At the end of this lesson, you should be able to:

- ☐ Read & write index notation for positive and negative powers (including base 10)
- ☐ Find the missing base or index of an index notation

Numbers, Operations & Algebra

INDEX NOTATION

index

base

$$2^{3} = \overbrace{2\times2\times2}^{\text{3 factors}}$$

$$5^{4} = \overbrace{5\times5\times5\times5}^{\text{4 factors}}$$

$$81 = 9\times9 = 9^2$$

9^2 *is the index form of* 81 *in the* **base 9**

$$81 = 3\times3\times3\times3 = 3^4$$

3^4 *is the index form of* 81 *in the* **base 3**

RULES	EXAMPLES
Positive Index $a^n = a\times a\times \ldots \times a$	$3^5 = 3\times3\times3\times3\times3$ $41\cdot41\cdot73\cdot73\cdot73 = 41^2\cdot73^3$ $(-3)\times(-3)\times(-3)\times(-3) = (-3)^4$
Zero Index $a^0 = 1$	$3^0 = 1$
Negative Index $a^{-n} = \frac{1}{a^n}$, *given that* $a \neq 0$	$6^{-2} = \frac{1}{6^2}$
Base 10	$10^3 = 10\times10\times10 = 1000$ (1 *thousand*) $10^2 = 10\times10 = 100$ (1 *hundred*) $10^0 = 1$ $10^{-1} = \frac{1}{10^1} = \frac{1}{10}$ $10^{-4} = \frac{1}{10^4} = \frac{1}{1000}$

EXERCISE

1. Fill in the missing index:

   a. $8 \times 8 \times 8 \times 8 \times 8 = 8^{\square}$

   b. $5 \times 5 = 5^{\square}$

   c. $17 \times 17 \times 19 \times 19 = 17^{\square} \times 19^{\square}$

   d. $11 \times 11 \times 11 \times 11 \times 13 \times 13 \times 13 = 11^{\square} \times 13^{\square}$

2. Fill in the blanks below

   a. $100\ 000 = 10^{\square}$

   b. $\frac{1}{100000} = 10^{\square}$

   c. $\frac{1}{100} = 10^{\square}$

   d. $5^{-1} =$

   e. $3^{-4} =$

   f. $\frac{1}{2^3} =$