

Grade 6 - Exponents and Order of Operations - Lesson

Common Core 6.EE.A.1, 6.EE.A.2c · maths-pdf.fr/en/

An exponent tells how many times a base is used as a factor, so $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$. Follow the order of operations: parentheses, exponents, multiplication and division from left to right, then addition and subtraction from left to right. With a variable, substitute first.

Grade 6 · Common Core State Standards: **6.EE.A.1, 6.EE.A.2c**

Key facts

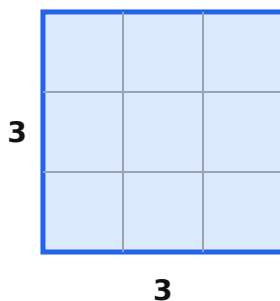
- In b^n , the base b is used as a factor n times.
- Squares and cubes: $3^2 = 9$ and $2^3 = 8$.
- Order of operations: parentheses, exponents, multiply or divide, add or subtract.
- Powers of 10 have as many zeros as the exponent.
- To evaluate an expression with a variable, substitute then follow the order of operations.

What is an exponent?

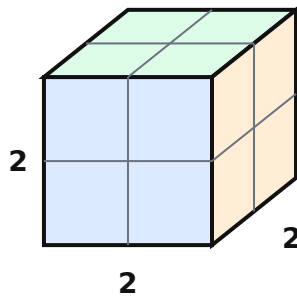
An exponent tells how many times a number, called the base, is used as a factor. In 2^5 , the base is 2 and the exponent is 5, so $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$.

Power

A **power** such as b^n means b is multiplied by itself n times. We read 3^2 as "3 squared" and 2^3 as "2 cubed."



3 squared = $3 \times 3 = 9$ square units.

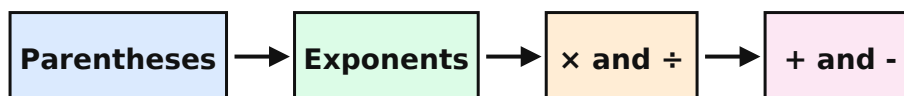


$2 \text{ cubed} = 2 \times 2 \times 2 = 8 \text{ unit cubes.}$

Powers also work with fractions and decimals: $\left(\frac{1}{2}\right)^3 = \frac{1}{8}$ and $0.5^2 = 0.25$. Powers of 10 are easy: $10^3 = 1,000$ has 3 zeros.

What is the order of operations?

When an expression has several operations, follow the order of operations so everyone gets the same answer.



Work left to right within multiplication and division, then within addition and subtraction.

1. Parentheses (and other grouping symbols).
2. Exponents.
3. Multiplication and division, from left to right.
4. Addition and subtraction, from left to right.

Example: $24 \div 4 + 3^2$. Exponent first: $3^2 = 9$. Then divide: $24 \div 4 = 6$. Add: $6 + 9 = 15$.

How do you evaluate an expression with a variable?

Replace the variable with the given number and then follow the order of operations. To evaluate $x^2 - 3$ when $x = 6$, compute $6^2 - 3 = 36 - 3 = 33$. Formulas work the same way. The volume of a cube is $V = s^3$, so a cube with edge 4 inches has $V = 4^3 = 64$ cubic inches.

x	1	2	3	4	5
2^x	2	4	8	16	32

Powers of 2 double each time.

A common mistake is to treat 2^3 as 2×3 . The exponent counts factors, not groups. Another

mistake is to work strictly left to right: $2+3\times 4$ is $2+12=14$, not $5\times 4=20$, because multiplication comes before addition.

Exponents grow quickly. Doubling a colony of bacteria every hour gives 2^n bacteria after n hours, so after 10 hours there are $2^{10}=1,024$. Use the table to see the pattern and check that your answer fits it. Use parentheses when you want a different order: $(2+3)^2=25$, but $2+3^2=11$.

Questions about exponents and order of operations

What does an exponent mean?

An exponent tells how many times the base is multiplied by itself. In 4^3 , the base 4 is used 3 times: $4 \times 4 \times 4 = 64$.

Is 2^3 the same as 2×3 ?

No. 2^3 means $2 \times 2 \times 2 = 8$, but $2 \times 3 = 6$. The exponent counts factors, not groups to add.

What is the order of operations?

Do parentheses first, then exponents, then multiplication and division from left to right, then addition and subtraction from left to right.

How do you evaluate an expression with a variable?

Replace each variable with its value and follow the order of operations. For $x^2 - 3$ when $x = 6$, compute $36 - 3 = 33$.

How do you evaluate powers of 10?

Write a 1 followed by as many zeros as the exponent. For 10^4 , there are 4 zeros, so the value is 10,000.