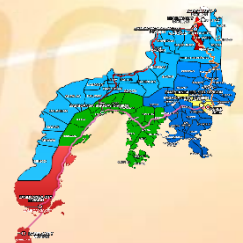




Republic of the Philippines
Department of Education
Regional Office IX, Zamboanga Peninsula



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MATHEMATICS

Quarter 2 – Module 5: Exponents and Exponential Notation



Name of Learner: _____

Grade & Section: _____

Name of School: _____

Mathematics – Grade 6
Alternative Delivery Mode
Quarter 2 – Module 5: Exponents and Exponential Notation
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What I Need to Know

This module was designed and written with you in mind. It is here to help you master the exponents and exponential notation. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

The module has two lessons, namely:

- Lesson 1 – Describing the exponent and the base in a number expressed in exponential notation.
- Lesson 2- Giving the value of numbers expressed in exponential notation.

After going through this module, you are expected to:

1. Describe the exponent and the base in a number expressed in exponential notation.
2. Give the value of numbers expressed in exponential notation

Lessons 1-2

Describing the exponent and the base in a number expressed in exponential notation.
Giving the value of numbers expressed in exponential notation



What's In

Find the quotient of the following expressions.

1. $144 \div (-6) =$

2. $124 \div (-4) =$

3. $(-420) \div (70) =$



What's New

Read the Problem:

Cindy saved ₱2.00 on Monday, ₱4.00 on Tuesday, ₱8.00 on Wednesday, ₱16.00 on Thursday, and so on. If the pattern continues, how much will she save on Sunday? How much will her total savings be in that week?

Answer the following:

1. What is asked? _____
2. What are the given facts? _____
3. What do you observe in the pattern? _____
4. What operation should you use to solve the problem?

5. What is the answer? _____



What is It

The expression $2 \times 2 \times 2 \times 2$ can also be expressed as 2^4 .

base $\rightarrow 2^4 \leftarrow$ exponent

The expression 2^4 is called an *exponential notation* or *exponential form*. The number 2 is called the *base* and the number 4 is called the *exponent*. The exponent tells how many times the base is used as a factor. Thus, in the expression 2, the exponent 4 tells that the base 2 is used as factor 4 times.

Therefore, we can say that $2^4 = 2 \times 2 \times 2 \times 2 = 16$.

The table below shows some examples of exponential expression, how to read it, and its value.

Exponential Notation	Read	Meaning and Value
4^2	four to the second power, or four squared	$4 \times 4 = 16$
2^3	two to the third power, or two cubed	$2 \times 2 \times 2 = 8$
7^4	seven to the fourth power	$7 \times 7 \times 7 \times 7 = 2401$

Let's try the following examples.

Example 1 Write $3 \times 3 \times 3 \times 3$ in exponential notation. Then, evaluate.

Solution:

The base is 3. Since 3 is used as a factor four times, the exponent is 4.
Therefore, $3 \times 3 \times 3 \times 3 = 3^4 = 81$.

Example 2 Evaluate each expression

a. $4^5 = 4 \times 4 \times 4 \times 4 \times 4$ 4 is used as a factor 5 times.
 $= 1024$

b. $9^3 = 9 \times 9 \times 9$ 9 is used as a factor 3 times.
 $= 729$

c. $(-6)^5 = (-6) \times (-6) \times (-6) \times (-6) \times (-6)$ -6 is used as a factor 5 times.
 $= -729$ -An odd power of a negative number is negative.

Exponents are also useful when writing powers of ten. Numerical expressions as 10 , 10^2 , 10^3 , and so on are called powers of 10.

Study this example.

$$100\,000 = 10 \times 10 \times 10 \times 10 \times 10$$

Observe that there are five zeros in 100 000, so 10 is used 5 times as a factor.

Thus, to write 100 000 in exponential we have,

$$100\,000 = 10 \times 10 \times 10 \times 10 \times 10 = 10^5$$

Consider the following examples.

