



Learning Objective: Converting to index form and expanding a power to evaluate.

Converting to index form and expanding a power to evaluate

Powers are used when representing very large or small numbers.

They are used to help write expressions where there is repeated multiplication:

Expanded form → $6 \times 6 \times 6 \times 6 \times 6 = 6^5$ ← Index form

Expression above is written in expanded form and in index form. The 6 is called the **base** and the 5 is called the index or exponent. We read an expression written in index form as 6 to the power of 5: 6^5

The plural of index is indices.

Example 1:

Write the following expression in index form:

$$4 \times 4 \times 4 \times 4 \times 4$$

The number 4 is multiplied 6 times

Therefore, $4 \times 4 \times 4 \times 4 \times 4 \times 4 = 4^6$

Example 2:

Write the following expression in index form:

$$2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 5 \times 3$$

Therefore, $2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 5 \times 3 = 2^2 \times 3^3 \times 5^3$

Evaluate the following using the laws for multiplication and division.

$$6^4 \times 6^5 =$$

$$7^3 \times 7^2 =$$

$$2^5 \times 2^3 =$$

$$4^6 \div 4^5 = 4^1 =$$

$$4^7 \div 4^5 =$$

$$7^7 \div 7^5 =$$

Simplify and solve the following questions.

$$(6^3)^2$$

$$(3^5)^2$$

$$(8^3)^3$$

$$(7^4)^2$$



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Example 2:

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Therefore, $2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 5 \times 3 = 2^2 \times 3^3 \times 5^3$

Evaluate the following using the laws for multiplication and division.

$$6^4 \times 6^5 =$$

$$6^4 \times 6^5 = 6^9$$

$$7^3 \times 7^2 =$$

$$7^3 \times 7^2 = 7^5$$

$$2^5 \times 2^3 =$$

$$2^5 \times 2^3 = 2^8$$

$$4^6 \div 4^5 = 4^1 =$$

$$4^6 \div 4^5 = 4^1 = 4$$

$$4^7 \div 4^5 =$$

$$4^7 \div 4^5 = 4^2$$

$$7^7 \div 7^5 =$$

$$7^7 \div 7^5 = 7^2$$

Simplify and solve the following questions.

$$(6^3)^2$$

$$\begin{aligned} (6^3)^2 &= 6^{(3 \times 2)} \\ &= 6^6 \\ &= 46656 \end{aligned}$$

$$(3^5)^2$$

$$\begin{aligned} (3^5)^2 &= 3^{(5 \times 2)} \\ &= 3^{10} \\ &= 59049 \end{aligned}$$

$$(8^3)^3$$

$$\begin{aligned} (8^3)^3 &= 8^{(3 \times 3)} \\ &= 8^9 \\ &= 134217728 \end{aligned}$$

$$(7^4)^2$$

$$\begin{aligned} (7^4)^2 &= 7^{(4 \times 2)} \\ &= 7^8 \\ &= 5764801 \end{aligned}$$