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| NECC_NETS_small | **Lesson Plan for Implementing NETS•S—Template I*(More Directed Learning Activities)*** |
| ***Template with guiding questions*** |
| Teacher(s) Name | Brandy Stapleton |
| Position | Mathematics Teacher |
| School/District | Gainesville High School/ Gainesville City Schools |
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| Phone | 7066584782 |
| Grade Level(s) | 11 |
| Content Area | Mathematics, Algebra 2 |
| Time line | 2-3 class periods (160-240 minutes) |

**Standards** (What do you want students to know and be able to do? What knowledge, skills, and strategies do you expect students to gain? Are there connections to other curriculum areas and subject area benchmarks? ) Please put a summary of the standards you will be addressing rather than abbreviations and numbers that indicate which standards were addressed.

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| Content Standards | GA Standards of Excellence: MGSE9-12.A.SSE.2, MGSE9-12.A.APR.2 |
| NETS\*S Standards: | Empowered Learner, Knowledge Constructor, Innovative Designer |

**Overview** (a short summary of the lesson or unit including assignment or expected or possible products)

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| To study polynomial division, students will complete a student choice [Think-Tac-Toe](https://docs.google.com/document/d/1rZ4UZSqwIZdI_OQ17Qye_q_5dDqosYUVVycl_FT5754/edit?usp=sharing) assignment which includes various activities designed to introduce/explain concepts, provide practice with immediate feedback, and assess understanding of topics. Students will complete 5/9 activities to and must complete practices, assessments, and/or create products to demonstrate mastery. Students will receive feedback and teachers will monitor progress and provide supports to individuals or small groups as needed. Activities include:1. Learning by Reading (websites with interactive practice or [Textbook lesson](https://my.hrw.com/tabnav/controller.jsp?isbn=9780547709956) with practice quiz)
2. Desmos activity [Polynomial Relationships & the Factor Theorem](https://student.desmos.com/?prepopulateCode=ete6ct),
3. Quizizz Practice
4. Tech Break – practice packet
5. a Google Slides (hyperdocs) practice, [Polynomial Long & Synthetic Division](https://docs.google.com/presentation/d/16lhte3zo1CQO48cvMy3OU2GWkLbx1w_CbLEctS3zzeQ/edit?usp=sharing),
6. Khan Academy assignment set,
7. Edpuzzle Videos
8. Delta Math Assignment
9. Create It- Examples by Me
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**Essential Questions** (What **essential question** or learning are you addressing? What would students care or want to know about the topic? What are some questions to get students thinking about the topic or generate interest about the topic? Additionally, what questions can you ask students to help them focus on important aspects of the topic? (Guiding questions) What background or prior knowledge will you expect students to bring to this topic and build on?) Remember, essential questions are meant to guide the lesson by provoking inquiry. They should not be answered with a simple “yes” or “no” and should have many acceptable answers.

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| **Essential Questions for this lesson include:*** **How do we evaluate and determine factors of polynomials using polynomial division?**
* **If you know one zero of a polynomial function, how can you determine another zero?**

During lesson introduction or overview, to access background knowledge, use the following prompt: “How are polynomial functions factored using traditional methods?” Student prior knowledge should include factoring and solving polynomials using basic factoring methods, special patterns (difference of 2 squares, perfect square trinomial, sum or difference of cubes, quadratic form), by greatest common factor or grouping, by square roots, completing the square, or by the quadratic formula. Students should be able to complete warm-up exercises involving any prior factoring method. Guiding questions during the lesson include:* How is Long Division utilized to divide a polynomial function?
* How is Synthetic Division utilized to divide a polynomial function?
* What is the Factor and Remainder theorem?
* How is a Polynomial evaluated for a given value using Synthetic division and how is a binomial determined to be a factor (or not) using the same process?
* What does it mean to factor completely?
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**Assessment** (What will students do or produce to illustrate their learning? What can students do to generate new knowledge? How will you assess how students are progressing (*formative assessment*)? How will you assess what they produce or do? How will you differentiate products?) You must attach copies of your assessment and/or rubrics. Include these in your presentation as well.

