Lesson Plans

LESSON 1: Important vocab to understand Polynomial Functions & Adding and subtracting Polynomials

(Duration: Approximately 55 minutes)

Overview

Before starting the lesson, students will complete a not-graded self-assessment to know if they have any gaps or concepts we need to review before we start the chapter. The time spent on the review will be dependent on these test results. In addition to reviewing as needed, in the first lesson, students will also learn the main terms needed to understand the classification of polynomials, as well as the steps to add and subtract polynomials.

Introduction

Teacher will use the digital projector to show students a short review of the concepts they need to have clear for a better understanding of this chapter. After that, teacher will go over the presentation of the first section of this chapter, explain the objectives and the importance of learning about polynomials, making sure to mention rea-life applications. Briefly talk about the activities in this unit and answer student questions as needed.

Key Words

Monomial,
Degree of a monomial,
binomial, trinomial,
polynomials,
Degree of a polynomial,
Standard form,
Leading coefficient.

Materials

Not-graded self-assessment.
Student and educator computers with internet connection
Digital projector
Flashcards
Notebook, math textbook, pencil.

ACTIVITIES [DAY 1]

- 00:00 – 00:05: Welcome students to class while playing “The Polynomial Basics” Song [Link https://www.youtube.com/watch?v=WZh_EqWnXcY]
- 00:06 – 00:10: “DO NOW” assessment [Prepared in advance and placed on students’ desks before class starts – NOT GRADED]: Two exercises asking students to simplify algebraic expressions and two short exercises where they are asked to find the Greatest Common Factor.
- 00:11 – 00:30: Lecture and class discussion: Teacher reviews how to simplify algebraic expressions and finding the GCF before starting the lesson. The time spent on the review will vary depending on students’ proficiency. After that, teacher will go over the key vocab and the steps to add and subtract polynomials. Teacher will solve two examples and will be available for one-on-one instruction as needed.
- 00:35 – 00:50: Divide students in groups (suggestion: 2 – 4 students per group, depending on the size of the class). Have students create vocabulary flashcards for each of the vocab terms. Students must use their own words and examples as much as possible to define each of the vocab terms. Students will get to choose the resource they would like to use: flashcards or Quizlet. One side of the flashcard must be for the term and the other side must include the definition of each term and a picture or an example, if applicable. Students might not have time to finish making flashcards for all of the vocabulary terms in these fifteen minutes. More time will be provided during next class for students to finish this activity on Quizlet.
- 00:51 – 00:55: “Let’s Quiz Each other” activity [NOT GRADED]: By working in groups of 2 or 4, students will have the opportunity to recall the information learned today and quiz each other using the flashcards created during class.

LESSON 1

MODIFICATIONS

For Struggling Students:

Students who are struggling with the new concepts, have doubts, or need further clarification, will have the opportunity to have one-on-one or small group instruction differentiated instruction as needed. They can also watch the following Brainpop video that explains in a simple way what polynomials are:

- https://www.brainpop.com/search/?keyword=Polynomials

Students Who Need a Challenge

Students who want to get ahead or need more challenging material can use the following websites to watch lesson videos, get ahead, and solve practice problems and exercises.

- Option 1: https://www.mathsisfun.com/algebra/polynomials.html
  https://www.mathsisfun.com/algebra/polynomials-adding-subtracting.html
  This website explains all of the main concepts of section one and has ten practice problems.

- Option 2: https://www.khanacademy.org/math/algebra-home/alg-polynomials
  This website has videos explaining each topic and four practice problems.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Students who do not get to finish the vocab in-class activity can work on it later as it will be their homework assignment.

Common Core State Standards

HSA-APR.A.1 → Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

LESSON 2: Multiplying Polynomials

(Duration: Approximately 55 minutes)

Overview

Before starting the second lesson, students will review concepts they learned the day before by completing a not-graded self-assessment. By the end of this lesson, students will have learned how to use the FOIL method to multiply binomials and the application of the distributive property to multiply polynomials.

