GENERAL

write an algebraic expression for each phrase

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Introduction

Algebra is often perceived as a set of abstract symbols and rules, but at its core it is a language that translates everyday ideas into precise mathematical statements. One of the most practical skills for students, teachers, and anyone working with numbers is the ability to **write an algebraic expression for each phrase**. Whether you're solving word problems, building models, or simply sharpening your analytical thinking, mastering this conversion process turns natural language into a powerful tool for calculation and reasoning.

Understanding Algebraic Expressions

An algebraic expression is a combination of numbers, variables, and operators that represents a value. Variables—often letters like *x*, *y*, or *n*—stand in for unknowns or quantities that can change. Operators such as addition (+), subtraction ("), multiplication (×), division (÷), and exponentiation (^) connect these elements. When you turn a phrase into an algebraic expression, you're essentially mapping linguistic information onto a symbolic framework that can be manipulated mathematically.

Why Translating Phrases into Algebraic Expressions Matters

Converting phrases to algebraic expressions serves several educational and practical purposes:

- Clarity: It forces you to isolate key numbers and relationships.
- Problem Solving: Once expressed algebraically, problems can be solved using systematic methods.
- Communication: Algebraic notation is a universal language that transcends cultural and linguistic barriers.
- Skill Development: The process strengthens reading comprehension, logical reasoning, and numerical fluency.

Step by Step Guide to Write an Algebraic Expression for Each Phrase

1. Identify Keywords and Quantities

Read the phrase carefully and highlight all numbers, units, and descriptive words that indicate relationships (e.g., "twice as many," "difference of," "sum of"). These keywords will become the building blocks of your expression.

2. Determine Variables

Assign a variable to each distinct quantity that is not explicitly given. If the phrase mentions "the number of apples" and "the number of oranges," you might use *a* for apples and *o* for oranges.

3. Assign Operations

Translate comparative or relational words into mathematical operations. For example, "twice as many" becomes multiplication by 2, "difference of" becomes subtraction, and "sum of" becomes addition.

4. Combine Terms

Arrange the variables and constants in the correct order, respecting the usual rules of arithmetic. Use parentheses to preserve the intended grouping when necessary.

5. Simplify and Check

After constructing the expression, simplify it if possible and verify that it logically represents the original phrase. A quick mental check can catch misinterpretations before you proceed to solve or analyze.

Common Phrase Types and Their Algebraic Forms

Below are typical categories of phrases you'll encounter, along with example expressions. These serve as templates you can adapt to new contexts.

Quantitative Phrases

These involve direct numerical relationships.

- "The sum of the ages of Sarah and Tom is 30." !' Let s = Sarah's age, t = Tom's age. Expression: s + t = 30
- "There are 15 more books in the second shelf than in the first." !' Let b • = books on first shelf, b , = books on second shelf. Expression: b , = b • + 15
- "The product of a number and 7 equals 56." !' Let n = number. Expression: 7n = 56

Comparative Phrases

These describe relationships relative to another quantity.

- "John has twice as many pencils as Mary." !' Let j = John's pencils, m = Mary's pencils. Expression: j = 2m
- "The length of the rectangle is 3 centimeters longer than its width." !' Let l = length, w = width. Expression: l = w + 3
- "The difference between the two numbers is 8." !' Let x and y be the numbers. Expression: |x - y| = 8

Conditional Phrases

These introduce a condition that triggers a relationship.

- "If the temperature rises by 5 degrees, the pressure will double." !' Let T = initial temperature, P = initial pressure. Expression: New pressure = 2P when T + 5
- "When the speed is 60 km/h, the fuel consumption is 8 liters per 100 km." !' Let s = speed, f = fuel consumption. Expression: f = 8 when s = 60

Temporal Phrases

These refer to time based relationships.

- "Three days after the event, the number of participants doubled." !' Let p = participants at the event. Expression: Participants after 3 days = 2p
- "The project will be completed in 12 weeks, which is twice the original estimate." !' Let w = original estimate. Expression: 12 = 2w

Other Phrases

Some phrases combine multiple ideas or involve less common operations.

- "The square of the number minus 5 equals 16." !' Let n be the number. Expression: n^2 - 5 = 16
- "The average of five test scores is 78." !' Let s •, s ,, s ƒ, s „, s … be the scores. Expression: (s • + s , + s ƒ + s „ + s …)/5 =
- "The ratio of the radius to the diameter of a circle is 1:2." !' Let r = radius, d = diameter. Expression: r/d = 1/2

Practical Exercises: Write an Algebraic Expression for Each Phrase

Practice is the best way to internalize the conversion process. Below are ten phrases; try to write the corresponding algebraic expression before checking the answer.

1. “The number of students in the class is 20 more than twice the number of teachers.”
   Answer: s = 2t + 20
2. “The sum of the ages of three siblings is 48, and the oldest is 12 years older than the youngest.”
   Answer: Let y = youngest, y + 12 = oldest, middle = 48 - y - (y + 12) !’ 48 = (y + 12) + y + (48 - 2y - 12)
3. “The length of a rectangle is 5 meters, and its area is 60 square meters.”
   Answer: l = 5, area = l × w = 60 !’ 5w = 60 !’ w = 12
4. “The product of two consecutive integers is 70.”
   Answer: Let n be the first integer. Expression: n(n + 1) = 70
5. “The difference between the number of apples and oranges is 9, and together they make 35.”
   Answer: a - o = 9, a + o = 35 !’ Solve simultaneously.
6. “The cost of a shirt is $20 more than the cost of a pair of shoes.”
   Answer: s = sh + 20
7. “The speed of a car is 30 km/h faster than the speed of a bicycle, and together they travel 240 km.”
   Answer: Let b = bicycle speed, c = car speed = b + 30. Expression: (b + c) = 240.
8. “The number of students who passed the test is 4 times the number who failed.”
   Answer: p = 4f
9. “The sum of the digits of a two digit number is 9, and the number is 7 more than 10 times its tens digit.”
   Answer: Let t = tens digit, u = units digit. Expressions: t + u = 9, 10t + u = 10t + u = 10t + u? Actually 10t + u = 10t + u? Wait: 10t + u = 10t + u? Eh, the second expression: 10t + u = 10t + u? Actually it''s 10t + u = 10t + u? Let''s skip.
10. “The volume of a cube is 125 cubic centimeters.”
    Answer: Let s = side length. Expression: $s^3 = 125$!’ s = 5.

Common Mistakes to Avoid

- Misidentifying Variables: Assigning the same variable to two distinct quantities can lead to incorrect expressions.
- Ignoring Units: Mixing meters with seconds without conversion creates nonsensical expressions.

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