

The Great Divide

Polynomial Division

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Grade Level	10th – 12th Grade	**Time Frame**	80 - 85 Minutes
Subject	Mathematics	**Duration**	2-3 Class Periods
Course	Algebra 2		

Essential Question

What is your preferred way to solve polynomial equations?

Summary

In this lesson, students leverage their prior knowledge of numerical long division, factoring, and graphing as a foundation for exploring polynomial division. The lesson formalizes student knowledge of polynomial long division, covering both scenarios with and without remainders. Through active practice solving polynomials by graphing, factoring, and division, students solidify their understanding. To enhance the learning, conduct interviews to encourage communication and reflection.

Snapshot

Engage

Students will review numerical long division and use prior knowledge about polynomials to determine if statements are always, sometimes, or never true.

Explore

Students will use their knowledge to simplify and solve polynomial equations.

Explain

Students will showcase their prior knowledge and then formalize their knowledge of polynomial long-division through guided notes.

Extend

Students will work independently to practice solving polynomial division problems.

Evaluate

Students will interview a peer over the independent practice to dive more deeply into their knowledge of the content.

Standards

ACT College and Career Readiness Standards - Mathematics (6-12)

A507: Solve quadratic equations in the form (x + a)(x + b) = 0, where a and b are numbers or variables
A508: Factor simple quadratics (e.g., the difference of squares and perfect square trinomials)

Oklahoma Academic Standards Mathematics (Algebra 2)

A2.A.1.4: Solve polynomial equations with real roots using various methods (e.g., polynomial division, synthetic division, using graphing calculators or other appropriate technology).

Attachments

- Equation Expedition (Teacher Resource)—The Great Divide .docx
- Equation Expedition (Teacher Resource)—The Great Divide .pdf
- Equation Expedition—The Great Divide - Spanish.docx
- Equation Expedition—The Great Divide - Spanish.pdf
- Equation Expedition—The Great Divide.docx
- Equation Expedition—The Great Divide.pdf
- Lesson Slides—The Great Divide.pptx
- Math Interview—The Great Divide - Spanish.docx
- Math Interview—The Great Divide - Spanish.pdf
- Math Interview—The Great Divide.docx
- Math Interview—The Great Divide.pdf
- Navigating the Great Divide (Teacher Resource)—The Great Divide.docx
- Navigating the Great Divide (Teacher Resource)—The Great Divide.pdf
- Navigating the Great Divide—The Great Divide - Spanish.docx
- Navigating the Great Divide—The Great Divide - Spanish.pdf
- Navigating the Great Divide—The Great Divide.docx
- Navigating the Great Divide—The Great Divide.pdf
- Polynomial Preview (Teacher Resource)—The Great Divide.docx
- Polynomial Preview (Teacher Resource)—The Great Divide.pdf
- Polynomial Preview—The Great Divide - Spanish.docx
- Polynomial Preview—The Great Divide - Spanish.pdf
- Polynomial Preview—The Great Divide.docx
- Polynomial Preview—The Great Divide.pdf

Materials

- Lesson Slides (attached)
- Polynomial Preview (2 pages attached; 1/2 page per group)
- Polynomial Preivew Teacher Resource (attached)
- Navigating the Great Divide (2 pages attached; 1 set per student)
- Navigating the Great Divide Teacher Resource (attached)
- Equation Expedition (2 pages attached; 1 per student)
- Equation Expedition Teacher Resource (attached)
- Math Interview (2 pages attached; 2 pages per student)
- Pencil
- Paper
- Graphing Calculator

15 minutes

Engage

Teacher note

The slide deck is quite long—85 slides. However, the length is because each example in the explain portion of the lesson is worked out step-by-step to scaffold the process for students.

Use the attached **Lesson Slides** to guide this lesson.

Start on **slide 2** and progress through **slide 4** to introduce the lesson, essential question, and learning objectives.

Move to **slide 5,** introduce the Tell Me Everything strategy, and ask each student to get out a piece of paper and pencil. Instruct the students to look at the division problem on the slide and write down everything they know about the problem. Use the example prompts on the slide to guide student thinking.

Guiding the Lesson

Based on student responses to **slide 5,** you can choose to unhide **slide 6** and review numerical division with and without a remainder for students or continue on with the lesson without additional review.

Transition to **slide 7** and introduce the Always, Sometimes, or Never True strategy to the class. On each slide, ask students to determine if the statement in red is always, sometimes, or never true. Once students have made a decision about the statement, have all students stand and hold a brief conversation about the choices students have made. After a brief conversation, move the red circle on the slide to cover one of the incorrect answers and ask the students who chose that answer to sit down. Continue the conversation to determine which of the two remaining solutions is correct before moving the second red circle over the other incorrect answer to reveal the correct answer. Continue this process on each slide until **slide 11**.