Introduction

During this lesson, students will learn how to multiply binomials using the FOIL method and also how to multiply trinomials. Students will use algebra tiles to practice the concepts learned and will work independently on exercises to make sure they can solve problems with little or no assistance. Students will have the opportunity to choose what resources they would like to use, which will make them feel in charge of their learning process

Key Words

Binomial, trinomial, polynomials,
FOIL Method

Materials

Not-graded self-assessment.
Student and educator computers with internet connection
Digital projector
Flashcards
Notebook, math textbook, pencil.

ACTIVITIES [DAY 2]

- 00:00 – 00:05: Welcome students to class while playing “The FOIL” Song [Link https://www.youtube.com/watch?v=1Wp0Hvhgi3w]
- 00:06 – 00:10: “DO NOW” assessment [Prepared in advance and placed on students’ desks before class starts – NOT GRADED]: Ask students to write three concepts or things they learned in the previous class.
- 00:11 – 00:30: Lecture and class discussion: Teacher goes over the FOIL method to explain how to multiply binomials, and solves two examples. Students also solve two examples with little or no assistance to make sure they understand the process. If everything is clear, teacher moves on to explaining multiplication of trinomials and solves a real-life problem. Teacher will be available for one-on-one instruction as needed after solving the examples.
- 00:35 – 00:50: Practice with Algebra Tiles: Divide students in groups of two. Have students practice multiplication of polynomials using algebra tiles. Students will get to choose the resource they would like to use: paper algebra tiles or “Mathbits.com”.
- 00:51 – 00:55: “Complete the exit ticket” activity [NOT GRADED]: Students will solve one multiplication exercise individually and will turn it in before leaving the classroom.

LESSON 2

MODIFICATIONS

For Struggling Students:

Students who are struggling with the new concepts, have doubts, or need further clarification, will have the opportunity to have one-on-one or small group instruction differentiated instruction as needed during the last fifteen minutes of the class.

Students Who Need a Challenge

Students who want to get ahead or need more challenging material can use the following websites to watch lesson videos, get ahead, and solve practice problems and exercises.

- Link 1: https://www.mathsisfun.com/algebra/polynomials-multiplying.html
  This website explains all of the main concepts of section two and has ten practice problems.

- Link 2: https://www.khanacademy.org/math/algebra-home/alg-polynomials
  This website has videos explaining each topic and four practice problems.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Teacher will assign homework exercises for practice.

Common Core State Standards

HSA-APR.A.1 → Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of … multiplication; … multiply polynomials.

LESSON 3: Special Products of Polynomials

(Duration: Approximately 55 minutes)

Overview

Before learning about the special product of polynomials, students will use algebra tiles to find a sum and a difference pattern. This will help them understand special products better. By the end of this lesson, students will have learned how to use the square of a binomial pattern, the sum and the difference pattern, and how to apply these special product patterns to solve real-life problems. Once again, students will have the opportunity to choose what resources they would like to use, which will make them feel in charge of their learning process

Introduction

During this lesson, students will work in small groups to explore and identify special products using algebra tiles. After that, the teacher will give the lecture about special products and will solve examples. Students will work independently and will solve examples as well, to make sure they understand the multiplication process and how to apply the different formulas learned.

Key Words

Binomial, trinomial, polynomials, standard form, greatest common factor (GCF).

Materials

Not-graded self-assessment.
Student and educator computers with internet connection
Digital projector
Flashcards
Notebook, math textbook, pencil.

ACTIVITIES [DAY 3]

