

Important Concepts . . .

Preview Review



Mathematics Grade 9
W1 - Lesson 1: Powers

Important Concepts of Grade 9 Mathematics

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Materials Required

Paper
Pencil
Calculator

No Textbook Required

This is a stand-alone course.

Mathematics Grade 9

Version 6

Preview/Review W1 - Lesson 1

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Preview/Review Concepts for Grade Nine Mathematics



W1 – Lesson 1:

Powers

OBJECTIVES

By the end of this lesson, you will be able to:

- Explain, using repeated multiplication, the difference between two given powers in which the exponent and base are interchanged; e.g., 10^3 and 3^{10} .
- Express a given power as a repeated multiplication.
- Express a given repeated multiplication as a power.

GLOSSARY

Power: Has two parts:

$$\text{Base}^{\text{exponent}} = 3^4$$

Exponent: The number of times a number is being multiplied by itself in a power.

Base: The number being multiplied in a power.

Repeated Multiplication: A longer way to express a power.

$$\text{ex. } 6^4 = 6 \times 6 \times 6 \times 6$$

W1 – Lesson 1: Perfect Squares and Square Roots

Materials required:

- Paper, Pencil, and Calculator

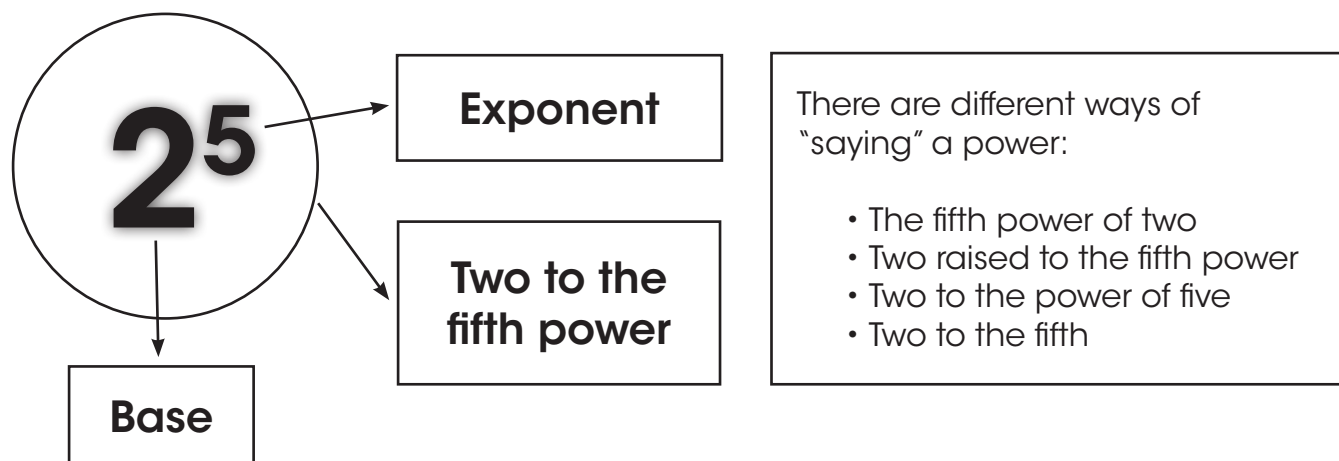
Part 1: Bases and Exponents

Powers have two parts: a base and an exponent.

Example: 2^5

The number 2 is the base. The number 5 is the exponent.

The exponent tells you how many times to multiply the base by itself.



This means $2 \times 2 \times 2 \times 2 \times 2 = 32$

Note: 2^5 does NOT mean '2 times 5'. It means 'multiply 2 by itself 5 times'.

Example 1

The base is 4 and the exponent is 3. The power would be represented like this:

$$4^3$$

This one means 'multiply 4 by *itself* 3 times. So it's $4 \times 4 \times 4 = 64$

