California State University Chico

## School of Education

## SSP LESSON PLAN TEMPLATE

| WHO | Who is Learning? |
|---|---|

**TEACHER:** Kamille Delgardo (CT Emily Abshier) **DATE:** 4 September 2025

**INQUIRY-BASED LESSON TITLE:** (A student-friendly non yes/no question that the lesson aims to answer)

What are the negative and zero properties of exponents?

**CONTENT AREA:** Integrated Math I

**GRADE LEVEL(S):** 9-12

**NUMBER OF ELD STUDENTS AND LEVELS:**

Numerous reclassified native Spanish speakers.
One English Learner in a Structured English Immersion Program
Levels (As of 2022):

- **Oral**: 3 out of 4
- **Written**: 2 out of 4
- **Listening**: somewhat/moderately
- **Speaking**: well developed

**NUMBER OF IEP and/or 504 STUDENTS:**

504 - 4
IEP - 4

**STUDENTS' ASSETS:**

**Bilingualism** - We have numerous "reclassified" native Spanish speakers in the class. Their knowledge of multiple languages should be helpful in learning new vocabulary and concepts in the language of math.

**Sports** - Students involved in sports should know the value of teamwork, participation, and hard work. They may also be well-versed in the quick arithmetic that is involved with scoring points.

**Music** - Students who are musicians are already learning a very mathematical language by learning to read music. They should understand fractions and be adept at picking up new symbols.

**Digital literacy** - Students know how to use their online textbook including the "Homework Help" feature. They have access to extra lessons on Google Classroom and Khan Academy.

**STUDENTS' LEARNING NEEDS:**

Students should use prior knowledge of exponents, fraction, multiplication/divison, and addition/subtraction to discover the negative and zero properties of exponents.

**LESSON LENGTH:** 50 minutes

## WHAT — What are students learning?

**CONTENT STANDARD(S) & MATHEMATICAL PRACTICE STANDARD(S):**

CA Math Content Standards
Mathematical Practice Standards

**Content**: Mathematics I A-SSE "Seeing Structure in Expressions"

1. Interpret the structure of expressions. [Linear expressions and exponential expressions with integer exponents]
    a. Interpret expressions that represent a quantity in terms of its context.
    b. Interpret parts of an expression, such as terms, factors, and coefficients.

**Practice**:

- 1. Make sense of problems and persevere in solving them.
    - Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution.
    - They analyze givens, constraints, relationships, and goals.
- 7. Look for and make use of structure:
    - Mathematically proficient students look closely to discern a pattern or structure.
    - They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects.

**CONTENT-SPECIFIC LEARNING GOAL(S):**

Students will use appropriate mathematical vocabulary and notation to describe properties of exponents and simplify them.

**ENGLISH LANGUAGE DEVELOPMENT STANDARD(S):**

CA ELD Standards

Grades 9-10 Part I: "Interacting in Meaningful Ways"

- A. Collaborative 1. Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics
- C. Productive 12. Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas

**ENGLISH LANGUAGE DEVELOPMENT GOAL(S) FOR ELD STUDENTS:**

Student will use mathematical language when listening and speaking to his group as they work through problems together. When prompted he will be able to answer whether we add, subtract, or multiply exponents and which law that is.

**IEP GOAL(S) FOR IEP STUDENTS (if applicable):**

- Our ADHD student will self-regulate by taking short breaks outside, as needed.

- With prompting students will be able to identify which exponent law(s) in their table align with the problem at hand.
- Students will raise hands to ask appropriate questions or answer questions posed to the class.