- 00:00 – 00:05: Welcome students to class while playing "The Square of a Binomial" Song [Link https://www.youtube.com/watch?v=bG5yscL193k]
- 00:06 – 00:10: "DO NOW" assessment [Prepared in advance and placed on students' desks before class starts – NOT GRADED]: Do you remember what a binomial is? Write one or two examples.
- 00:11 – 00:25: Algebra Tiles Activity: Divide students in groups of two. Have students use algebra tiles to find the product and two binomials, identifying and taking notes of the patterns they find. Students will get to choose the resource they would like to use: paper algebra tiles or "Mathbits.com".
- 00:26 – 00:45: Lecture and Class Discussion: Teacher goes over the special product patterns: Square of a binomial pattern and sum and difference pattern and will solve two examples of each. Students will also solve two examples with little or no assistance to make sure they understand the process. If everything is clear, teacher moves on to solving a real-life problem. Teacher will be available for one-on-one instruction during the last ten minutes of the class.
- 00:35 – 00:50: Divide students in groups (suggestion: 2 – 4 students per group, depending on the size of the class). Have students add the new formulas learned today to their vocabulary flashcards. Students must use their own words and examples as much as possible to define each of the vocab terms. Students will get to choose the resource they would like to use: flashcards or Quizlet. One side of the flashcard must be for the term and the other side must include the formula. Students who finish with the flashcards before the class is over, can start working on their homework exercises.
- 00:51 – 00:55: "Complete the exit ticket" activity [NOT GRADED]: Students will solve two exercises individually and will turn it in before leaving the classroom.

LESSON 3

MODIFICATIONS

For Struggling Students:

Students who are struggling with the new concepts, have doubts, or need further clarification, will have the opportunity to have one-on-one or small group instruction after the lecture and finish the in-class activity at home as part of their homework.

Students Who Need a Challenge

Students who want to get ahead or need more challenging material can use the following websites to watch lesson videos, get ahead, and solve practice problems and exercises.

- Link: https://www.khanacademy.org/math/algebra-home/alg-polynomials
  This website has videos explaining each topic and four practice problems.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Teacher will assign homework exercises for practice.

Common Core State Standards

HSA-APR.A.1 → Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of … multiplication; … multiply polynomials.

LESSON 4: Solving Polynomial Equations in Factored Form

(Duration: Approximately 55 minutes)

Overview

Before starting the second lesson, students will review concepts they learned the day before by completing a not-graded self-assessment. By the end of this lesson, students will have learned how to use the FOIL method to multiply binomials and the application of the distributive property to multiply polynomials.

Introduction

During this lesson, students will complete a review worksheet before the class lecture and discussion. After that, the teacher will go over the steps to solve polynomial equations and will solve examples. Students will be encouraged to work independently and solve examples as well.

Key Words

Binomial, trinomial, polynomials, factored form, Zero-Product Property, roots, repeated roots

Materials

Not-graded self-assessment.
Review Worksheet
Digital projector
Flashcards
Notebook, math textbook, pencil.

ACTIVITIES [DAY 4]

- 00:00 – 00:05: Welcome students to class while playing the "Teach Me How to Factor" Song [Link: https://www.youtube.com/watch?v=OFSrINhfNsQ]
- 00:06 – 00:20: Review Worksheet [Prepared in advance and placed on students' desks before class starts – NOT GRADED]: Students complete a review worksheet where they solve exercises finding the GCF, identify the different forms of equations (factored, standard, and non-standard forms), and practice the special properties of numbers zero and one.
- 00:21 – 00:45: Lecture and Class Discussion: Teacher goes over the steps to solve polynomial equations, explains how factor polynomials using the GCF, and solves two examples of each. Students will also solve two examples with little or no assistance to make sure they understand the process. If everything is clear, teacher moves on to solving a real-life problem. Teacher will be available for one-on-one instruction while students work on an in-class activity.
- 00:46 – 00:55: Plan for the Mid-Chapter Performance Task: Divide students in groups (4 students per group). Each student will be able to choose the topic of the unit they understand the most. If the choosing of the topics becomes challenging, then teacher makes a raffle and assigns one topic to each student. The options will be:
    - Before we start vocab and classification of polynomials.
    - Addition and subtraction of polynomials
    - Multiplication of polynomials
    - Solving polynomial equations in factored form

Each student will be in charge of gathering the information and then choose a format of their choice (video, PowerPoint presentation, infographics) to present and explain to their teammates the topic they chose. The students will be given two days to complete this assignment. Each presentation must include a summary of the main concepts, the steps to solve exercises (if applicable), and solving and explaining one example. The students will anonymously review the presenter at the end of each presentation.