Practice Questions

1. Identify the base in each of the following powers.

a. 5^4

b. 3^7

c. -4^3

d. $(-6)^5$

2. Identify the exponent in each of the following powers.

a. b^7

b. 9^1

c. 5^4

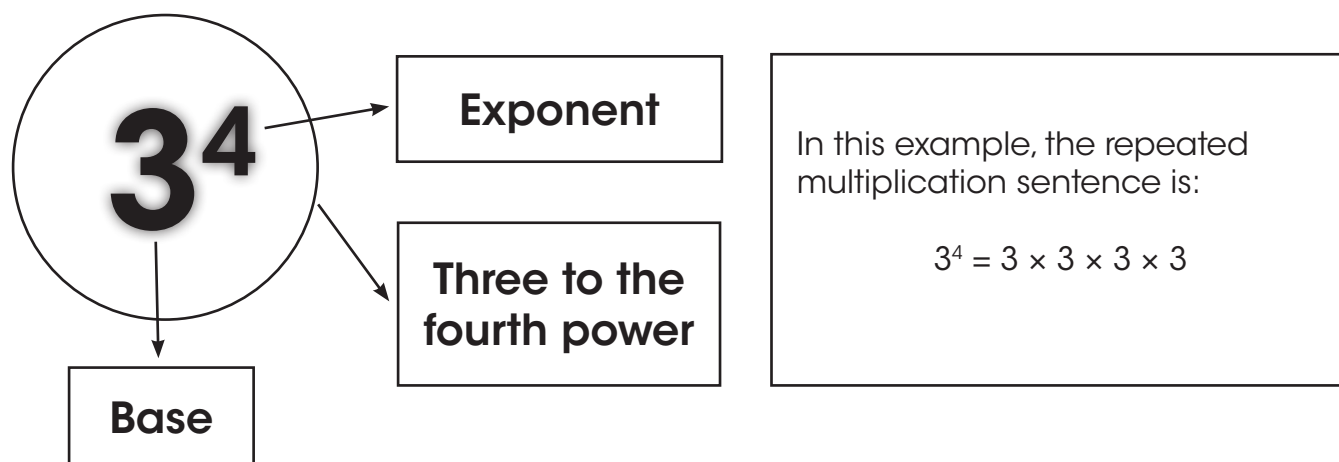
d. -6^2

3. Write the power for each of the following.

a. Two to the third _____

b. Seven to the power of four _____

Part 2: Repeated Multiplication



The base represents the number that is in the repeated multiplication sentence. The exponent represents how many times the base is being multiplied. In the example, 3^4 , think as 3 multiplied by itself 4 times.

Example 1

Power: 3^5

Repeated Multiplication: $3 \times 3 \times 3 \times 3 \times 3$

Example 2

Power: b^4

Repeated Multiplication: $b \times b \times b \times b$

Example 3

Power: $(-3)^4$

The base is (-3) and the exponent is 4.

Repeated Multiplication: $(-3) \times (-3) \times (-3) \times (-3)$

Example 4

Power: -3^4

The base is 3 and the exponent is 4.

Repeated Multiplication: $-(3 \times 3 \times 3 \times 3)$

Note: Notice that $-$ is not a part of the base in the last example.

Practice Questions

1. Express each power as repeated multiplication.

a. 6^3

b. 3^5

c. -8^4

d. $(-9)^6$

2. Express each repeated multiplication sentence as a power.

a. $d \times d \times d \times d$

b. $(-8) \times (-8) \times (-8)$

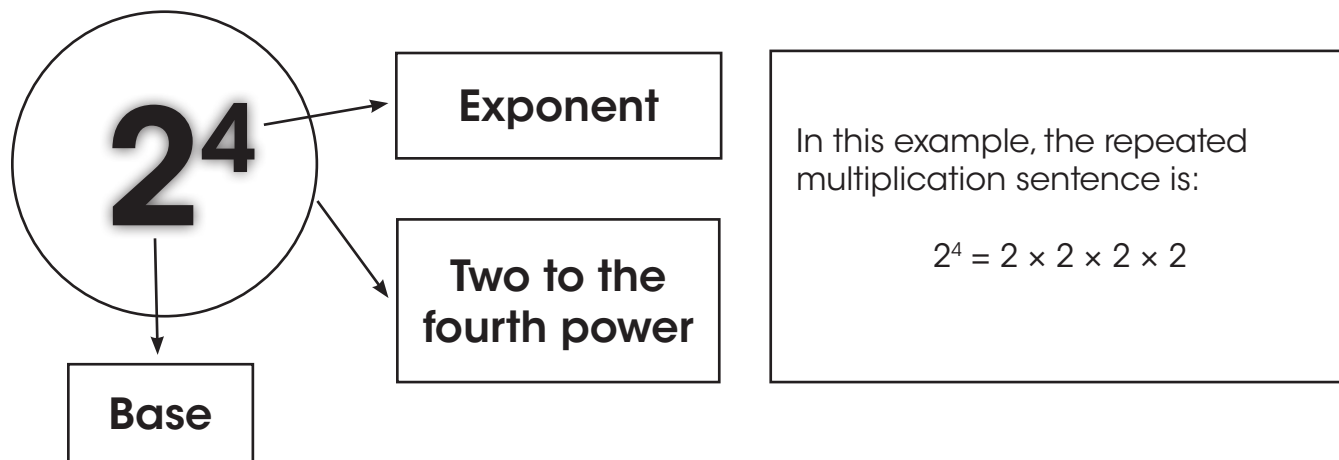
c. $-(5 \times 5 \times 5 \times 5)$

d. $(-y) \times (-y) \times (-y) \times (-y) \times (-y)$

3. Complete the chart

| Power | Base | Exponent | Repeated Multiplication |
|-------|------|----------|-------------------------|
| 7^5 | | | |
| | | | $9 \times 9 \times 9$ |
| | -8 | 4 | |

Part 3: Evaluating Powers

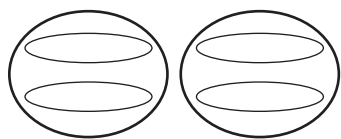


The base represents the number that is in the repeated multiplication sentence. The exponent represents how many times the base is being multiplied.

