Lesson Plan Template

Grade: 9th Grade

Subject: Algebra

Materials: 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:

Standard(s)

HS.A.APR.1: Add, subtract, and multiply polynomials.

Objective(s)

Students will learn how to multiply polynomials using several different methods.

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

Differentiation

Below Proficiency: Students who are below proficiency may struggle with this lesson because it moves more quickly. However, this may be a good opportunity for them to work with students who are higher achieving. These students will have difficulty applying different methods, and they may struggle to apply their own method. My hope is that they can at least understand how to multiply individual monomials, that is, by multiplying the coefficients and adding the exponents.

Above Proficiency: The students who are above proficiency are expected to be very comfortable using at least two, if not more, methods to multiply polynomials. They will also be expected to be able to help other students in their groups and contribute to the discussion at the end of class. They should start to recognize ways that each method may be useful, and this will hopefully help the to understand how to generalize each method to higher order polynomials.

Approaching/Emerging Proficiency: Students who are approaching proficiency should begin to understand how to use at least one or two methods. They should also be able to make strong contributions when they are working with students from another group. These students may also be able to identify some of the benefits/disadvantages of different methods.

Modalities/Learning Preferences: Students will have the opportunity of doing some discovery with new methods of multiplication, working in groups, teaching others, grid method is like a graphic organizer, other methods give a better understanding of distributive property.

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

- Students are expected to enter the classroom and quietly begin working on the opening activity.
- Students should transition into their groups quickly and quietly.
- Students are expected to cooperate with the people they are assigned to work with.
- Students are expected to listen respectfully and attentively to the contributions of others.

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

- Students are expected to work quietly during the opening activity.
- Students are expected to listen attentively as they learn about multiplication and are assigned their groups.
- Students must respect the contributions of others and work together to understand their method of multiplication.
- Students should listen respectfully to the contributions of other students

Minutes	Procedures
3 min	**Set-up/Prep:** I will write a few problems on the board as an opening activity for students. I will hand out worksheets once students have been separated into groups.
7 min	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** Students will enter class and begin working on the opening activity on the board. They will be given about 3-5 minutes to complete the problems, and then we will discuss the. The problems are listed below. Students will only be expected to simplify these problems without finding an exact solution.

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	1) $3^2 * 3^4$ 2) $4^2 * 4$ 3) $25 * 5^2$ 4) $64 * 4^2$ 5) $8 * 2^5$ Once students have had enough time to try these problems, we will talk about some of the solutions to these problems. They should begin to give students an idea of how to multiply polynomials because they will help students review the properties of exponents.
10 min	**Explain: (concepts, procedures, vocabulary, etc.)** This section will be brief. I will give students a brief overview of each type of multiplication, but I will allow them to learn how to apply it in their groups. The main thing that students must remember is how to multiply different exponential terms. "To multiply different exponential terms, we will multiply their coefficients and then we will multiply the variable component by adding the exponents together. I will use several examples of monomials, such as $x*3x = 3x^2$ and $4x^2*10x = 40x^3$. To perform the box method of multiplication, students should recognize that the box is helping them group each term together. To perform the vertical method, students will align the polynomials as they would align integers and continue to multiply in the same way as they would for integers. In the FOIL method, they will multiply the First, Outer, Inner, and Last terms together. In the grouping method, the will separate the process into the addition of two groups of multiplications. For example, the multiplication $(4x + 3)(3x + 2)$ will be split into $4x(3x + 2) + 3(3x + 2)$. After this explanation, I will split students up into groups where they will try to practice using one of the methods with their partners. Each group will be assigned one of these four methods to work on, and they will be given a worksheet with a set of problems on it to try.
20-25 min	**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)** Once we have covered enough information about each type of multiplication, I will allow the students to split into the groups that I have assigned for them. Then, they will be given a worksheet of problems to try together. Each group will be working on the same problems, but they will be expected to try them in a different way than the other groups. For example, one group may be expected to use the FOIL method, while another group will use the box method. After students have had enough time to learn their multiplication strategy, I will have a few students from each group visit each of the other groups so that all the students have an opportunity to learn about the other types of multiplication. Students will present the problems that they did, and they will show the other students how to use their method of multiplication.
5 min	**Review (wrap up and transition to next activity):** We will end class with a discussion of how each method might be helpful. Students will have the opportunity to analyze the strengths and weaknesses of each method. I will have them provide examples where they found each method was most helpful. We will also take a few minutes to generalize how each method may be generalized to higher order polynomials.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.** Progress monitoring will consist of walking around the classroom to monitor how each group is doing. Then, I will also monitor how each student contributes to the discussion at the end of class to see how well they understand each method. **Consideration for Back-up Plan:** If students are struggling to understand all the different methods, we will work on the grouping method and the grid method as a class because these will be the most useful in generalizing to higher order polynomials.	**Summative Assessment (linked back to objectives)** **End of lesson:** At the end of the lesson, I will have students turn in the problems that they were working on. I will be grading on completion, and I am hoping that all students will be able to finish the problems. Students will still receive full credit if they submit something. **If applicable- overall unit, chapter, concept, etc.:** Students are expected to be able to multiply polynomials on the test.

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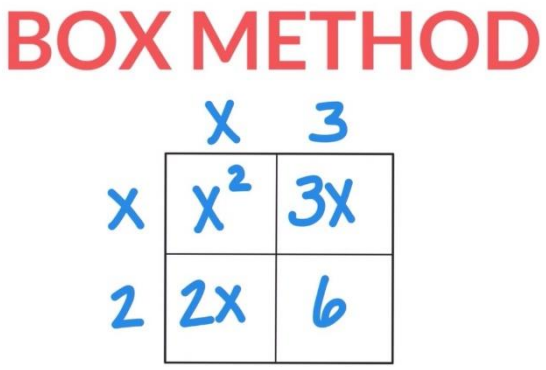
Reflection (What went well? What did the students learn? How do you know? What changes would you make?):

Solutions to opening activity:

1) 3^6
2) 4^3
3) 5^4
4) 4^5
5) 2^8



Worksheet problems (and solutions)

1) $(x + 7)(3x + 2) = 3x^2 + 23x + 14$
2) $(x + 3)(2x + 6) = 2x^2\ 12x + 18$
3) $(x + 4)(6x - 1) = 6x^2 + 23x\ 1\ 4$
4) $(x - 2)(2x - 5) = 2x^2 - 9x + 10$

$$x^3 + 4x^2 - 2x + 6$$
$$2x + 7$$
$$7x^3 + 28x^2 - 14x + 42$$
$$2x^4 + 8x^3 - 4x^2 + 12x$$
$$2x^4 + 15x^3 + 24x^2 - 2x + 42$$