LESSON 4

MODIFICATIONS

For Struggling Students:

Students who are struggling with the new concepts, have doubts, or need further clarification, will have the opportunity to have one-on-one or small group instruction after the lecture and finish the in-class activity at home as part of their homework

Students Who Need a Challenge

Students who want to get ahead or need more challenging material can use the following websites to watch lesson videos, get ahead, and solve practice problems and exercises.

- Link: https://www.khanacademy.org/math/algebra-home/alg-polynomials
  This website has videos explaining each topic and four practice problems.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Teacher will assign homework exercises for practice. Students who do not get to finish the vocab in-class activity can work on it at home.

Common Core State Standards

HSA-APR.B.3 → Identify zeros of polynomials when suitable factorizations are available and use the zeros to construct a rough graph of the function defined by a polynomial.
HSA.REI.B.4b→ Solve quadratic equations by … factoring, as appropriate to the initial form of the equation.

LESSON 5: Practice Class - Solving Polynomial Equations in Factored Form

(Duration: Approximately 55 minutes)

Overview

The day after learning how to solve polynomial equations, students will complete a worksheet to make sure they understand and remember the steps of the process. It will also help them consolidate the material they learned. By the end of this lesson, students will be more proficient and will have more practice on solving polynomial equations in factored form using the Zero-Product Property.

Introduction

During this lesson, students will continue to review the vocabulary terms of the chapter and will add new concepts to their flashcards. After that, students will complete a worksheet so they can get more practice on solving polynomial equations and more opportunities to have any questions they might have about the process answered by the teacher. Students will be encouraged to work in small groups for the flashcards activity and independently for the worksheet.

Key Words

Binomial, trinomial, polynomial, factored form, Zero-Product Property, roots, repeated roots.

Materials

Review worksheet
Student and educator computers with internet connection
Digital projector
Flashcards
Notebook, math textbook, pencil.

ACTIVITIES [DAY 5]

- 00:00 – 00:05: Welcome students to class while playing the "Teach Me How to Factor" Song [Link: https://www.youtube.com/watch?v=OFSrINhfNsQ]
- 00:06 – 00:15: Divide students in groups (suggestion: 2 – 4 students per group, depending on the size of the class). Have students add the new terms, properties, and the new formulas learned to their vocabulary flashcards. Students must use their own words and examples as much as possible to define each of the vocab terms. Students will get to choose the resource they would like to use: flashcards or Quizlet. One side of the flashcard must be for the term and the other side must include the formula.
- 00:16 – 00:35: Worksheet: Students complete a review worksheet to practice how to solve polynomial equations.
- 00:36 – 00:45: Time to get your questions answer: Teacher goes any questions students might have and solves the more challenging exercises on the board. Students will be encouraged to participate.
- 00:51 – 00:55: "Complete the exit ticket" activity [NOT GRADED]: Students will solve two exercises individually and will turn it in before leaving the classroom.

LESSON 5

MODIFICATIONS

For Struggling Students:

Students who are struggling with the new concepts, have doubts, or need further clarification, will have the opportunity to use online resources to go back and review the material at their own using the Khan Academy videos or the math is fun website.
Links:

- https://www.mathsisfun.com/algebra/polynomials-multiplying.html
- https://www.khanacademy.org/math/algebra-home/alg-polynomials

Students Who Need a Challenge

Students who want to get ahead or need more challenging material will work on a different review worksheet with practice problems that are more challenging. If they finish the worksheet earlier, they will watch tutorial videos to get ahead or can use the extra time to work on their performance task presentation.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Students who do not get to complete the worksheet during class have the option to take it home and work on it as homework. Teacher will assign homework exercises for practice for the students who completed the worksheet.

LESSON 6: Mid-Chapter Review

(Duration: Approximately 55 minutes)

Overview

This lesson will be focused solely on the review of all the concepts and methods learned during the first four sections of the unit.

Introduction

During this lesson, students will focus on reviewing all of the concepts learned during the first four sections of the test. They will be encouraged to work in small groups (or independently, if that is their preference) to complete a mid- chapter practice quiz, in order to help them consolidate all the new information.

