

2.1 Laws of Exponents: Product Laws

Cross-References

Exponents

Student Workbook pages 8–11

Key Objectives

The student will:

- explain and apply the exponent laws for multiplying powers with whole number exponents.
- simplify and evaluate expressions involving powers.
- solve problems involving powers.

Key Terms

power, exponent, base, coefficient, product law, power of a product law, power of a power law

Prerequisite Skills

- Define powers, bases, and exponents and use them to represent repeated multiplication.
- Apply knowledge of factors and factoring.
- Evaluate equations.
- Substitute values into expressions.
- Demonstrate understanding of the concept of inequality.

Lesson Description

This lesson introduces exponent laws that students can use to simplify multiplication calculations.


A visit from a genetic engineer provides the context for the problem in the **Introduction**, which introduces an exponential number pattern. Students use paper folding to develop a pattern they can use to find out how many times a bacterium needs to divide in two to produce over 1000 bacteria. In the **Summary**, the same problem is solved using strategies developed in the **Tutorial** and **Examples**.

The **Tutorial** uses number tables to help students explore relationships among numbers and powers and to develop three exponent laws:

- The Product Law states that you can multiply two powers with the same base by adding the exponents. ($x^m \times x^n = x^{m+n}$)
- The Power of a Product Law states you can simplify the power of a product by applying the exponents to each term in the product. [$(x \times y)^m = x^m \times y^m$]
- The Power of a Power Law states that you can simplify the power of a power by multiplying the exponents. ($(x^m)^n = x^{mn}$)

In the **Examples** section, students further explore the three exponent laws and the ways in which they can be applied and combined. Over the next few lessons, students will continue to use these exponent laws and will learn about other laws that apply in division situations and in situations with negative exponents.

To demonstrate the growth of the bacteria, Andrea has the class fold sheets of paper. The class notices a relationship between the number of sections on each sheet of paper and the number of folds.



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