**ACADEMIC/CONTENT LANGUAGE DEMANDS AND PLANNED SUPPORTS:**

**Language Function**:

- Students will be able to explain what strategy(ies) they used to solve a problem.
- Students will be able to describe how $x^m / x^m = x^0 = 1$

**Vocabulary**:

1. Subject-specific meanings:
    a. Power
    b. Base
    c. Function
    d. Expression
    e. Negative
2. Academic vocabulary:
    a. Simplify
    b. Expand
    c. Justify
    d. Evaluate
    e. Describe
    f. Summarize
3. Subject specific words:
    a. Exponent
    b. Numerator
    c. Denominator

**Discourse**:

- Explaining solution steps
- Making and supporting a conjecture

**Syntax**:

- Long or elaborate phrasing
    - Expand as needed in order to use the Giant One to rewrite each of the expressions below without any negative exponents.
- Mathematical sentences using words or symbols
    - Explain how to interpret $x^0$ and $x^1$ and $1 / x^{-1}$

**Supports**:

- Students will use appropriate mathematical vocabulary and notation to **discover zero property** and **negative property** of exponents and **simplify** complex exponents.
- Negative, zero properties (vocabulary):
    - Work through textbook problems in groups, then define properties as a class using our table of laws.
- Discover, simplify (function):
    - Use already-known arithmetic processes to break complex problems into simpler steps.

| **WHY** | **Why does this lesson matter? (Rationale)** |
|---|---|

**RELEVANCE**:

Exponents are used regularly in higher mathematics. Negative exponents are used in real life to model very small numbers (scientific notation) as well as concepts like depreciation in finance settings.

**PRIOR KNOWLEDGE**:

Students will make use of their prior knowledge of exponent notation, basic arithmetic operations, fractions, and the multiplicative identity to discover the laws around negative and zero exponents. Teacher will move slowly and deliberately through all steps so that students can relate their prior knowledge to new concepts (i.e., no skipping steps).

## HOW — How is Learning Being Facilitated?

**CREATE HEALTHY CLASSROOM COMMUNITY:**

Students will store and silence cell phones upon entering the classroom. They will practice collaboration skills by working through problems in pairs and diverse groups. When teachers are instructing, we will make sure only one voice is heard at a time.

**ACADEMIC LITERACY (Listening, Reading, Writing, Speaking):**

- **Listening**: Students will listen to instruction, to pair partners, and to group mates
- **Reading**: Upon transitioning into groups students will read textbook passages to work on
- **Writing**: Students will write lesson notes, classwork, and homework in the appropriate sections of their class composition books
- **Speaking**: Students will speak to the class, pair partners, and their group mates

**ACCOMMODATIONS, MODIFICATIONS & UDL CONSIDERATIONS:**

- Spanish version of textbook available
- Mrs. Riley will be pushed in from SPED classroom to assist
- Students will be able to **read** about properties of exponents from their textbook. They will **write** problems, rules, and examples in their class journal. They will explore **visual representations** of these concepts. They will **listen and speak** to the class and to their groupmates.

**CO-TEACHING Strategy(s) AND/OR PARAPROFESSIONAL SUPPORT** (If applicable)**:**

Cooperating teacher and I will go back and forth team-teaching items starting at 1-73 in CPM Textbook Integrated I Section 1.3.2. We will circulate through groups individually after each main lesson.

**INFORMAL ASSESSMENT(S):**

- Knowledge checks during instruction (thumbs-up, pair/share, calling on students).
- Examination of homework
- Group performance while teachers circulate after instruction
- Exit ticket:
    - Demonstrate knowledge of the five exponent laws we've learned

**FORMAL ASSESSMENT(S):**

Group test on Monday following unit closure day on Friday.

**MATERIALS NEEDED:** (List equipment and materials necessary for the lesson.)

Teachers:

- Smartboard with CPM textbook loaded

Students:

- Chromebooks with CPM textbook online
- Math journals (composition books)
- Calculators

**LEARNING ACTIVITY SEQUENCE: (Procedure)**

0. Maintain routine by checking homework, stamping homework logs, and answering homework questions.

1. **Engaging Introduction**:

   We're going to continue building our Laws of Exponents chart in our notebook. I've already seen exponents used in real life in Ms. Bill's chemistry class, and they're also used for applications like compound interest and depreciation in finance settings (**relevance to real world**).
   Let's do a quick review of what we learned yesterday (**activate prior knowledge**):

   **1-73.** Review what you learned about exponents in Lesson 1.3.1 to rewrite each expression below as simply as possible. If you see a pattern or know of a shortcut, be sure to share it with your teammates and provide justification for the shortcut.

   a. $x^7 \cdot x^4$ b. $(x^3)^3$ c. $\frac{m^{14}}{m^2}$

   d. $(x^2y^2)^4$ e. $\frac{x^5y^{11}}{x^2y^3}$ f. $\frac{2x^{12}}{8x^2}$

   I will call on students to help answer a, b, and c as a class using the format "which law are we using for this expression?" We will do short pair/shares to work through d, e, and f step by step.