Key Words

Monomial, binomial, polynomial, standard form, greatest common factor (GCF), monomial factored form, Zero-Product Property, roots, repeated roots.

Materials

Not-graded self-assessment.
Review worksheet
Digital projector
Flashcards
Notebook, math textbook, pencil.

ACTIVITIES [DAY 6]

- 00:00 – 00:05: Welcome students to class while playing the most popular song from the last four classes: “The Polynomial Basics,” “The Foil,” “The Square of a Binomial” or the “Teach Me How to Factor” song. Voted by students the day before.
- 00:06 – 00:10: “DO NOW” assessment [Prepared in advance and placed on students’ desks before class starts – NOT GRADED]: Please mention one or two topics you have had trouble understanding so far in this unit.
- 00:26 – 00:45: Lecture and Class Discussion: Teacher summarizes all important information and the main concepts students need to be able to recall and learn for the mid-chapter test. Teacher solves two exercises for each of the four sections. Students are encouraged to participate, and solve exercises independently too.
- 00:46 – 00:55: Practice Quiz: Divide students in groups of two to complete a practice quiz. During these last ten minutes, the teacher will be available for questions and one-on-one instructions as needed.

LESSON 6

MODIFICATIONS

For Struggling Students:

Students who are struggling with the new concepts, have doubts, or need further clarification, will have the opportunity to have one-on-one or small group instruction after the lecture and finish the in-class activity at home as part of their homework. They will also be given the opportunity to go online, watch videos, and solve guided examples using the "Khan Academy" or the "Math is Fun" website

Links:

- https://www.mathsisfun.com/algebra/polynomials.html
- https://www.khanacademy.org/math/algebra-home/alg-polynomials

Students Who Need a Challenge

Students who want to get ahead or need more challenging material will work on a different review worksheet with practice problems that are more challenging. If they finish the worksheet earlier, they will watch tutorial videos to get ahead or can use the extra time to work on their performance task presentation.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Students who not get to finish the practice quiz can work on it for homework. Teacher will also assign additional (optional) exercises for practice. Students who do not get to finish the vocab in-class activity can work on it at home.

Common Core State Standards

HSA-APR.A.1 → Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
HSA-APR.B.3 → Identify zeros of polynomials when suitable factorizations are available and use the zeros to construct a rough graph of the function defined by a polynomial.
HSA.REI.B.4b→ Solve quadratic equations by … factoring, as appropriate to the initial form of the equation

LESSON 7: Mid-Chapter Performance Task

(Duration: Approximately 55 minutes)

Overview

After learning the first four sections, students will get the opportunity to use technology and the format of their choice to demonstrate understanding of the material.

Introduction

During this lesson, students will work in small groups and present to their group members the topic of their selection using technology and the format of their choice. The purpose is to encourage students to be creative, work on something different, and get out of their comfort zone. This will also help students understand the material better before the mid-chapter test.

Key Words

Binomial, trinomial, polynomial, factored form, Zero-Product Property, roots, repeated roots.

Materials

Not-graded self-assessment
Student and educator computers with internet connection
Digital projector

ACTIVITIES [DAY 7]

- 00:00 – 00:05: Welcome students to class while playing “Inspiring and Uplifting Background Music for Videos and Presentations” Song [Link www.youtube.com/watch?v=SSqgaFE9igo]
- 00:06 – 00:45: Time to Present! Students will gather in groups and will present and explain to their teammates the topic they chose. Each presentation will be timed and must include a summary of the main concepts involved in the topic, the steps to solve exercises (if applicable), and solving and explaining one example. The students will anonymously review the presenter at the end of each presentation.
- 00:45 – 00:55: Time for questions.

LESSON 7

MODIFICATIONS

For Struggling Students:

The teacher can choose the topic of the presentation for the students who are having difficulties.
Students with math anxiety might choose to record their presentation at home and share the video with their classmates.

Students Who Need a Challenge

Once they are done with their presentation, students who want a more challenging material can team up with students who are having difficulties understanding a topic to answer their questions and be their tutor during the class.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Since this a performance task to demonstrate understanding of the material, no extension will be given unless the teacher considers the student(s) has a reason to request an extension of the deadline. In that case, the teacher will schedule a new time for the student to present.

