

Lesson Plan Template

Grade: 9 th grade		Subject: Algebra	
Materials:		Technology Needed: Projector for video	
Instructional Strategies: <input type="checkbox"/> Direct instruction <input type="checkbox"/> Peer teaching/collaboration/ <input type="checkbox"/> Guided practice cooperative learning <input type="checkbox"/> Socratic Seminar <input type="checkbox"/> Visuals/Graphic organizers <input type="checkbox"/> Learning Centers <input type="checkbox"/> PBL <input type="checkbox"/> Lecture <input type="checkbox"/> Discussion/Debate <input type="checkbox"/> Technology integration <input type="checkbox"/> Modeling <input type="checkbox"/> Other (list)		Guided Practices and Concrete Application: <input type="checkbox"/> Large group activity <input type="checkbox"/> Hands-on <input type="checkbox"/> Independent activity <input type="checkbox"/> Technology integration <input type="checkbox"/> Pairing/collaboration <input type="checkbox"/> Imitation/Repeat/Mimic <input type="checkbox"/> Simulations/Scenarios <input type="checkbox"/> Other (list) Explain: We will begin the lesson with a large group discussion, and we will watch a short video together. Then, I will show students how to perform synthetic division, and they will work on problems together.	
Standard(s) HS.A.APR.2: Apply the Remainder Theorem.		Differentiation <p>Below Proficiency: These students may still be struggling to understand long division, and if this is the case, I will encourage them to try to focus on learning long division instead of synthetic division. This will mean that the first part of class may be somewhat confusing to them. However, my hope is that by allowing them to work one-on-one with another student, they will at least learn how to perform long division. Some of them may be able to start making connections between the two methods once they begin to understand long division as well.</p> <p>Above Proficiency: These students should quickly grasp what is going on in synthetic division. They will likely draw some of the connections as we are watching the video, and this will help them as we continue to work on problems. These students will have the opportunity to act as a peer tutor for the students who are struggling. My hope is that this will also help these students to gain an even better understanding of the material as they are challenged to explain what they know to others.</p> <p>Approaching/Emerging Proficiency: Students who are approaching proficiency will likely have a good understanding of how to perform long division at this point. They may become confused when they first see this new type of division. However, they should be able to grasp how to repeat this process once they recognize the pattern. My hope is that they will benefit from seeing the video because this will compare synthetic division to what they already know.</p> <p>Modalities/Learning Preferences: watching a video, comparing between division methods, working in pairs, large group activity, evaluating which method is better</p>	
Objective(s) Students will learn how to divide polynomials using the synthetic method of long division. "I can use synthetic division to factor and divide polynomials." Bloom's Taxonomy Cognitive Level: Applying, Analyzing, Evaluating			
Classroom Management- (grouping(s), movement/transitions, etc.) <ul style="list-style-type: none"> • Students are expected to listen respectfully to the teacher and other students • Students are expected to remain attentive during the video • Students are expected to work cooperatively with their partner • Students are expected to transition smoothly to sit next to their partner 		Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules, and expectations, etc.) <ul style="list-style-type: none"> • Students are expected to listen respectfully to the teacher and other students • Students are expected to pay attention during the video and the rest of the lesson • Students are expected to respect their partner during their group work 	
Minutes	Procedures		

