect the contributions of others
- Students are expected to avoid becoming distracted by the manipulative
- Students will be expected to work alone, but they will be allowed to ask questions to the teacher

Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules, and expectations, etc.)

- Students are expected to leave algebra tiles to the side of their desk unless they are needed to solve a problem
- Students are expected to listen respectfully to other students and the teacher
- Students are expected to work quietly during the work time unless they have a question

Minutes	Procedures

Lesson Plan Template

	Set-up/Prep: First, I will need to hand out enough algebra tiles to each student. Then, I will have them take out their notebooks to take notes and draw diagrams of what we are doing.
	Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.) In the opening activity, I will have students begin to think about a word problem. "If you are trying to design a new tile floor that is exactly 48 sq. ft, what might the dimensions of this floor be if we must use 1x1 ft tiles? How many tiles would you need to use? As we go over the answer to this question, students should recognize that there are several pairings of side lengths that will work. We could create a 6 ft by 8 ft floor. We could create a 12 ft by 4 ft floor. We could also create several other sets of dimensions that would work. Now we will try to generalize this to an area with variables.
	Explain: (concepts, procedures, vocabulary, etc.) Now, I will have students construct a floor of size $x^2 + 2x + 1$. They will use their algebra tiles to do this, and they must create a rectangular floor. Then, I will have them observe what the side lengths of this floor are. First, students should notice that they have a square. Next, they will notice that the side lengths of this square are x+1. Finally, we will observe that $(x +1)(x + 1) = x^2 + 2x + 1$, which means that we have found a way to factor the expression. We will try another example, and this time, it will not be a square. For this example, students must find a way to create a rectangle with area $x^2 + 6x + 8$. This time, they should notice that the sides of the rectangle will be x + 4 and x + 2. Finally, if we multiply these two sides, we will get $(x + 4)(x + 2) = x^2 + 6x + 8$, which means that we have factored correctly again. Finally, I want to cover two more problems where we will not use algebra tiles. These two problems will teach the students how to factor by grouping. 1) $x^2 + 4x + 2x + 8$ 2) $x^3 + 3x^2 + 6x + 18$ In each of these examples, it will be helpful to break our factoring up into two steps. First, we will group the first two and last two terms together and factor a GCF out of each of them. Then, we will factor an expression out of the remaining to terms. The steps are listed below. 1) $x^2\ 4x + 2x + 8 = (x^2 + 4x) + (2x + 8) = x(x + 4) + 2(x + 4) = (x + 4)(x + 2)$ 2) $x^3 + 3x^2 + 6x + 18 = (x^3 + 3x^2) + (6x + 18) = x^2(x + 3) + 6(x + 3) = (x + 3)(x^2 + 6)$
	Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions) I will encourage students to use algebra tiles to continue solving problems. They will also be assigned a few problems where factoring by grouping will be simpler. Students will work alone this time, but I will be walking around to answer any questions that they have. 1) $x^2 + 8x + 12$ 2) $x^2 + 4x + 3$ 3) $x^2 + 7x + 10$ 4) $x^2 – 4x + 4x – 1$ 5) $x^2 + 8x + 2x + 16$ 6) $x^3 + 12x – x^2 – 12$ Solutions: 1) $(x + 6)(x + 2)$ 2) $(x + 3)(x + 1)$ 3) $(x + 5)(x + 2)$ 4) $(x + 1)(x – 1)$ 5) $(x + 8)(x + 2)$ 6) $(x + 1)(x^2 + 12)$
	Review (wrap up and transition to next activity): We will conclude class by talking about the best applications for each of these methods. Students should recognize that the algebra tiles method will have a hard time with negative numbers, and the grouping method becomes more difficult when the terms are not already grouped well. I will also ask if students have any more questions, but if not, I will have them continue to work quietly until the end of class.

Lesson Plan Template

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-** **in strategies, etc.** I will assess students based on their participation and engagement. I will also walk around to assess students on how well they are handling problems on their own. **Consideration for Back-up Plan:** If I am unable to use algebra tiles, I will switch the order of my lessons and do the lesson on the AC method instead. Then, I will do this lesson the next day.	**Summative Assessment (linked back to objectives)** **End of lesson:** At the end of the lesson, I will have the students hand in their work. I will assess how they are doing with each of the two methods based on the 6 problems they turn in. **If applicable- overall unit, chapter, concept, etc.:** Students will need to be able to factor polynomials on the test.
Reflection (What went well? What did the students learn? How do you know? What changes would you make?):