Properties of Integer Exponents

Name: _____

Prerequisite: Evaluate Numerical Exponential Expressions

Study the example problem showing how to write and evaluate expressions with exponents. Then solve problems 1–9.

Example

Jacob decides to save money for a new tablet. He will save $3 the first week and then triple the amount he has saved each week for 5 weeks. Write and evaluate an exponential expression to find how much money Jacob will have in his savings in Week 5.

Represent the problem with repeated multiplication and exponential expressions.

Week 1	Week 2	Week 3	Week 4	Week 5
$3 = 3^1$	$3 \cdot 3 = 3^2$	$3 \cdot 3 \cdot 3 = 3^3$	$3 \cdot 3 \cdot 3 \cdot 3 = 3^4$	$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^5$

Week 5 expression: 3^5
Evaluate the expression: $3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 243$

Jacob will have $243 in his savings in Week 5.

1 Look at the table. How many times greater is the amount in Jacob's savings in Week 3 than in Week 2?

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2 How much will Jacob have in his account in Week 3?

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3 Jacob thinks that 3^5 is $5 \cdot 5 \cdot 5$, or 125. Explain what Jacob is doing wrong.

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4 Margo's dad offers to give her 5¢ on Sunday. Then for each day of the week, he offers to give her 5 times the amount from the previous day. How much will he give her on Saturday? Write an expression to show how much Margo's dad gives her on Saturday.

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Vocabulary

base the number being used as a factor in an exponential expression.

5 is the base. → 5^3

exponent the number that shows how many times a base is used as a factor.

5^3 ← 3 is the exponent.

Solve.

5 Is 2^4 equal to $2 \cdot 4$? Explain.

6 A bacterium cell splits into 2 cells every hour. Write and evaluate an exponential expression to find how many cells there will be in 6 hours. Then use your answer to help you find the number of hours it will take for there to be 1,024 cells.

Show your work.

Solution:

7 The population of California is about 39 million. Is this greater than or less than 10^7? Explain.

8 Write each of the numbers 1, 8, 27, 64, and 125 as a base raised to the third power.

$1 = \square^3$ $\quad 8 = \square^3$ $\quad 27 = \square^3$

$64 = \square^3$ $\quad 125 = \square^3$

9 The exponential expression 2^8 has a value of 256. Write two other exponential expressions that have a value of 256. Explain how you got your answers. (Begin by writing out 2^8 as the product of 2s.)