SAT MATH / DAILY CHALLENGE

Exponent rules

2026-11-01 ▪ Question first, full lesson next

TODAY'S QUESTION

For positive t, $t^7 \times t^{12} = t^k$. What is k?

A. 20

B. 19

C. 18

D. 21

Before you choose

Identify what the question asks for. Write the relationship you will use, show the substitutions, and check whether the answer represents a value, a coordinate or a coefficient. The complete solution and the supporting theory follow in this document.

Your reasoning

When you are ready, continue to the illustrated lesson. The worked answer to this exact challenge appears on the final page.

ADVANCED MATH / 01 UNDERSTAND

Exponent rules

An illustrated lesson ▪ Theory, reasoning and worked examples

An exponent counts repeated factors

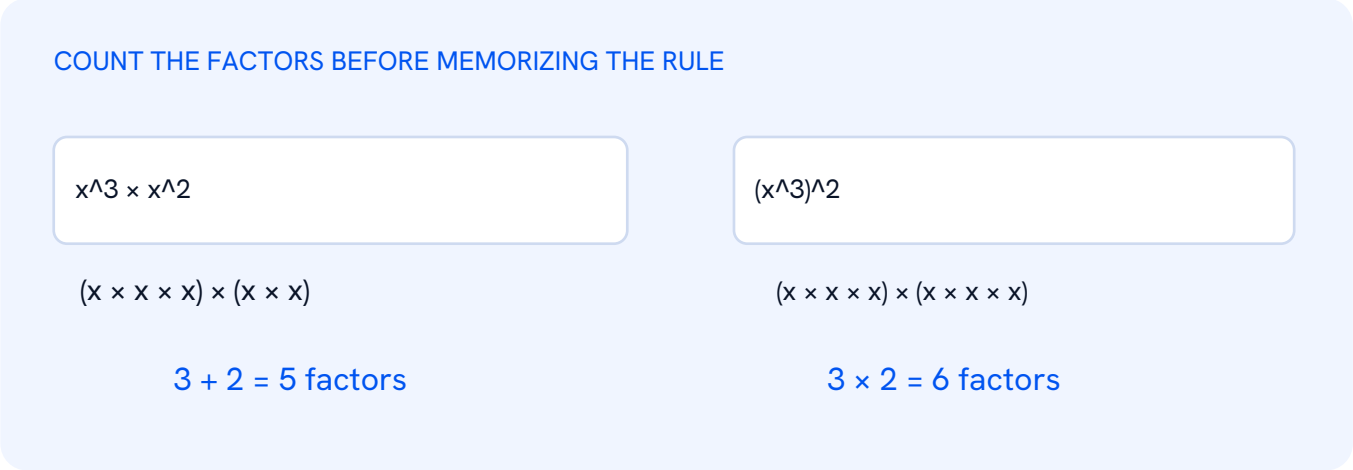
For a positive integer n, a^n means multiplying n copies of a. This definition explains the product rule: $a^m \times a^n = a^{(m+n)}$, because the two groups together contain m + n copies. The rule requires the same base; it does not allow combining 2^3 and 3^4 into a single power by adding exponents.

Division removes matching factors

For a nonzero base, $a^m / a^n = a^{(m-n)}$. Cancelling repeated factors explains why $a^0 = 1$ and $a^{(-n)} = 1/a^n$. A negative exponent indicates a reciprocal, not a negative value. The restriction on zero matters because division by zero is undefined.

Powers of powers multiply exponents

$(a^m)^n = a^{(mn)}$ because each of the n groups contains m factors. A power of a product distributes to every factor: $(ab)^n = a^n b^n$. A power does not distribute across addition: $(a + b)^2$ contains the extra term 2ab.



Illustrative teaching diagram. Values and examples are explained in the lesson.

THE ESSENTIAL IDEA

Multiplying powers with the same base adds their exponents.

ADVANCED MATH / 02 BUILD THE METHOD

From idea to method

Read parentheses before applying a rule

Compare $(-3)^2 = 9$ with $-3^2 = -9$. In the second expression, the exponent applies to 3 before the leading negative sign. Likewise, $(2x)^3 = 8x^3$, while $2x^3$ has an unchanged coefficient 2. Parentheses determine exactly what the base is.

Connect roots and rational exponents

For positive a, $a^{(1/n)}$ is the nth root of a, and $a^{(m/n)}$ can be evaluated as the nth root followed by the mth power. Thus $27^{(2/3)} = 3^2 = 9$. Restricting the base to positive values avoids sign and real-domain complications while learning the rule.

Compare powers with a common base

Rewrite 8^x as $(2^3)^x = 2^{(3x)}$. Then $8^x = 2^{12}$ becomes $2^{(3x)} = 2^{12}$, so $3x = 12$ and $x = 4$. This equal-exponent argument works for a fixed positive base other than 1, whose exponential function is one-to-one.

WORKED EXAMPLE / COMBINE THREE EXPONENT RULES

Simplify $(x^3)^2 / x^4$ for $x > 0$.

01 Set up the reasoning

Apply the power rule to the numerator: $(x^3)^2 = x^6$.

02 Apply the relationship

Divide powers with a common base: $x^6 / x^4 = x^{(6 - 4)} = x^2$.

03 Interpret and check

For $x = 2$, the original is $64/16 = 4$ and the simplified form is also 4. The check supports the algebra.

Keep these distinctions handy

Product / quotient	Same base: add / subtract the exponents.
Power of a power	Multiply the exponents: $(a^m)^n = a^{(mn)}$.
Negative power	For nonzero a: $a^{(-n)} = 1/a^n$.

ADVANCED MATH / 03 CONNECT & REMEMBER

See the deeper pattern

Keep coefficients separate

In $(3x^2)(4x^5)$, multiply coefficients to get 12 and combine variable powers to get x^7. The result is $12x^7$. In $(3x^2)^3$, the coefficient is also cubed, giving $27x^6$. Sorting numerical factors from variable powers makes multi-step simplification less error-prone.

TODAY'S CHALLENGE / SOLUTION

For positive t, $t^7 \times t^{12} = t^k$. What is k?

1. The bases match, so add exponents.

2. $k = 7 + 12 = 19$.

Answer: 19

Mistakes to recognize

- Add exponents for multiplication; multiply them for a power of a power.
- A negative exponent does not make a positive base negative.
- Do not distribute a square across a sum.

A quick understanding check

Why is x^0 equal to 1 when x is nonzero?

Explanation: Because $x^n/x^n = 1$ and the quotient rule gives $x^{(n - n)} = x^0$.

MORE PRACTICE IN YOUR DASHBOARD

Open prepvora.com/app/ and use the SAT question bank. Work on Advanced Math, then look for exponent rules questions. Solve independently before reviewing the explanation. Use this guide for the theory; use the dashboard for a longer practice session.

Open your dashboard → | Explore the resource library →

Original Prepvora explanations and examples. Scope: this topic, not the entire SAT syllabus. 2026-11-01 ▪ theory-v2