Common Core State Standards

HSA-APR.A.1 → Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
HSA-APR.B.3 → Identify zeros of polynomials when suitable factorizations are available and use the zeros to construct a rough graph of the function defined by a polynomial.
HSA.REI.B.4b→ Solve quadratic equations by … factoring, as appropriate to the initial form of the equation

LESSON 8: Factoring $X^2 + bX + C$

(Duration: Approximately 55 minutes)

Overview

During this lesson, students will learn how to factor polynomials in the form of $X^2 + bX + C$ when the constant C is negative and when it is positive. Students will also learn how to apply factoring to solve real-life problems.

Introduction

During this lesson, the teacher will go over the process to factor quadratic polynomials. After that, students will use algebra tiles to practice the factorization process they just learned. Students will be encouraged to work in small groups. During the last fifteen minutes of the class, students will start to plan for their End-of-the-Chapter Performance Task.

Key Words

Polynomial, factored form, FOIL method, Zero-Product Property.

Materials

Not-graded self-assessments
Student and educator computers with internet connection
Digital projector
Flashcards
Notebook, math textbook, pencil.

ACTIVITIES [DAY 8]

- 00:00 – 00:05: Welcome students to class while playing the "Teach Me How to Factor" Song [Link: https://www.youtube.com/watch?v=OFSrINhfNsQ]
- 00:06 – 00:15: "DO NOW" [Prepared in advance and placed on students' desks before class starts – NOT GRADED]: Have students match equations in factored form with their correct equation in standard form.
- 00:16 – 00:35: Lecture and Class Discussion: Teacher goes over how to factor polynomials with the form $X^2 + bX + C$, and solves two examples of each, explaining the steps to follow when C is positive and when C is negative. Students will also solve two examples with little or no assistance to make sure they understand the process. If everything is clear, teacher moves on to solving a real-life problem. Teacher will be available for one-on-one instruction while students work on an in-class activity.
- 00:36 – 00:45: Algebra Tiles Activity: Divide students in groups of two. Have students use algebra tiles to factor the trinomial $X^2 + bX + C$ into the product of two binomials, identifying and taking notes of the patterns they find. Students will get to choose the resource they would like to use: physical algebra tiles or "Mathbits.com".
- 00:46 – 00:50: Plan for the End of the Chapter Performance Task: Inform students they will be working independently to create a poster or an infographic that explains the process of factoring quadratic polynomial equations in both forms: $X^2 + bX + C$ and $aX^2 + bX + C$. Though the use on online resources such as canva.com is encouraged, students will be free to choose the format they feel more comfortable using (Paper posters, PowerPoint Presentations, Video).
- 00:51 – 00:55: "Complete the exit ticket" activity [NOT GRADED]: Students will solve two exercises individually and will turn it in before leaving the classroom.

LESSON 8

MODIFICATIONS

For Struggling Students:

Students who are struggling with the new concepts, have doubts, or need further clarification, will have the opportunity to have one-on-one or small group instruction during the last fifteen minutes of the class, after the lecture. Students who prefer to work independently or work at their own pace can use online video tutorials.

Link: https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:quadratics-multiplying-factoring/x2f8bb11595b61c86:factor-quadratics-strategy/a/factoring-quadratics-in-any-form

Students Who Need a Challenge

Students who want to get ahead or need more challenging material will have the option watch tutorial videos and work independently to get ahead. They can solve extra practice problems online or use the ones in the book. If they finish early, they can use the extra time to work on their performance task presentation.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Teacher will assign homework exercises for practice.

Common Core State Standards

HSA-SSE.A.2 → Use the structure of an expression to identify ways to rewrite it.
HSA.SSE.B.3a→ Factor a quadratic expression to reveal the zeros of the function it defines.

LESSON 9: Factoring $aX^2 + bX + C$

(Duration: Approximately 55 minutes)

Overview

During this lesson, students will learn how to factor polynomials in the form of $aX^2 + bX + C$ when the constant C is negative and when it is positive. Students will also learn how to apply factoring to solve real-life problems.

