

Algebraic Expressions and Properties of Real Numbers: math practice, Grade 9 – download the PDF

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

1 Parts of an expression



Consider the expression $7x^2 - 4x + 9$.

- How many terms does it have, and what are they?
- Give the coefficient of each variable term.
- What is the constant term?

2 Order of operations



Compute each expression and write every step.

- $5 + 3 \cdot 4$
- $(5 + 3) \cdot 4$
- $20 - 12 \div 4$
- $2 \cdot 3^2$

3 Evaluate a linear expression



Evaluate $4n + 7$ for each value of n .

- a. $n = 3$
- b. $n = -2$
- c. $n = 0$
- d. $n = \frac{1}{2}$

4 Name the property



Name the property that justifies each statement.

- a. $6 \cdot 9 = 9 \cdot 6$
- b. $(4 + 5) + 1 = 4 + (5 + 1)$
- c. $3(x + 2) = 3x + 6$
- d. $8 + 0 = 8$
- e. $5 \cdot \frac{1}{5} = 1$

5 Combine the like terms



Simplify each expression.

- a. $6a + 2a$
- b. $9y - 4y + y$
- c. $3x + 5 - x + 2$
- d. $4m + 3n - m + 2n$

6 Which set is smallest?



For each number, name the smallest set it belongs to: natural, whole, integer, rational, or irrational.

- a. -9
- b. $\frac{2}{5}$
- c. $\sqrt{25}$
- d. $\sqrt{10}$

7 Words to symbols



Write an expression, using n for the number.

- a. the sum of a number and 9
- b. 7 times a number
- c. a number decreased by 4
- d. the quotient of a number and 6

8 Evaluate a quadratic expression



Evaluate $2x^2 - 5x + 1$ for $x = 3$, $x = -1$, and $x = 0.5$.

9 Grouping symbols



Compute.

- a. $-6 + 4 \cdot (-3)^2 \div 9$
- b. $3 - 2[5 - (1 + 3)]$

10 Use the distributive property



Expand.

- a. $5(2x - 3)$
- b. $-3(4y + 1)$
- c. $-(7 - 2z)$
- d. $\frac{1}{2}(8a + 6)$

11 Distribute and combine



Simplify $3(x + 4) + 2(5x - 1)$, then check your answer for $x = 1$.

12 Mental math with properties



Use properties to compute these without a calculator, and name the property you use.

- a. $25 \cdot 17 \cdot 4$
- b. $8 \cdot 53$
- c. $99 \cdot 6$

13 Concert tickets



A school concert sells adult tickets for \$12 and student tickets for \$8.

- a. Write an expression for the money collected from a adult tickets and s student tickets.
- b. Evaluate it for $a = 15$ and $s = 22$.

14 True or false?

Decide whether each statement is true for all numbers. If it is false, give a counterexample.

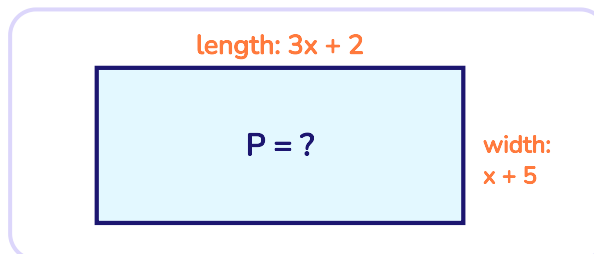
- a. $5 - x = x - 5$
- b. $4 + x = x + 4$
- c. $2(x + 3) = 2x + 3$
- d. $12 \div (3 \cdot 2) = (12 \div 3) \cdot 2$

15 A longer simplification

Simplify $4(3x - 2) - 2(5x - 7) + x$.

16 Perimeter of a rectangle

The rectangle below has length $(3x + 2)$ cm and width $(x + 5)$ cm.



- a. Write and simplify an expression for the perimeter.
- b. Find the perimeter when $x = 3$.

17 Phone plan

Plan A costs \$25 per month plus \$0.10 per text message.

- a. Write an expression for the monthly cost with t texts.
- b. What is the bill for 240 texts?
- c. One month the bill was \$60. How many texts were sent?

18 Find the error

A student simplified $3(x - 4) + 2x$ and wrote $3x - 4 + 2x = 5x - 4$. Explain the error and give the correct answer.

19 Shopping for notebooks

A notebook costs n dollars. Ava buys 4 notebooks and a \$3 pen. Ben buys 6 notebooks and uses a \$2 coupon.

- Write and simplify an expression for their combined spending.
- Evaluate it for $n = 2.50$.

20 Always, sometimes, or never?

Decide whether each statement is always, sometimes, or never true, and justify.

- The sum of two rational numbers is rational.
- The sum of two irrational numbers is irrational.
- The product of a nonzero rational number and an irrational number is irrational.
- The square root of a positive integer is irrational.

21 Evaluate a fraction expression

Evaluate $\frac{(a - b)^2}{2c} + ab$ for $a = 7$, $b = -3$, and $c = 5$.

22 Fractions with distribution

Simplify $\frac{3}{4}(8x - 12) + \frac{1}{2}(6x + 4)$.



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