ETEC 6440 Report #2

Administrator Mandate goal: Common Core State Standard 8.EE.1., Know and apply the properties of integer exponents to generate equivalent numerical expressions.

Instructional goal: Students will evaluate and generate equivalent expressions by applying the three properties of integer exponents.

→ Skills and Knowledge

Skills:	Knowledge:
Know	the properties of integer exponents
Apply	the properties of integer exponents
Generate	equivalent numerical expressions

Goal #1:

$$(3^2 \cdot 3^{-5})^{-9} =$$

Goal #2: $4^5 \cdot 4^n = 4^{15}$ ↑

Instructional Analysis:

-Intellectual skills

1. Simplify exponential expressions with integer exponents by using at least one of properties of exponents.
2. Simplify exponential expressions with integer exponents by using a combination of at least two properties of exponents.
3. Simplify exponential expressions with integer exponents by using a combination of all three the properties of exponents.
4. Applying properties to solve exponents problems with integers.

-Subordinate Skills

1. Combining exponents when multiplying powers with the same base: Product rule.
2. Combining exponents when dividing powers with the same base: Quotient Rule.
3. Simplify a power of a power, multiply the exponents , keeping the same base: Power Rule.
4. Convert negative exponents into positive exponents.

-Entry Skills

1. Adding integers
2. Subtracting integers
3. Multiplying integers
4. Exponential vocabulary key terms

Flow Chart:
https://lucid.app/lucidchart/invitations/accept/inv_350dbac6-9365-4754-9a3b-a15d773380d3?viewport_loc=-175%2C20%2C4691%2C2575%2C0_0

Performance objectives:

1. Given positive exponents, students will be able to evaluate exponents with positive integers by reaching a smart score of 50 on the IXL assignment.
2. Given positive exponents, students will be able to evaluate using the product rule of exponents to simplify exponential expressions by reaching a smart score of 50 on the IXL assignment.
3. Given positive exponents, students will be able to evaluate using the quotient rule of exponents to simplify exponential expressions by reaching a smart score of 50 on the IXL assignment.
4. Given positive exponents, students will be able to evaluate using the power rule of exponents to simplify exponential expressions by reaching a smart score of 50 on the IXL assignment.
5. Given integer exponents, students will be able to rewrite an exponential expression with negative exponents using positive exponents by reaching a smart score of 50 on the IXL assignment.
6. Given integer exponents, students will be able to simplify expressions using a combination of at least 2 properties by reaching a smart score of 50 on the IXL assignment.
7. Given integer exponents, students will be able to simplify expressions using a combination of the properties by reaching a smart score of 50 on the IXL assignment.
8. Given integer exponents, students will be able to identify the missing value that makes the equation true by applying the properties of integer exponents by reaching a smart score of 50 on the IXL assignment.

Instructional Strategy

Step 1: Delivery system: The delivery system is going to be a Tele-course. More specifically an e-classroom that involves two-way interactive video conference/ computer-based instruction via Google Meets.

Step 2: Instructional Strategy

Learning Components	Considerations for each component	Instructional

Pre-Instructional Activities	Provide for motivation	Teacher provides students with a rubric of the assessment and asks the students to create a goal based on what they want to accomplish by the end of the unit. The rubric includes the following questions: ● What grade do you want? ● What do you need to do in order to obtain that grade?
	Relevance	Being able to get a good grade at the end of the unit.
	Confidence	Understand that it's okay to make errors.
	Inform the learner of objectives	Go over the performance objectives at the beginning of class.
	Promote recall	Students will complete a warm up activity at the beginning of each lesson to recall the content from the prior lesson.
	Gain Attention	Give the students a scenario and have think regarding the exponents.
Content Presentation and Learner Guidance	Sequence of skills in order	1. Intro to exponents (Review evaluating and write expressions using exponents) 2. Product rule 3. Quotation rule 4. Power rule 5. Negative exponents 6. Combine at least 2 properties: Product/quotient/power rule with integers 7. Combine Product/quotient/power rule with integers 8. Apply properties to solve
	Provide examples	Demonstrate how to derive the rules of exponents by explaining how to solve the examples and debriefing with the students.
Learner Participation	Ensure note-taking	Students will be taking notes on examples on: product rule, quotient rule, power rules, negative exponents, and applying all properties.
	Practice examples	Students will practice problems that correlate with the notes. Learners will engage in practice where they will apply the rules of exponents.