Introduction

During this lesson, the teacher will go over the process to factor quadratic polynomials that have a coefficient different than 1. After that, students will use algebra tiles to practice the factorization process they just learned. Students will be encouraged to work in small groups.

Key Words

Polynomial, factored form, FOIL method, Zero-Product Property.

Materials

Not-graded self-assessments
Student and educator computers with internet connection
Digital projector
Flashcards
Notebook, math textbook, pencil.

ACTIVITIES [DAY 9]

- 00:00 – 00:05: Welcome students to class while playing the "Teach Me How to Factor" Song [Link: https://www.youtube.com/watch?v=OFSrINhfNsQ]
- 00:06 – 00:15: "DO NOW" [Prepared in advance and placed on students' desks before class starts – NOT GRADED]: Have students match equations in factored form with their correct equation in standard form.
- 00:16 – 00:40: Lecture and Class Discussion: Teacher goes over how to factor polynomials with the form $aX^2 + bX + C$, and solves two examples of each, explaining the steps to follow when C is positive and when C is negative. Students will also solve two examples with little or no assistance to make sure they understand the process. If everything is clear, teacher moves on to solving a real-life problem. Teacher will be available for one-on-one instruction while students work on an in-class activity.
- 00:21 – 00:40: Algebra Tiles Activity: Divide students in groups of two. Have students use algebra tiles to factor the trinomial $aX^2 + bX + C$ into the product of two binomials, identifying and taking notes of the patterns they find. Students will get to choose the resource they would like to use: physical algebra tiles or "Mathbits.com".
- 00:51 – 00:55: "Complete the exit ticket" activity [NOT GRADED]: Students will solve two exercises individually and will turn it in before leaving the classroom.

LESSON 9

MODIFICATIONS

For Struggling Students:

Students who are struggling with the new concepts, have doubts, or need further clarification, will have the opportunity to have one-on-one or small group instruction during the last fifteen minutes of the class, after the lecture. Students who prefer to work independently or work at their own pace can use online video tutorials.

- Option 1: https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:quadratics-multiplying-factoring/x2f8bb11595b61c86:factor-quadratics-strategy/a/factoring-quadratics-in-any-form
- Option 2: https://www.purplemath.com/modules/factquad.htm

Students Who Need a Challenge

Students who want to get ahead or need more challenging material will have the option watch tutorial videos and work independently to get ahead. They can solve extra practice problems online or use the ones in the book. If they finish early, they can use the extra time to work on their performance task presentation.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Teacher will assign homework exercises for practice.

Common Core State Standards

HSA-SSE.A.2 → Use the structure of an expression to identify ways to rewrite it.
HSA.SSE.B.3a→ Factor a quadratic expression to reveal the zeros of the function it defines.

LESSON 10: End of the Chapter Performance Task

(Duration: Approximately 55 minutes)

Overview

After learning the last two sections of the chapter, students will have the opportunity to use technology and the format of their choice to demonstrate understanding of the material.

Introduction

During this lesson, students will work independently to briefly present and explain to their classmates the poster, video or infographic they made about how to factor quadratic polynomials, describing each step. Though the use of online resources such as infographics or posters are encouraged, students are free to use the format of their choice. The purpose is to encourage students to be creative, work on something different, and get out of their comfort zone. This will also help students understand the material better before the chapter test.

Key Words

Binomial, trinomial, polynomial, factored form, Zero-Product Property, roots, repeated roots.

Materials

Review worksheet
Student and educator computers with internet connection
Digital projector
Flashcards
Notebook, math textbook, pencil.

ACTIVITIES [DAY 10]

- 00:00 – 00:05: Welcome students to class while playing “Inspiring and Uplifting Background Music for Videos and Presentations” Song [Link www.youtube.com/watch?v=SSqgaFE9igo]
- 00:06 – 00:45: Students Presentation. Each presentation will be timed (5 max so all students get a chance to present).
- 00:45 – 00:55: Time for questions

LESSON 10

MODIFICATIONS

For Struggling Students:

The teacher can choose the topic of the presentation for the students who are having difficulties.
Students with math anxiety might choose to record their presentation at home and share the video with their classmates.