Answers

Slide 7: “A polynomial written in standard form has the highest degree listed first.” **Always**

Slide 8: “The degree of a linear binomial is three.” **Never**

Slide 9: “The product of two binomials is a polynomial.” **Always**

Slide 10: “A polynomial has a leading coefficient of one.” **Sometimes**

Slide 11: “The quotient of two polynomials is a polynomial.” **Sometimes**

10 minutes

Explore

Move to **slide 12** and divide the class into four or eight equal groups, depending on the class size. Give each group 1/4th of the attached **Polynomial Preview** Handout to complete together.

Review the instructions for this activity with the class, and then start the timer to initiate group work. As groups work, rotate about the room to keep students on task and answer any questions. Use the attached **Polynomial Preview Teacher Resource** document to guide students learning.

Once the timer is finished, move to **slide 13** and inform the groups that they will work out either the simplify or solve problem from their handout for the entire class. Give students about 1 minute to decide which problem they will work out before moving to the next slide.

25 minutes

Explain

Ask each group to refer to the top of their handout to determine which group number they are and use **slide 14** through **slide 17** for each group to come to the board and work out a solution from their handout by writing directly on the slide. After each group, review the answer with the whole class to clear up any misconceptions and ensure that the correct answer is written on the board.

After students have showcased their knowledge, ask everyone to return to their seats and pass out the attached **Navigating the Great Divide** handout. Progress from **slide 18** through **slide 36** to model solving polynomial division problems with and without a remainder algebraically.

Progress from **slides 37** through **slide 64** to model solving polynomials through graphing, factoring, and dividing.

Progress from **slide 65** through **slide 83** to model a scenario when polynomial division is needed to find the roots of a function. Ask students to work out the examples on their paper as they appear on the screen. Utilize the attached **Navigating the Great Divide Teacher Resource** as needed.

Guiding the Lesson

While progressing through the guided notes handout, draw connections between polynomial long division and numerical long division and help students understand that the same procedure and processes exist for each type of division.

Note that the steps in the long division examples are color-coded to help clarify for students the relationship the quotient plays in the problem.

15 minutes

Extend

Transition to **slide 84,** introduce the Elbow Partners strategy, give each pair a set of the attached **Equation Expedition** handout, and ask each student to take 1 piece of paper. Instruct students to work independently on the 3 practice problems on their paper using prior knowledge and the completed guided notes as reference.

Start a timer to indicate the beginning of this activity.

While students work, walk around the room to ensure students stay on task and clear up any misconceptions as needed. Use the attached **Equation Expedition Teacher Resource** document as a reference.

Guiding the Lesson

In the next part of this lesson, students will be in pairs speaking about this handout. If a student asks for help or needs assistance, provide enough assistance for students to move forward with the activity. Do not, however, give any answers or help beyond what is minimally necessary.

20 minutes

Evaluate

Preparing the activity

Before the activity, review the Math Interview handout, and adjust the number and depth of questions based on the needs of your classroom.

When the timer has stopped, move to **slide 85**. Ask students to look at the top of their handout to identify if they are partner A or partner B. Have students move their desks to face their elbow partner.

Using the Math Interview strategy, give each student a copy of the attached **Math Interview** handout and review the instructions on the slide for the students to understand the activity.

Each student will be assigned a role as either Partner A or Partner B based on the heading of their handout. Partner A will start by interviewing Partner B first by asking the questions on the Math Interview handout. When answering the questions, Partner B will look at their **Equation Expedition** handout and answer based on their responses. Once the interview is complete, Partner B will get their Math Interview handout and ask it to Partner A, who will answer the questions based on the answers on their Equation Expedition handout.

Once the math interview is complete, both students can correct or adjust answers on their Equation Expedition handout before turning in their practice problem and math interview to a designated location based on classroom procedures.

Resources

- K20 Center. (n.d.). Always, sometimes, or never true. Strategies. https://learn.k20center.ou.edu/strategy/145
- K20 Center. (n.d.). Elbow partners. Strategies. https://learn.k20center.ou.edu/strategy/116
- K20 Center. (n.d.). Math interview. Strategies. https://learn.k20center.ou.edu/strategy/3296
- K20 Center. (n.d.). Tell me everything. Strategies. https://learn.k20center.ou.edu/strategy/107