	Feedback	Students will receive instant feedback on their performance.
Assessment	Ensure students readiness Sequence of skills in order	Students will review all objectives in preparation for the assessment 1. Evaluate using the product rule with integer exponents 2. Evaluate using the quotient rule with integer exponents 3. Evaluate using the power rule with integer exponents 4. Evaluate using two of the three properties of integer exponents. 5. Evaluate using the three properties of integer exponents 6. Apply properties of exponents to find missing values
Follow through	Promote transfer Memory aid Transfer of Learning Reflect on learning experience	Show videos of the different properties of exponents. Students will take notes concerning the product rule, quotient rule, power rule, etc. The notes are a checklist that helps students understand the concept of the properties. Students will practice problems that are similar to the assessment and the notes to enable the transfer process. Students will explain their process of their learning outcome.

Step 3: Sequence and Cluster of Performance Objectives Table 9.2

Sequence and Cluster of Performance Objectives	
Instructional Goal: Know and apply the properties of integer exponents to generate equivalent numerical expressions.	Objective Cluster
Main Steps Step 1: Know properties of integer exponents Step 2: Apply properties of integer exponents	1. Students will be able to evaluate exponents with positive integers (15 minutes) 2. Students will be able to evaluate using the product rule of exponents to simplify exponential expressions (80 minutes)

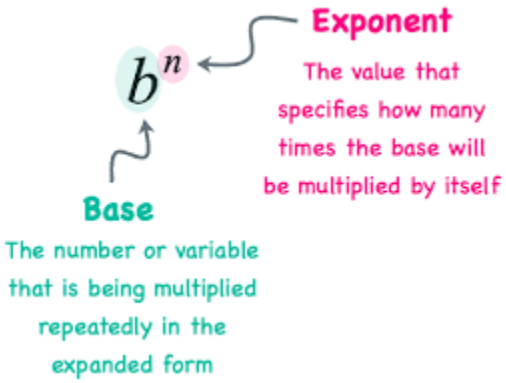
	3. Students will be able to evaluate using the quotient rule of exponents to simplify exponential expressions. (80 minutes) 4. Students will be able to evaluate using the power rule of exponents to simplify exponential expressions. (80 minutes) 5. Students will be able to rewrite an exponential expression involving negative exponents with positive exponents. (80 minutes) 6. Students will be able to simplify expressions using a combination of at least 2 of the properties. (80 minutes) 7. Students will be able to simplify expressions using a combination of the properties. (80 minutes) 8. Students will be able to determine a value that makes two expressions equivalent by applying the properties of integer exponents. (80 minutes)

Step 4: Writing Pre-Instructional activities, assessment, and follow through

Pre Instructional Activities
- Motivation: **Which would you choose?** **You are given an option of being paid either** ● **$1,000,000 or** ● **for thirty days receiving one cent the first day and each succeeding day double the amount of the previous day.** - Objectives: Students will be provided with seven objectives that build on each other throughout the unit. The first of the seven objectives is evaluating exponents with positive integers, once the students a "smart score" on the IXL problems provided they will move to the next objective which is the product rule for exponents. The class will move through the lesson in a similar fashion until they have covered all the included objectives which are; a. evaluate exponents with positive integers b. evaluate using the product rule of exponents c. evaluate using the quotient rule of exponents d. evaluate using the power rule of exponents e. write an exponential expression involving negative exponents with positive exponents f. simplify expressions using a combination of the properties

g. determine a value that makes two expressions equivalent by applying the properties of integer exponents