Students Who Need a Challenge

Once they are done with their presentation, students who want a more challenging material can team up with students who are having difficulties understanding a topic to answer their questions and be their tutor during the class.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Since this a performance task to demonstrate understanding of the material, no extension will be given unless the teacher considers the student(s) has a justifiable reason to request an extension of the deadline. In that case, the teacher will schedule a new time for the student to present.

Common Core State Standards

HSA-SSE.A.2 → Use the structure of an expression to identify ways to rewrite it.
HSA.SSE.B.3a→ Factor a quadratic expression to reveal the zeros of the function it defines.

LESSON 11: End-of-the-Chapter Review

(Duration: Approximately 55 minutes)

Overview

During this lesson, students will complete a worksheet so they can get more practice on factoring quadratic polynomials and will have the opportunity to ask the teacher any questions they might have about the process. Students will be encouraged to work on the worksheet independently.

Introduction

After learning how to factor quadratic polynomials, students will complete a worksheet to make sure they understand and remember the steps of the process. It will also help them consolidate the material they learned. By the end of this lesson, students will be more proficient and will have more practice on factoring polynomials.

Key Words

Polynomial, factored form, FOIL method, Zero-Product Property

Materials

Not-graded self-assessment.
Review worksheet
Digital projector
Flashcards
Notebook, math textbook, pencil.

ACTIVITIES [DAY 11]

- 00:00 – 00:05: Welcome students to class while playing the "Ambient Study Music to Concentrate" [Link: https://www.youtube.com/watch?v=gtmzPUmq7XU]
- 00:06 – 00:35: Worksheet: Students complete a review worksheet to practice how to factor polynomials.
- 00:36 – 00:45: Time to get your questions answer: Teacher goes any questions students might have and solves the more challenging exercises on the board. Students will be encouraged to participate.
- 00:51 – 00:55: "Complete the exit ticket" activity [NOT GRADED]: Students will solve two exercises individually and will turn it in before leaving the classroom.

LESSON 11

MODIFICATIONS

For Struggling Students:

Students who are struggling with the new concepts, have doubts, or need further clarification, will have the opportunity to use online resources to go back and review the material at their own using tutorial videos or educational website.

- Option 1: https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:quadratics-multiplying-factoring/x2f8bb11595b61c86:factor-quadratics-strategy/a/factoring-quadratics-in-any-form
- Option 2: https://www.purplemath.com/modules/factquad.htm

Students Who Need a Challenge

Students who want to get ahead or need more challenging material will work on a different review worksheet with practice problems that are more challenging. If they finish the worksheet earlier, they will watch tutorial videos to get ahead or can use the extra time to work on their performance task presentation.

Remote Learning Option

Teachers who are providing remote instruction can apply the "Flipped classroom," a concept explored by authors Brown and Kelleher (2012) in their article "What Great Homework Looks Like." Math teachers can record the lessons, or make the instructional videos (mentioned above) available to the students and have them watch the videos at home as homework. Then, use the class time to have students solve practice exercises and apply the material learned online or through videos the day before. By doing this, the teacher has the opportunity to provide individual and immediate positive feedback, which helps keeping students engaged in the class and motivated (Brown and Kelleher, 2012).

Extension/Independent Practice

Students who do not get to complete the worksheet during class have the option to take it home and work on it as homework. Teacher will assign (optional) homework exercises for practice for the students who completed the worksheet.

National Standards

HSA-APR.A.1 → Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
HSA-APR.B.3 → Identify zeros of polynomials when suitable factorizations are available and use the zeros to construct a rough graph of the function defined by a polynomial.
HSA.REI.B.4b→ Solve quadratic equations by … factoring, as appropriate to the initial form of the equation
HSA-SSE.A.2 → Use the structure of an expression to identify ways to rewrite it.
HSA.SSE.B.3a→ Factor a quadratic expression to reveal the zeros of the function it defines.