

Exponent Rules and Polynomials: math practice, Grade 9 – download the PDF

23 problems graded by difficulty (★ easy, ★★ medium, ★★★ hard). Try first, without looking at the solutions!

1 Product rule



Simplify each expression.

a. $x^4 \cdot x^7$

b. $6a^3 \cdot 2a^5$

c. $(-3m)(5m^4)$

d. $y \cdot y^9$

2 Quotient rule



Simplify.

a. $\frac{z^{12}}{z^5}$

b. $\frac{24b^8}{6b^2}$

c. $\frac{18x^5y^3}{9x^2y}$

3 Numerical powers



Compute without a calculator.

a. $2^3 \cdot 2^4$

b. $(3^2)^2$

c. $7^0 + 5^0$

d. $\frac{10^3}{10^1}$

4 Power of a power



Simplify.

a. $(x^3)^5$

b. $(2y^4)^3$

c. $(-a^2)^4$

d. $(xy^2)^3$

5 Negative exponents as numbers



Write each value as a fraction or a decimal.

a. 2^{-3}

b. 10^{-2}

c. $\left(\frac{1}{3}\right)^{-2}$

d. $(-2)^{-3}$

6 Scientific notation conversions



Convert.

- a. Write 3,600,000 in scientific notation.
- b. Write 0.0072 in scientific notation.
- c. Write 5.1×10^4 in standard form.
- d. Write 9×10^{-5} in standard form.

7 Name that polynomial



For each expression, give the number of terms, the name (monomial, binomial, trinomial) and the degree.

- a. $7x$
- b. $x^2 - 9$
- c. $4x^3 + x - 1$
- d. 12

8 Adding polynomials



Add: $(4x^2 - 3x + 8) + (x^2 + 9x - 2)$.

9 Subtracting polynomials



Subtract: $(7x^2 + 2x - 5) - (3x^2 - 6x + 4)$.

10 Monomial times polynomial



Expand $-2x(3x^2 - 5x + 4)$.

11 Product of two binomials



Expand and simplify.

a. $(x + 7)(x + 4)$

b. $(x - 6)(x + 2)$

c. $(x - 5)(x - 3)$

12 Special products



Use a special product formula.

a. $(x + 9)^2$

b. $(2x - 1)^2$

c. $(5x + 3)(5x - 3)$

13 Only positive exponents



Simplify and write the answer with positive exponents.

a. $x^{-4} \cdot x^9$

b. $6a^{-2}b^3$

c. $\frac{x^2}{x^8}$

d. $(3y^{-1})^2$

14 Scientific notation arithmetic



Give each result in scientific notation.

a. $(4 \times 10^6)(2 \times 10^3)$

b. $\frac{9 \times 10^7}{3 \times 10^2}$

c. $(5 \times 10^4)(6 \times 10^{-2})$

15 The community garden



A rectangular garden is $(x + 8)$ feet long and $(x + 3)$ feet wide.

a. Write its area as a polynomial in standard form.

b. Find the area, in square feet, when $x = 12$.

16 True or false?



Decide whether each statement is true or false. Justify, and correct the false ones.

a. $(x + 3)^2 = x^2 + 9$

b. $x^2 \cdot x^3 = x^6$

c. $(2x)^3 = 2x^3$

d. $5^0 = 0$

e. $(a - b)(a + b) = a^2 - b^2$

17 A cubic product



Expand and simplify $(2x - 3)(x^2 + 4x - 1)$, then check your result with $x = 2$.

18 Combined expansion

★★★

Expand and simplify $(x + 4)^2 - (x - 2)(x + 5)$.

19 Mental math with identities

★★★

Use a special product to compute without a calculator.

a. 62^2

b. 38×42

20 Simplify a quotient of powers

★★★

Simplify $\frac{(2x^3)^2 \cdot 3x^{-1}}{6x^4}$ for $x \neq 0$.

21 Light from the Sun

★★★

Light travels at about 3×10^8 meters per second (about 1.9×10^5 miles per second). The Sun is about 1.5×10^{11} meters from Earth.

- How many seconds does sunlight need to reach Earth? Use scientific notation.
- Convert to minutes and round to the nearest tenth.

22 A square with a corner removed

★★★

A square sheet of metal has side $(3x + 2)$ centimeters. A square corner of side $(x + 1)$ centimeters is cut off.

- Write the remaining area as a polynomial in standard form.
- Find the area for $x = 2$.

23

Find the missing numbers

- a. Find numbers a and b so that $(x + a)(x + b) = x^2 + 9x + 20$.
- b. Find k and m so that $(x + k)^2 = x^2 + 14x + m$.

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