- Entry Skills:
  a. Exponent Vocabulary:
     - Exponent
     - Base



- Student Grouping and Media Selections: Individualized, web-based, practice and feedback online. Streaming video as a class when required

Assessment

- Initial skills assessment
- Pretest: (8th Common Core Math Unit 4 - Exponents Assessment) The class will be given a pretest to test what prior knowledge they have on exponents. The data will be compared with the post test to measure the growth the students experienced throughout the unit.
- Practice Test: The class will receive an exit ticket when an objective is completed, from the exit ticket we will be able to see if students understood the objective before we move into another objective.
  a. Product Rule
  b. Quotient Rule
  c. Power Rule
  d. Negative Exponents
  e. Combinations of Exponent Properties

- Posttest: (8th Common Core Math Unit 4 - Exponents Assessment) The class will be given a post test to test what objectives the students have mastered throughout the unit. The data will be compared with the pre test to measure the growth the students experienced throughout the unit.

- Student Grouping and Media Selections: Individualized, web-based, practice and feedback online using IXL.com for practice problems.

Follow-Through Activities

- Memory Aid: Note taking and videos
- Transfer: Practice problems
- Student Grouping: Individual

- Media Selection: IXL, google forms, and Classkick

Step 5: Content presentation and Student participation learning Components: Table 9.4

Objective Number: 1-Given positive exponents, students will be able to evaluate exponents with positive integers by reaching a smart score of 50 on the IXL assignment.

Content Presentation: Teacher will share screen and present a video to introduce exponents. Group discussions about main ideas and then notes that students will need to copy down in their math notebook.

Content: Teacher will go over vocabulary and explain to students what is an exponent, base, exponential form, and expanded form when evaluating exponents. The teacher will lead a discovery lesson for students to construct their own understanding of exponents and recognize any patterns.

Examples:

- $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$
- $2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$
- $2^3 = 2 \cdot 2 \cdot 2 = 8$
- $2^2 = 2 \cdot 2 = 4$
- $2^1 = 2$
- $2^0 = 1$

Student Groupings and Media selections: Streaming video as a class when required. Whole class/discussion.

Student Participation: Students will watch the video as a class and participate in a class discussion on what is an exponent and what does it mean. Students will also follow along and take notes with the teacher asking and answering any questions posed by the teacher. Students will also participate in reaching a smart score of 50 on the IXL assignment.

Practice Items and Activities: Students will evaluate positive exponents on the IXL Assignment F.2.

- 5^4
- 2^6
- 3^0

Feedback: Students will receive a smart score determining their level of understanding on the content. The feedback is immediate, their score will increase with each correct response and will decrease with each incorrect response. If students answer a problem incorrectly then they will be given a tutorial in how to solve the problem correctly with step by step instructions.
Student Groupings and Media selections: Individualized, web-based, practice and feedback online using IXL.com for practice problems.

Objective Number: 2-Given positive exponents, students will be able to evaluate using the Product rule of exponents to simplify exponential expressions by reaching a smart score of 50

on the IXL assignment.

Content Presentation: Teacher will share screen and present a video to introduce the Product rule. Group discussions about main ideas and then notes that students will need to copy down in their math notebook.

Content: Teacher will go over three example problems of how to simplify exponential expressions using the Product rule while asking guiding questions to guide student participation and interaction.

Examples:

- $3^2 \cdot 3^6 = 3^8$
- $8^5 \cdot 8^4 = 8^9$
- $122^0 \cdot 122^1 = 122^1$

Student Groupings and Media selections: Streaming video as a class when required. Whole class/discussion.

Student Participation: Students will watch the video as a class and participate in a class discussion on how to simplify exponential expressions using the product rule. Students will also follow along and take notes with the teacher asking and answering any questions posed by the teacher. Students will also participate in reaching a smart score of 50 on the IXL assignment.