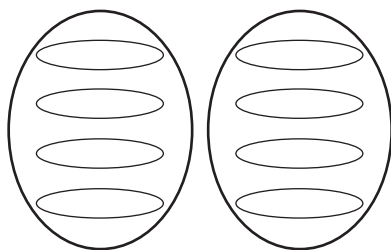
In our example:

2^4 , think as

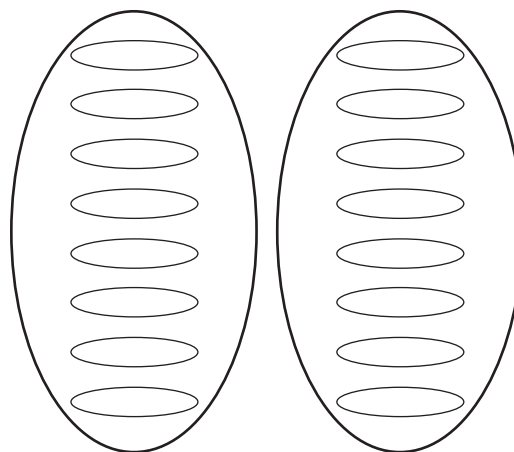
$$2 \times 2 = 4$$



$$\times 2 = 8$$



$$\times 2 = 16$$



Example 1

Evaluate 4^3 .

Think: repeated multiplication = $4 \times 4 \times 4$

$$4 \times 4 = 16 \times 4 = 64$$

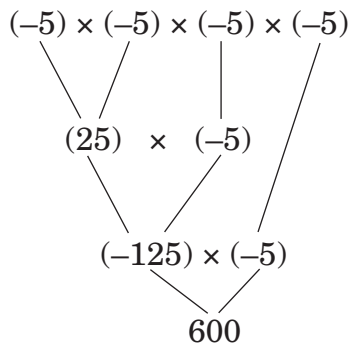
Example 2

Evaluate $(-5)^4$.

Think: repeated multiplication = $(-5) \times (-5) \times (-5) \times (-5)$

$$(-5) \times (-5) = (25) \times (-5) = (-125) \times (-5) = (600)$$

It can also be thought of like this:



Example 3

Using your calculator, evaluate 7^4 .

Solution 1:




Type in        

The screen will show an answer of 2401.

Solution 2 (using a scientific calculator):

Type in    

The screen will show an answer of 2401.

Note: On some scientific calculators, the  could also appear as 
or as . Play with your calculator to see which function is present.

Example 4

Using your calculator, evaluate 7^0 , $(-5)^0$, and 101^0 . What do you notice?

Solution:

Any base with exponent zero gives an answer of 1.

Practice Questions

1. Write each power as a repeated multiplication sentence and then evaluate.

a. 5^6

b. -3^4

c. $(-8)^5$

d. 2^0

2. Complete the chart

| Power | Base | Exponent | Repeated Multiplication | Value |
|-------|--------|----------|-----------------------------------|-------|
| 3^6 | | | | |
| | | | $5 \times 5 \times 5$ | |
| | (-4) | 3 | | |
| | | | $-(b \times b \times b \times b)$ | |
| | 3 | | | 27 |

3. Which is greater? Circle the greater power and explain your answer.

a. 5^3 or 4^4

b. -3^4 or $(-3)^4$

Lesson 1 Assignment

1. Identify the base in each of the following powers.

a. 6^9

b. -7^4

2. Identify the exponent in each of the following powers.

a. 5^3

b. $(-8)^5$

3. Express each power as repeated multiplication.

a. r^4

b. $-(6)^8$

c. $(-d)^5$

d. 6^3

4. Evaluate each power.

a. 3^6

b. -4^0

c. $(-8)^3$

d. -5^4

5. Complete each number sentence by using either $<$, $>$ or $=$.

a. 5^6 6^5

b. -2^4 $(-2)^4$

c. $(-8)^5$ $(-5)^8$

d. 2^0 $(-5)^0$

6. Look at the power and answer the following questions.

$$(-5)^3$$

a. What is the base? _____

b. What is the exponent? _____

c. Write the repeated multiplication sentence. _____

d. Evaluate the power. _____

7. Explain the following:

a. $(-3) \times (-3) \times (-3) \times (-3) \neq -3^4$

b. $-4^4 \neq 64$