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| Students will complete a student choice [Think-Tac-Toe](https://docs.google.com/document/d/1rZ4UZSqwIZdI_OQ17Qye_q_5dDqosYUVVycl_FT5754/edit?usp=sharing) assignment which includes various activities, including: a Google Slides (hyperdocs) practice, [Polynomial Long & Synthetic Division](https://docs.google.com/presentation/d/16lhte3zo1CQO48cvMy3OU2GWkLbx1w_CbLEctS3zzeQ/edit?usp=sharing), Desmos activity [Polynomial Relationships & the Factor Theorem](https://student.desmos.com/?prepopulateCode=ete6ct), Edpuzzle Video, Delta Math Assignment, [Textbook lesson](https://my.hrw.com/tabnav/controller.jsp?isbn=9780547709956) & practice quiz, [Quizizz](https://quizizz.com/join/quiz/5ea70197eb0b84001bfb24ea/start?from=soloLinkShare&referrer=5820884e675bc49b5b7cffe1) Game, Khan Academy assignment set, Applications, & (Tech-break) Seated Trail Run Activity. Many of the activities include immediate formative assessments and feedback to students, some support learning of new material, and some provide students with opportunities to demonstrate knowledge or create products (see table). Students are required to choose a total of 5 of the 9 available activities. They will submit the Think-Tac-Toe document to their teacher in Google Classroom, allowing teachers to gather data and offer additional feedback. |

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| **Activity** | **Content Learning** | **Practice with Immediate Feedback** | **Practice** | **Assessment** | **Higher Order Thinking (Blooms)** | **Technology** | **Notes** |
| **Learn by Reading** | **✔** | **✔** |  |  |  | **✔** | **Students choose among websites and online textbook to view content explanations and examples.** |
| **Desmos Activity** |  |  | **✔** |  | **✔** | **✔** | **Students complete practice while exploring & analyzing graphs and properties.** |
| **Quizizz** |  | **✔** | **✔** | **✔** |  | **✔** | **Students complete online practice/quiz assessment with immediate feedback.** |
| **Tech-Break** | **✔** |  | **✔** | **✔** |  |  | **Students complete practice sheets in non-technology format (paper & pencil).** |
| **Slides HyperDoc** | **✔** |  | **✔** |  | **✔** | **✔** | **Students complete online practice and creation activity.** |
| **Khan Academy** | **✔** | **✔** |  | **✔** |  | **✔** | **Students utilize Videos & interactive practices and quiz to learn content.** |
| **EdPuzzle** | **✔** | **✔** |  |  |  | **✔** | **Students watch explanation videos with embedded formative checks for understanding and engagement.** |
| **DeltaMath** |  | **✔** | **✔** |  |  | **✔** | **Students complete practices with examples and error trials to demonstrate mastery.** |
| **Create It** |  |  |  | **✔** | **✔** | **✔** | **Students create a product to demonstrate understanding and technology applications.** |

**Resources** (How does technology support student learning? What digital tools, and resources—online student tools, research sites, student handouts, tools, tutorials, templates, assessment rubrics, etc—help elucidate or explain the content or allow students to interact with the content? What previous technology skills should students have to complete this project?)

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| This lesson is technology enhanced for student engagement and asynchronous learning experiences. Students will choose from a variety of learning and assessment platforms to interact with content. Students will need access to device such as tablet or Chromebook & internet connectivity. They will utilize Google Classroom to access material and resource links but may also need to log-in to resource websites to save progress. |

**Instructional Plan**

**Preparation** (What student **needs, interests, and prior learning** provide a foundation for this lesson? How can you find out if students have this foundation? What difficulties might students have?)