Practice Items and Activities: Students will simplify exponential expressions using the product rule on the IXL Assignment F.8.

- $15^4 \cdot 15^4$
- $23^6 \cdot 23^{20}$
- $335^0 \cdot 335^{10}$

Feedback: Students will receive a smart score determining their level of understanding on the content. The feedback is immediate, their score will increase with each correct response and will decrease with each incorrect response. If students answer a problem incorrectly then they will be given a tutorial in how to solve the problem correctly with step by step instructions.
Student Groupings and Media selections: Individualized, web-based, practice and feedback online using IXL.com for practice problems.

Objective Number: 3-Given positive exponents, students will be able to evaluate using the Quotient rule of exponents to simplify exponential expressions by reaching a smart score of 50 on the IXL assignment.

Content Presentation: Teacher will share screen and present a video to introduce the Quotient rule. Group discussions about main ideas and then notes that students will need to copy down in their math notebook.

Content: Teacher will go over three example problems of how to simplify exponential expressions using the Quotient rule. while asking guiding questions to guide student participation and interaction.

Examples:

- $\frac{2^{10}}{2^{2}}$ - $\frac{6^{20}\cdot 6^{3}}{6^{15}\cdot 6^{2}}$ - $\frac{12^{32}\cdot 12^{5}}{12^{15}\cdot 12^{7}}$

Student Groupings and Media selections: Streaming video as a class when required. Whole class/discussion.

Student Participation: Students will watch the video as a class and participate in a class discussion on how to simplify exponential expressions using the Quotient rule. Students will also follow along and take notes with the teacher asking and answering any questions posed by the teacher. Students will also participate in reaching a smart score of 50 on the IXL assignment.

Practice Items and Activities: Students will simplify exponential expressions using the Quotient rule on the IXL Assignment F.9.

- $\frac{12^{12}}{12^{5}}$ -$\frac{23^{25}\cdot 23^{2}}{23^{6}\cdot 23^{4}}$ -$\frac{65^{88}\cdot 65^{3}}{65^{20}\cdot 65^{2}}$

Feedback: Students will receive a smart score determining their level of understanding on the content. The feedback is immediate, their score will increase with each correct response and will decrease with each incorrect response. If students answer a problem incorrectly then they will be given a tutorial in how to solve the problem correctly with step by step instructions.
Student Groupings and Media selections: Individualized, web-based, practice and feedback online using IXL.com for practice problems.

Objective Number: 4-Given positive exponents, students will be able to evaluate using the Power rule of exponents to simplify exponential expressions by reaching a smart score of 50 on the IXL assignment.

Content Presentation: Teacher will share screen and present a video to introduce the Power rule. Group discussions about main ideas and then notes that students will need to copy down in their math notebook.

Content: Teacher will go over three example problems of how to simplify exponential expressions using the Power rule. while asking guiding questions to guide student participation and interaction.

Examples:

- $(5^{2})^{6}$ -$(4^{5})^{4}$ -$(8^{3})^{7}$

Student Groupings and Media selections: Streaming video as a class when required. Whole class/discussion.

Student Participation: Students will watch the video as a class and participate in a class discussion on how to simplify exponential expressions using the Power rule. Students will also follow along and take notes with the teacher asking and answering any questions posed by the teacher. Students will also participate in reaching a smart score of 50 on the IXL assignment.

Practice Items and Activities: Students will simplify exponential expressions using the Power rule on the IXL Assignment F.11.

- $(5^4)^8$ -$(6^2)^9$ -$(12^3)^2$

Feedback: Students will receive a smart score determining their level of understanding on the content. The feedback is immediate, their score will increase with each correct response and will decrease with each incorrect response. If students answer a problem incorrectly then they will be given a tutorial in how to solve the problem correctly with step by step instructions.
Student Groupings and Media selections: Individualized, web-based, practice and feedback online using IXL.com for practice problems.

