

Grade 8 · Properties of Integer Exponents · Worksheet Answer Key

Common Core 8.EE.A.1 · mathovore.fr

Each solution names the rule used, shows the exponent arithmetic and ends with the final answer in bold. If an answer differs, rewrite the expression as repeated factors to see which rule applies.

Grade 8 Common Core: 8.EE.A.1

Problem 1: Expand and evaluate

$2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$. Multiply: 4, 8, 16, 32. Answer: 32.

Problem 2: Write as a power

Four factors of 5 give 5^4 . Evaluate: $25 \cdot 25 = 625$. Answer: $5^4 = 625$.

Problem 3: Product rule

Same base, so add exponents: $4 + 2 = 6$. Then $3^6 = 729$. Answer: $3^6 = 729$.

Problem 4: Product with a large base

Add exponents: $5 + 3 = 8$. Answer: 7^8 (which equals 5,764,801).

Problem 5: Quotient rule

Subtract exponents: $9 - 6 = 3$. Then $5^3 = 125$. Answer: $5^3 = 125$.



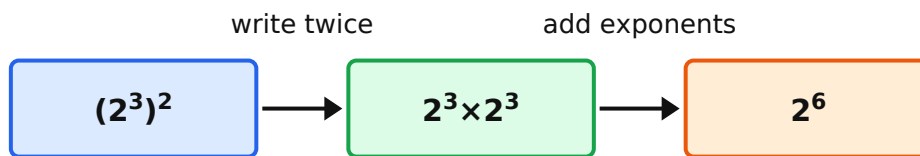
Three factors of 5 are left.

Problem 6: Powers of ten

Subtract exponents: $8 - 3 = 5$. So 10^5 is a 1 followed by five zeros. Answer: **100,000**.

Problem 7: Power of a power

Multiply exponents: $3 \cdot 2 = 6$. Then $2^6 = 64$. Answer: $2^6 = 64$.



Two copies of 2 cubed make 2 to the sixth.

Problem 8: Power of a larger base

$2 \cdot 3 = 6$, so the expression is 4^6 . Evaluate: $4^3 = 64$ and $64 \cdot 64 = 4096$. Answer: $4^6 = 4096$.

Problem 9: Zero exponent

Any nonzero base to the power 0 is 1. So $9^0 = 1$ and $(-6)^0 = 1$. For the third, $4 \cdot 3^0 = 4 \cdot 1 = 4$. Answers: 1, 1, 4.

Problem 10: Negative exponents

Continue dividing by 2: $2^0 = 1$, then $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$. So $2^{-3} = \frac{1}{8}$. Also $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$.

$\div 2$	$\div 2$	$\div 2$	$\div 2$	$\div 2$	$\div 2$	$\div 2$
2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}
8	4	2	1	1/2	1/4	1/8

The completed table.

Problem 11: Negative power of ten

$10^{-4} = \frac{1}{10^4} = \frac{1}{10,000}$. As a decimal, that is four places after the point. Answer: $\frac{1}{10,000} = 0.0001$.

Problem 12: Mixed exponents

Add exponents: $2 + (-5) = -3$. Then $3^{-3} = \frac{1}{3^3}$. Answer: $\frac{1}{27}$.

Problem 13: Negative plus positive

$-2 + 5 = 3$, so the product is 4^3 . Evaluate: 64.

Problem 14: Quotient with a negative result

$3-5=-2$, so the quotient is 6^{-2} . Then $6^{-2}=\frac{1}{36}$. Answer: $\frac{1}{36}$.

Problem 15: Negative power of a power

Multiply exponents: $-2 \cdot 2 = -4$. Then $3^{-4} = \frac{1}{81}$. Answer: $\frac{1}{81}$.

Problem 16: Power of a product

$(2 \cdot 5)^3 = 2^3 \cdot 5^3 = 8 \cdot 125 = 1000$. Also $\left(\frac{2}{3}\right)^3 = \frac{2^3}{3^3} = \frac{8}{27}$. Answers: 1000 and $\frac{8}{27}$.

Problem 17: Fraction base, negative exponent

A negative exponent flips the fraction: $\left(\frac{3}{2}\right)^{-2} = \left(\frac{2}{3}\right)^2 = \frac{4}{9}$. Answer: $\frac{4}{9}$.

Problem 18: Find the missing exponent

First: $?+4=9$, so $?=5$. Second: $8-?=3$, so $?=5$. Third: $81=3^4$, so $\frac{1}{81}=3^{-4}$. Answers: 5, 5, -4 .

Problem 19: Multi-step expression

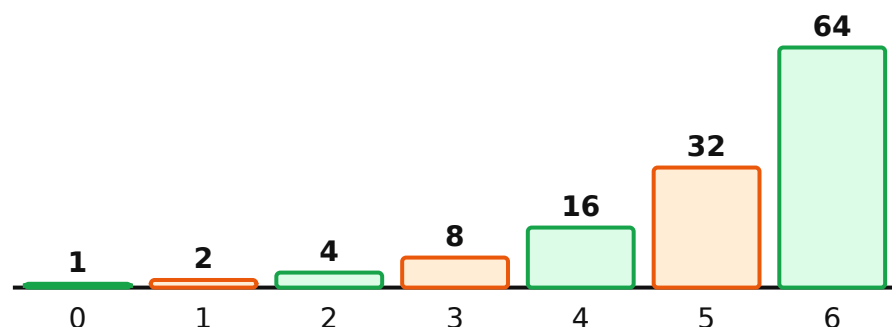
Inside the parentheses: $5+(-2)=3$, so 3^3 . Power rule: $(3^3)^2=3^6$. Divide: $6-4=2$, so 3^2 . Answer: 9.

Problem 20: Which is greater?

$2^{-4}=\frac{1}{16}$ and $3^{-2}=\frac{1}{9}$. Since $\frac{1}{9} > \frac{1}{16}$, 3^{-2} is greater. Answer: **Maya is not right.**

Problem 21: Doubling colony

(a) After 10 doublings, $2^{10}=1024$ cells. (b) At hour 0 no doubling has happened, so the count is 1, and $2^0=1$. Answer: **1,024 cells.**



Each bar doubles.

Problem 22: Gigabytes and kilobytes

Divide: $\frac{10^9}{10^3} = 10^{9-3} = 10^6$. Answer: **1,000,000 kilobytes**.

Problem 23: Find Noah's error

He multiplied the bases, but the rule adds exponents and keeps the base: $2^3 \cdot 2^4 = 2^7 = 128$. His 4^7 (16,384) is far too big. Answer: $2^7 = 128$.

Problem 24: Find Priya's error

A negative exponent means a reciprocal, not a negative number. $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$. Answer: $\frac{1}{8}$.