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| Students should have previously learned to a) simplify and evaluate polynomials, b) add, subtract, and multiply polynomials, and c) factor polynomials using special patterns, gcf/grouping, trinomial factoring. In this lesson, students will learn to simplify higher order polynomials by dividing out one factor and then factoring further to find all other factors.  |

**Management** Describe the classroom management strategies will you use to manage your students and the use of digital tools and resources. How and where will your students work? (Small groups, whole group, individuals, classroom, lab, etc.) What strategies will you use to achieve equitable access to the Internet while completing this lesson? Describe what technical issues might arise during the Internet lesson and explain how you will resolve or **trouble-shoot** them? Please note: Trouble-shooting should occur prior to implementing the lesson as well as throughout the process. Be sure to indicate how you prepared for problems and work through the issues that occurred as you implemented and even after the lesson was completed.

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| Students may work on this lesson independently or in small groups. Preferably, the assignment would be completed in the classroom setting, offering differentiation and personalized learning opportunities for individual students or groups. This lesson actually was delivered in an asynchronous learning setting during the Covid-19 global pandemic. In the classroom setting, students would be provided with a Chromebook during class. In this situation, students were offered a Chromebook and Kajeet (Verizon Wireless Internet access point) for at home use if needed. |

**Instructional Strategies and Learning Activities** – Describe the research-based instructional strategies you will use with this lesson. How will your learning environment support these activities? What is your role? What are the students' roles in the lesson? How can you ensure **higher order thinking at the analysis, evaluation, or creativity levels of Bloom’s Taxonomy**? How can the technology support your teaching? What authentic, relevant, and meaningful learning activities and tasks will your students complete? How will they build knowledge and skills? How will students use digital tools and resources to **communicate and collaborate** with each other and others? How will you facilitate the collaboration?

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| Students will learn in a personalized learning environment, with adjusted differentiation as deemed necessary through teacher observations and supports. Students will have language supports for most of the assignments and are welcome to use Google Translate and teacher support for clarification. Teachers will monitor progress during class and online to ensure students are working towards their goals. Higher order thinking activities are embedded within the Think-Tac-Toe lessons, as well as by attaching back to the essential questions. There are also applications problems embedded in the activities to provide meaning and relevance. Students will use online tools and small groups to work independently, collaboratively, and efficiently. |

**Differentiation** (How will you differentiate **content and process** to accommodate various learning styles and abilities? How will you help students learn independently and with others? How will you provide extensions and opportunities for enrichment? What assistive technologies will you need to provide?)

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| Some students enjoy reading about content, while others need visual instruction, and others need to play with the material. These learning modalities are encompassed within several of the required activities, including Learn by Reading, Edpuzzle & Khan Academy, and the Google Slides and Desmos activities. Students are able to choose the activities they wish to learn from, and can also be guided by their teachers as needed. |

**Reflection** (Will there be a closing event? Will students be asked to reflect upon their work? Will students be asked to provide feedback on the assignment itself? Also answer the following questions?

**•** How will you know if the students found the lesson meaningful and worth completing?

**•** In what ways do you think this lesson will be effective? Why do you think this?

**•** What problems do you anticipate and why?

**•** How would you design and/or teach this lesson differently if you had more time?)

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| During Closure of the lesson (preferably at the beginning of the last class period), teachers should revisit the essential questions:* **How do we evaluate and determine factors of polynomials using polynomial division?**
* **If you know one zero of a polynomial function, how can you determine another zero?**

Also, teachers should ask students what they enjoyed about the activities, and if they found the learning experiences meaningful. Allow 10-20 minutes of discussion, before prompting students to finish up their final activities and submitting their work for review. |

**Closure:** Anything else you would like to reflect upon regarding lessons learned and/or your experience with implementing this lesson. What advice would you give others if they were to implement the lesson? Please provide a quality reflection on your experience with this lesson and its implementation.