Objective Number: 5-Given integer exponents, students will be able to rewrite an exponential expression with negative exponents using positive exponents by reaching a smart score of 50 on the IXL assignment.

Content Presentation: Teacher will share screen and revisit the pattern from the discovery lesson. Group discussions about main ideas and then notes that students will need to copy down in their math notebook.

Content: Teacher will go over the pattern from the discovery lesson to determine how to evaluate a negative exponent. Teacher will go over and explain three examples on how to rewrite a negative exponent as a positive to evaluate the exponential expressions.

Examples:

- $2^{-4} = \frac{1}{2^4} = \frac{1}{16}$
- $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$
- $\frac{1}{3^{-5}} = 3^5 = 243$

Student Groupings and Media selections: Whole class/discussion.

Student Participation: Students will participate in a class discussion on how to write an exponential expression with negative exponents using positive exponents. Students will also follow along and take notes with the teacher asking and answering any questions posed by the teacher. Students will also participate in reaching a smart score of 50 on the IXL assignment.

Practice Items and Activities: Students will simplify exponential expressions with negative exponents using positive exponents on the IXL Assignment F.6.

- 2^{-4}
- 142^{-6}
- $\frac{1}{245^{-3}}$

Feedback: Students will receive a smart score determining their level of understanding on the content. The feedback is immediate, their score will increase with each correct response and will decrease with each incorrect response. If students answer a problem incorrectly then they will be given a tutorial in how to solve the problem correctly with step by step instructions.
Student Groupings and Media selections: Individualized, web-based, practice and feedback online using IXL.com for practice problems.

Objective Number: 6-Given integer exponents, students will be able to simplify expressions using a combination of at least 2 properties by reaching a smart score of 50 on the IXL assignment.

Content Presentation: Teacher will share screen and go over notes for simplifying expressions using a combination of exponential properties. Group discussions about main ideas and then notes that students will need to copy down in their math notebook.

Content: Teacher will go over and explain three examples on how to simplify exponential expressions using a combination of exponential properties.

Examples:
- $\frac{(3^4)^3}{3^2}$
- $\frac{4^{-4}\cdot 4^6}{4}$
- $\frac{6^2\cdot 6^5}{6^{-3}}$

Student Groupings and Media selections: Whole class/discussion.

Student Participation: Students will participate in a class discussion on how to simplify exponential expressions using a combination of exponential properties. Students will also follow along and take notes with the teacher asking and answering any questions posed by the teacher. Students will also participate in reaching a smart score of 50 on the IXL assignment.

Practice Items and Activities: Students will simplify exponential expressions using a combination of exponential properties on the IXL Assignment F12.
- $\frac{(2^7)^2}{2^2}$
- $\frac{2^7\cdot 2^{-3}}{2}$

- $\frac{4^4 \cdot 4^5}{4^{-3}}$

Feedback: Students will receive a smart score determining their level of understanding on the content. The feedback is immediate, their score will increase with each correct response and will decrease with each incorrect response. If students answer a problem incorrectly then they will be given a tutorial in how to solve the problem correctly with step by step instructions.
Student Groupings and Media selections: Individualized, web-based, practice and feedback online using IXL.com for practice problems.

Objective Number: 7-Given integer exponents, students will be able to simplify expressions using a combination of the properties by reaching a smart score of 50 on the IXL assignment.

Content Presentation: Teacher will share screen and go over notes for simplifying expressions using a combination of exponential properties. Group discussions about main ideas and then notes that students will need to copy down in their math notebook.

Content: Teacher will go over and explain three examples on how to simplify exponential expressions using a combination of exponential properties.

Examples:

- $\frac{(3^4)^3}{3^2}$
- $\frac{(4^{-4} \cdot 4^6)^2}{4}$
- $\frac{(6^2 \cdot 6^5)^2}{6^{-3}}$

Student Groupings and Media selections: Whole class/discussion.