1. $1000 = 10 \times 10 \times 10 = 10^3$

2. $10\,000 = 10 \times 10 \times 10 \times 10 = 10^4$

3. $100\,000 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^6$

When a number, except 0, is raised to the zero power, the result will always be 1

So, $-18^0 = 1$ and $14^0 = 1$.

Example 3 Evaluate each expression if $f = 2$, $g = 5$, and $h = 6$.

- | | |
|----------------|-------------------|
| 1. $g + f^2$ | 4. $gh - f^3$ |
| 2. $h^3 - g^2$ | 5. $f^3g^2 - h^3$ |
| 3. $2f^3$ | |

Solution:

1. $g + f^2 = 5 + 2^2$	Substitute the given values of variables.
$= 5 + 4$	Evaluate 2^2 ($2 \times 2 = 4$). Then, add.
$= 9$	

$$2. \quad h^3 - g^2 = 6^3 - 5^2$$

$$= 216 - 25$$

Substitute the given values of the variables.

Evaluate 6^3 and 5^2

($6 \times 6 \times 6 = 216$; $5^2 = 5 \times 5 = 25$).

Then, subtract.

$$= 191$$

$$2. \quad 2f^3 = 2(2)^3$$

$$= 2(8)$$

$$= 16$$

Substitute the given values of the variables.

Evaluate 2^3 ($2 \times 2 \times 2$). Then, multiply.

$$3. \quad gh - f^3 = (5)(6) - 2^3$$

$$= 30 - 8$$

$$= 22$$

Substitute the given values of the variables.

Evaluate 2^3 ($2 \times 2 \times 2$). Then, subtract.

$$4. \quad f^3g^2 - h^3 = (2)^3(5) - (6)^3$$

$$= (8)(25) - 216$$

$$= 200 - 216$$

$$= -16$$

Substitute the given values of the variables.

Evaluate powers (2^3 , 5^2 , and 6^3). Then, multiply.

Subtract.



What's More

Rewrite the following expressions using exponents.

$$1. 5 \times 5 \times 5 \times 5 \times 5$$

$$4. (8)(8)(8)(8)$$

$$2. 21 \times 21 \times 21$$

$$5. 2.2.2.2.2.2.2.2$$

$$3. 3 \times 3 \times 3 \times 3 \times 3$$



What I Have Learned

- Exponential Notation is a way of shorthand for exceptionally large numbers and exceedingly small numbers.
- A number in exponential notation has a base and exponent. The base is the repeated factor.
- Any nonzero number with a zero exponent is equal to 1.
- Any number raised to the exponent 1 is equal to the number itself.
- The exponents tell how many times the base is used as a factor.
- The number of zeros found after the digit 1 in a power of 10 corresponds to the exponent of 10



What I Can Do

Solve and evaluate the expressions.

1. $(-4)^3$

4. $(-5)^3$

2. 6^3

5. 2^5

3. 100^2



Assessment

Write each of the following in expanded form and find its value.

Exponential Notation	Expanded Form	Value
10^5		
$(-3)^3$		
$(-7)^4$		
4^6		
2^9		



Answer Key

What's In

1. -24
2. -31
3. -6

What's More

1. 5^5
2. 21^3
3. 625

What's New

1. Total savings in a week
2. Cindy saved ₱2.00 on Monday, ₱4.00 on Tuesday, ₱8.00 on Wednesday, ₱16.00 on Thursday, and so on.
3. The pattern shows that Cindy was able to save twice as much as she saved the previous day.
4. Multiplication
5. Cindy will save a total of ₱254.00 in a week

What I Can Do

1. -64
2. 216
3. 10 000

Assessment

Exponential Notation	Expanded Form	Value
10^5	$10 \times 10 \times 10 \times 10 \times 10$	100 000
$(-3)^3$	$(-3) \times (-3) \times (-3)$	-27
$(-7)^4$	$(-7) \times (-7) \times (-7) \times (-7)$	2 401
4^6	$4 \times 4 \times 4 \times 4 \times 4 \times 4$	4 096
2^9	$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$	512



References:

- ☺ 21st Century MATHletes, Learners' Book, Teacher's Manual