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| Although the lesson was designed to be completed this semester, student participation was limited by misunderstandings provided by our school during the initial closure due to the Covid-19 pandemic. Unfortuantely, only about 60% of my students have completed the task, despite having no deadlines. Among the students who did complete it, their understanding was significantly bolstered and their continuation of content was successful. For some reason, there were errors with the performance of EdPuzzle in regards to tracking student progress, but I was able to identify the issue and assign through Google Classroom in a different way, so that students were not required to log-in twice. My advice to other teachers would be to make sure that this activity is NOT the first time your students are seeing the technology resources contained in it. This activity was designed using resources that I have used often in my classes, so my students were already familiar with the programs.  |

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| **Name:** |  | **Assigned:** 3/16 | **Due:** 4/20 *(by midnight)* |

**Topic: 2.5 Factor & Remainder Theorem**

**Directions:** You must start with **#1, # 5 OR #9** and then make **four additional choices**.
Be sure you are logged in to your accounts so we can see your work. Challenge yourself this week!

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| **Learn by Reading**https://lh5.googleusercontent.com/PZY2kO11ouTYZVbIyVs5lq4pZ1xWr_BFuSGoiICQr2MsI49nNT83BW6UapkxWf-iJuSsjGOJwKu0miw3rPtNGjUu8p_4129LratbhLleGpdgFmP9I9WnpaJgCfZBDwLRTQ0D14ehThis image rendered as PNG in**MathisFun.com** [**1**](https://www.mathsisfun.com/algebra/polynomials-dividing.html)**,**[**2**](https://www.mathsisfun.com/algebra/polynomials-division-long.html)**, &** [**3**](https://www.mathsisfun.com/algebra/polynomials-remainder-factor.html)**,****and/or**[**Algebra 2 Textbook (2.5)**](https://my.hrw.com/tabnav/controller.jsp?isbn=9780547709956)**, and/or****Kate’s Math Lessons** [**1**](https://www.katesmathlessons.com/synthetic-division.html) **&** [**2**](https://www.katesmathlessons.com/factoring-polynomials-completely.html)**.** | https://lh6.googleusercontent.com/l027QK6PNoXcEqsqU1m17aZTl83uEejcUD4UTGCRqBOeVl6xGrLEkmal5NT6Jq8wXx8A8UKbcOhhq_yCGlwyroPR-KQmkaAhSYC-mO1Lh2yT2kdlLYbGaYYFH0ISe3P7BADhCHGw**Desmos Activity**[Polynomial Relationships & the Factor Theorem](https://student.desmos.com/?prepopulateCode=ete6ct)https://lh4.googleusercontent.com/2ZFI5uFNWE9Vtm02zUXr8b0Dc1measi5C8Wa1dfhCjJTFEeJW2pD-YHP8UUK5LMNNuW3gigIicf1acZROeEz2uRJ1MSzGAtDZam6p-furXGbSOKN3LcXyiN3mIKpAXzoQ7NpydoS | **Quizizz Game**: https://lh5.googleusercontent.com/PKvEaTs5-a3J_e6onU_3XFWJg59J11YHu3nsggC73jgVzx9Yhf3jwwGWudjlrlGCnyUreP3SNzKwonJkzEE75QSbYjp5v6wuxUDNII7gFKeQo2UWJZcXXQkhc_fZECBMds2EFrok[**2.5 Apply the Remainder and Factor Theorems**](https://quizizz.com/join/quiz/5ea70197eb0b84001bfb24ea/start?from=soloLinkShare&referrer=5820884e675bc49b5b7cffe1)https://lh3.googleusercontent.com/IFuL7MyCjEzjD_iyNNZDNvUTv4dGCRvv_TD-8PsIfKSt1vABftVK19XTEs6P7PA35pCSP5FYO1rRdu6o6HxsHjn9naoPjdH4FAeEEKqZg30sQ1Z0plpDeB1K8NbWTJLjcFwJnM1z |