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2 min	<p>Set-up/Prep: To set up for this lesson, I will write a synthetic division problem on the board. I will include the work for solving it as well. (image below)</p>		
10-12 min	<p>Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.) To engage students, I will ask students what they think is going on in this problem. They may be confused at first because it looks different than a typical long division problem, and it may even look different than anything they have seen before. After listening to students' ideas, I will share with them that this synthetic division problem is the same thing that they were working on during the previous lesson. I will walk them through each of the steps of solving this problem, and I will explain how to interpret the solution as well. Then, I will show them this video from Khan Academy which compares synthetic division and long division.</p>		
12-15 min	<p>Explain: (concepts, procedures, vocabulary, etc.) Once I have shown students the video, we will work through a few more examples of synthetic division. First, I will explain that synthetic division can be very useful in finding the factors of a polynomial because it is quicker than performing long division. Then, we will try the examples below using synthetic division.</p> <p> $(x^2 + 5x + 4)/(x + 1)$ $(x^2 + 14x + 24)/(x + 2)$ $(x^3 + 2x + 5)/(x - 3)$ </p> <p>Solutions:</p> <ol style="list-style-type: none"> 1) $x + 4$ 2) $x + 12$ 3) $x^2 + 3x + 11$ Remainder: 38 <p>Each of these examples will be helpful. The first example will divide cleanly with no remainder, so this will be a simple example to start with. The second problem will have a remainder, so it will help students to understand what to do when this happens. The third problem does not have an x^2 term, so it will be helpful for students to be reminded that they need to include a placeholder here (zero) for this term.</p>		
15-20 min	<p>Explore: (independent, concrete practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions) Once we have gone over the examples as a class, I will break everyone up into pairs of two. I will pair students based on how well they are doing with the material, and each student will be expected to submit work at the end of class. Students will work through the problems below:</p> <p> $(x^2 + 3x + 2)/(x + 1)$ $(x^3 + 13x^2 + 5x + 14)/(x + 2)$ $(x^3 - 3x + 4x - 6)/(x - 2)$ $(x^4 - 4x^3 - 3x^2 + 7x + 8)/(x - 4)$ </p> <p>Solutions:</p> <ol style="list-style-type: none"> 1) $x + 2$ 2) $x^2 + 3x + 7$ 3) $x^2 - x + 2$ Remainder: -2 4) $x^3 - 3x - 5$ Remainder: -12 		
5-10 min	<p>Review (wrap up and transition to next activity): As we wrap up the lesson, I will ask students what their opinions are about synthetic division compared to long division. They should recognize that there are some limitations when we are performing synthetic division because we can only divide by binomials of degree 1 with a leading coefficient of 1. However, they should also begin to see how helpful synthetic division can be for factoring because it is much quicker than long division. They should recognize that if they must test multiple possible factors, this will be the quicker way to do it. Finally, I will remind students that they will have a quiz in the next lesson covering GCFs and dividing polynomials.</p>		
<table border="1" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Formative Assessment: (linked to objectives) Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.</p> </td> <td style="width: 50%; vertical-align: top;"> <p>Summative Assessment (linked back to objectives) End of lesson: At the end of the lesson, I will monitor student progress based on their ability to complete each problem during class. Their work will be graded on completion, but I will still provide feedback.</p> </td> </tr> </table>		<p>Formative Assessment: (linked to objectives) Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.</p>	<p>Summative Assessment (linked back to objectives) End of lesson: At the end of the lesson, I will monitor student progress based on their ability to complete each problem during class. Their work will be graded on completion, but I will still provide feedback.</p>
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I will monitor student progress by evaluating their contributions to the large group discussion. I will also walk around the classroom to monitor how students are doing in their pairs.

Consideration for Back-up Plan:

For students that struggle to understand synthetic division, I will allow the option of using long division instead. If the video does not work, I will facilitate a brief discussion about the similarities between the two types of division instead. I will use the example $(x^2 + 5x + 6)/(x + 3)$ to help students understand how each method can be compared. The solution to this example will be $(x + 2)$.

If applicable- overall unit, chapter, concept, etc.:

Students need to be able to divide polynomials on the test. They will be permitted to choose which method they prefer.

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

Synthetic Division

$$\begin{array}{r|rrrr} 3 & 1 & -5 & -2 & 24 \\ & & 3 & -6 & -24 \\ \hline & 1 & -2 & -8 & 0 \end{array}$$

Answer: $x^2 - 2x - 8$

Long Division

$$\begin{array}{r} x^2 - 2x - 8 \\ x - 3 \overline{) x^3 - 5x^2 - 2x + 24} \\ \underline{x^3 - 3x^2} \\ -2x^2 - 2x + 24 \\ \underline{-2x^2 + 6x} \\ -8x + 24 \\ \underline{-8x + 24} \\ 0 \end{array}$$