2. **Learning Activities**:

   Students should have notebooks out after homework checks.
   Yesterday students started a "Laws of Exponents" table in their notebook with headings "Law" and "Examples" with room for five rows. Since tests are open-note, re-emphasize the importance of having good notes to refer back to. We will also keep building this table on the smartboard canvas application as we go along.

**1-74.** Using the table below, summarize the patterns you found in problem 1-73. For each expression in the table below, rewrite the given expression in a simpler form and then write an expression that represents its generalization. Then, in your own words, explain why the pattern works.

| | Expression | Generalization | Why is this true? |
|---|---|---|---|
| a. | $x^{25} \cdot x^{40} = \ ?$ | $x^m \cdot x^n = ?$ | |
| b. | $\frac{x^{36}}{x^{13}} = ?$ | $\frac{x^m}{x^n} = ?$ | |
| c. | $(x^5)^{12} = ?$ | $(x^m)^n = ?$ | |

(Assist co-teacher for 1-74.) Encourage students to try expanding smaller exponents in each case to see that the rules work.

**At this point students will group their desks together into quads.** "Please move your desks together to work through our last two Laws of Exponents."

**1-75.** Rewrite each of the expressions below *twice*:

- Once using repeated multiplication and the Giant One to simplify.
- Again by using your new pattern for division with exponents (from problem 1-74).

Be ready to discuss the meaning of negative exponents with the class.

a. $\frac{x^4}{x^5}$ b. $\frac{x^2}{x^4}$ c. $\frac{x^7}{x^{10}}$

**(1-75):**

1. We will introduce the problem and have teams investigate. Informally assess their methods of problem solving:
   - Law of exponents for subtraction
   - Knowledge of fractions
   - Use of appropriate mathematical terminology (numerator/denominator, base, power, exponent)
2. After a few minutes I will regain class attention and ask for thumbs up if students got an answer.
   a. I will pick someone I overheard with a wrong answer and write out what they tell me on the board.
   b. I will then ask whether everyone got that answer.
   c. I will choose someone with the right answer and work through how they solved the expression
   d. I will then ask if someone got there a different way. If so, have them explain. If not, demonstrate it myself.
3. Finally, I will open the ongoing "Laws of Exponents" table we've been building on the smartboard. We will formalize the law of negatives with a law and an example.

**1-76.** Investigate $\frac{x^m}{x^m}$. What is its value? How can you rewrite it using a single exponent? What new conclusions about $x^0$ can you draw? Be prepared to explain your findings to the class.

Repeat procedure of 1-75 to formalize the law of zero powers in exponents.

For the remaining classwork sections instruct students to work through them as teams. Encourage them to refer back to the Laws of Exponents table we built. "Which law would we use here?"

3. **Learning Closure:**

Exponents will be used regularly in many future math contexts.
Advise that the Law of Exponents table is also listed in their textbook section 1.3.2.
Let students know that this will be on the group test on Friday and we are available at lunch every day for practice, review, and re-takes.
Administer an exit ticket for daily classwork points:

$(x^6)^7$

$x^6 x^7$

$x^{68}/x$

$x/x^{68}$

$67^0$

## REFLECTION

**ASSESSMENT RESULTS:**

**LESSON OBSERVATION FOCUS:** *What would you like your supervisor to focus on and provide feedback for during the lesson? (Related to TPEs or previous observation goals.) Debbi will be focusing on how you engage your students and how you establish a safe and positive learning environment for learning. If there is anything else you want me to notice or observe for, please add it to this box.*