| **TECH- break**https://lh4.googleusercontent.com/6Hjf_0oTHJrwO5UMrjykqjxmPGvSrEfqQ2_1cvicYx1lM6Ysq_NkXdl9wRmTBfTUGhUMT3yKGE3EjhRlJeoXI9e_Tt64w5DLInv0fwrZTRrsQJU4kcfnpzwe9IDUl04CP1NBLgjn[Factor & Remainder Theorem](https://drive.google.com/file/d/19Q3oqf0-hJ-wzA4u9Vs4r0KC2X4xHBLg/view?usp=sharing)*Just want a practice worksheet?  No technology required!* | **Google Slides Practice:**https://lh6.googleusercontent.com/a_MSmKL0Pmey9FaACf-MWAplH9kzlOICBKohlo7MP6TB-RHF-MSXYBTUNtM9Cl2kPCMbnSPOy6dkAblBr0MsXpuz-zbL_q0K1l5lOUq4GyLM9PN0K0zzD0GHzHvdmwaM3ydLTBDPThis image rendered as PNG in[**Polynomial Long & Synthetic Division**](https://docs.google.com/presentation/d/16lhte3zo1CQO48cvMy3OU2GWkLbx1w_CbLEctS3zzeQ/edit?usp=sharing)Make a copy of your own and attach the link to your submission | **Khan Academy Assignment Set:** https://lh4.googleusercontent.com/jM5HborqcAVesfMfg0IveFN-GG_guEI1WR4aTs-AUjQItrTip0JodH6izeXyfGPFzRZfT_I_MaROXK3Dn4fPKEgHaxwaMdvb2FUmx8foLwSjdHIEFHgFl5Sr6a2_2N8qwkk6lm2a[Divide Polynomials](https://www.khanacademy.org/math/algebra2/x2ec2f6f830c9fb89%3Apoly-div/x2ec2f6f830c9fb89%3Apoly-div-by-linear/v/poly-div-by-linear)[Factor & Remainder Theorem](https://www.khanacademy.org/math/algebra2/x2ec2f6f830c9fb89%3Apoly-div/x2ec2f6f830c9fb89%3Aremainder-theorem/v/polynomial-remainder-theorem)*Complete both practice sets!* |
| **Edpuzzle Video:** https://lh4.googleusercontent.com/EDhYjKlGoXsyn3r8vkugIJd3x9VRg20PJYidOIPZMeyXpuudMBmxcbMskuSZh537SU7PdcdoJ2MW-jEQ4OPuVtW5LMukVt1x_zZQAKQTR2WKthXKCujeBsCCN_Lt1M7HTjPkcPmJ[**Long & Synthetic Division 1**](https://edpuzzle.com/media/5ea70a38794b223f6668bb4c) or [2](https://edpuzzle.com/assignments/5e70c97a84e74b3e1b9edb03/watch) AND[**The Factor & Remainder Theorem**](https://edpuzzle.com/media/5e70c99ee766e03e406ad95f) | [**DeltaMath**](https://www.deltamath.com/) **Assignment Set**https://lh3.googleusercontent.com/8I0jzuwm6oU2DNk2EZNxqd8FuDZZVYp21lX9d9PBen7V19T-tJbKUsVMKPXwuwQB2U8WXAV0eATermdKEa97FuM9IpuD1kTNmu4eVe3P_c1s_cU2TWJql5ek0niHsG8LgJVl63Qn**Dividing Polynomials**Polynomial Long Division (1, 2)Synthetic Division (1, 2, 3) Remainder / Factor Theorem Synthetic Division to Find Zeros | **CREATE IT**https://lh4.googleusercontent.com/rLeeefVdIua6mrHP0JkbBORedH4ndOqtVv9LvBl3DmwuWeA-L0OAOM_UbAd9mixjKkPD5QfFz9duWK7TVo7SQDha9WpplLQVoQ5cOCnK1MNIZzJ9TvkS2LwlqVhLjhPwJQzLGxzHThis image rendered as PNG in**[Examples by Me](https://docs.google.com/document/d/1qVT_WsFBnzF6ruEc-lNSfMX86WvZ2v35xlkyUzJZgws/edit?usp=sharing)**You will create examples for Polynomial Division & the Factor/Remainder Theorems (video, website, slides, etc) |