Student Participation: Students will participate in a class discussion on how to simplify exponential expressions using a combination of exponential properties. Students will also follow along and take notes with the teacher asking and answering any questions posed by the teacher. Students will also participate in reaching a smart score of 50 on the IXL assignment.

Practice Items and Activities: Students will simplify exponential expressions using a combination of exponential properties on the IXL Assignment F12.

- $\frac{(2^7)^2}{2^2}$
- $\frac{2^7 \cdot 2^{-3}}{2}$
- $\frac{(4^4 \cdot 4^5)^3}{4^{-3}}$

Feedback: Students will receive a smart score determining their level of understanding on the content. The feedback is immediate, their score will increase with each correct response and will decrease with

each incorrect response. If students answer a problem incorrectly then they will be given a tutorial in how to solve the problem correctly with step by step instructions.
Student Groupings and Media selections: Individualized, web-based, practice and feedback online using IXL.com for practice problems.

Objective Number: 8-Given integer exponents, students will be able to identify the missing value that makes the equation true by applying the properties of integer exponents by reaching a smart score of 50 on the IXL assignment.

Content Presentation: Teacher will share screen and go over notes for identifying the missing value that makes the equation true by applying the properties of integer exponents. Group discussions about main ideas and then notes that students will need to copy down in their math notebook.

Content: Teacher will go over and explain three examples on how to identify the missing value that makes the equation true by applying the properties of integer exponents.

Examples:

- $2^3 \cdot 2^x = 2^5$
- $3^4 \cdot 3^x = 3^{10}$
- $5^{12} \cdot 5^x = 5^{25}$

Student Groupings and Media selections: Whole class/discussion.

Student Participation: Students will participate in a class discussion on how to identify the missing value that makes the equation true by applying the properties of integer exponents. Students will also follow along and take notes with the teacher asking and answering any questions posed by the teacher. Students will also participate in reaching a smart score of 50 on the IXL assignment.

Practice Items and Activities: Students will identify the missing value that makes the equation true by applying the properties of integer exponents on the IXL Assignment F.15.

- $2^6 \cdot 2^x = 2^{12}$
- $3^{25} \cdot 3^x = 3^{32}$
- $5^{17} \cdot 5^x = 5^{20}$

Feedback: Students will receive a smart score determining their level of understanding on the content. The feedback is immediate, their score will increase with each correct response and will decrease with each incorrect response. If students answer a problem incorrectly then they will be given a tutorial in how to solve the problem correctly with step by step instructions.
Student Groupings and Media selections: Individualized, web-based, practice and feedback online using IXL.com for practice problems.

Step 6: Review (terminal objective) Pg. 233 Table 9.4

Objective Number: All Objectives 1-8.
Content Presentation:

- Given integer exponents, students will be able to evaluate and simplify exponents by applying the product, quotient, and product properties.
- Given integer exponents, students will be able to determine the missing value that makes two expressions equivalent by applying the properties of integer exponents.

Content: Students will work individually through an asynchronous Class Kick activity to review properties of exponents. Students will have access to instructional videos if additional support is needed.

Examples: Students will have access to video examples on each of the properties if additional support is required.

Student Groupings and Media Selection: Individualized web-based asynchronous activity. Pre-recorded videos for additional support.

STUDENT PARTICIPATION

Practice Items and Activities: Students will work independently to complete the following practice problems through a Class Kick activity.

1. Write the expression using an exponent
   $2 * 2 * 2 * 2 * 2 * 2 * 2$
2. Evaluate:
   $(5^6)^3$
3. Simplify:
   $$\frac{10^{10} * 10^{-3}}{10^9 * 10^5}$$
4. Simplify:
   $(4^6 * 4^{-2})^{-3}$
5. Simplify the expression. Explain how you arrived to your answer:
   $5^4 * 5^y = 5^{13}$

Feedback: Students will be able to check their answers on the last slide of the class kick review activity.

Student groping and media selection: Individualized web-based asynchronous activity. Pre-recorded videos for additional support.