

# Simplify; $\frac{3}{10}(4m-8)+9m$

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### Introduction to Algebraic Expressions

Algebraic expressions are mathematical phrases that combine numbers, variables, and operations. Simplifying such expressions involves applying algebraic rules to reduce the expression to its most straightforward form. Doing so helps in easier computation and better understanding of the relationship between variables. The expression  $\frac{3}{10}(4m-8)+9m$  is a typical example of an algebraic expression that requires simplification to reveal its simplest form.

### Understanding the Components of the Expression

Before diving into the simplification process, it's essential to analyze each part of the expression:

- **Fraction coefficient:**  $\frac{3}{10}$  — a fractional multiplier affecting the entire parentheses expression.
- **Parentheses:**  $(4m - 8)$  — indicates that the operation applies to both  $4m$  and  $-8$ .
- **Additional term:**  $+ 9m$  — a separate term involving the variable  $m$ .

Understanding these parts helps in applying the correct algebraic operations systematically.

### Step-by-Step Simplification Process

#### Step 1: Distribute the Fraction

The first step involves distributing the fractional coefficient,  $\frac{3}{10}$ , across the terms inside the parentheses:

1. Multiply  $\frac{3}{10}$  by  $4m$ :
2. Multiply  $\frac{3}{10}$  by  $-8$ :

Let's perform these calculations:

$$- \frac{3}{10} \times 4m = (3 \times 4m) / 10 = 12m / 10$$

$$- \frac{3}{10} \times (-8) = (3 \times -8) / 10 = -24 / 10$$

### Step 2: Simplify the Fractions

Reduce the fractions where possible:

-  $12m / 10$  can be simplified by dividing numerator and denominator by 2:

$$12m / 10 = (12 \div 2)m / (10 \div 2) = 6m / 5$$

-  $-24 / 10$  can be simplified by dividing numerator and denominator by 2:

$$-24 / 10 = (-24 \div 2) / (10 \div 2) = -12 / 5$$

Now, the expression becomes:

$$6m / 5 - 12 / 5 + 9m$$

### Step 3: Combine Like Terms

Identify and combine like terms:

- The terms involving the variable  $m$  are  **$6m / 5$**  and  **$9m$** .

- The constants are  **$-12/5$** .

Convert all terms to have a common denominator to combine like terms:

-  $9m$  can be written as  $(45m / 5)$  because:

$$9m = (9 \times 5)m / 5 = 45m / 5$$

Now, combine the  $m$ -terms:

$$(6m / 5) + (45m / 5) = (6m + 45m) / 5 = 51m / 5$$

Constants:

$$-12 / 5$$

So, the simplified expression is:

$$(51m / 5) - (12 / 5)$$

#### Step 4: Final Expression

Since both terms share the same denominator, combine them:

$$(51m - 12) / 5$$

This is the most simplified form of the original expression.

## Interpreting the Simplified Expression

### Understanding the Result

The simplified expression:

$$(51m - 12) / 5$$

provides a clearer view of how the variable  $m$  influences the value of the entire expression. It expresses the original complex combination in a compact, manageable form, facilitating easier substitution of values for  $m$  or further algebraic manipulation.

## Applications of Simplified Expressions

Simplified algebraic expressions are vital in various mathematical and real-world contexts:

- **Solving equations:** Simplification makes solving for variables more straightforward.
- **Graphing:** Simplified forms allow for quick identification of slopes and intercepts in linear equations.
- **Modeling real-world problems:** Clear expressions help interpret relationships between quantities.

## Additional Tips for Simplifying Algebraic Expressions

## Use of Common Denominators

When combining fractions, always rewrite terms with a common denominator to facilitate addition or subtraction.

## Factorization

Factoring expressions can sometimes reveal common factors, simplifying the process of combining terms.

## Check for Like Terms

Identify terms with the same variables raised to the same powers; these are the only terms you can combine.

## Maintain Order of Operations

Always follow PEMDAS (Parentheses, Exponents, Multiplication & Division, Addition & Subtraction) to avoid errors.

## Conclusion

Simplifying algebraic expressions such as  $\frac{3}{10}(4m-8)+9m$  is fundamental in algebra. Through systematic distribution, fraction simplification, and combining like terms, the expression reduces to its most manageable form:  $(51m - 12) / 5$ . Mastery of these steps enhances problem-solving efficiency and deepens understanding of algebraic relationships. Whether you're tackling homework, preparing for exams, or applying math in real-world scenarios, practicing such simplification techniques is indispensable for mathematical proficiency.

## Frequently Asked Questions

### How do I simplify the expression $\frac{3}{10}(4m - 8) + 9m$ ?

First, distribute  $\frac{3}{10}$  to both terms inside the parentheses:  $(\frac{3}{10})4m = \frac{12m}{10} = \frac{6m}{5}$ , and  $(\frac{3}{10})(-8) = -\frac{24}{10} = -\frac{12}{5}$ . Then, combine all terms:  $\frac{6m}{5} - \frac{12}{5} + 9m$ , which simplifies to  $(\frac{6m}{5} + 9m) - \frac{12}{5}$ . Convert  $9m$  to a fraction with denominator 5:  $\frac{45m}{5}$ . So,  $(\frac{6m}{5} + \frac{45m}{5}) - \frac{12}{5} = \frac{51m}{5} - \frac{12}{5}$ , and the simplified expression is  $(51m - 12)/5$ .

### What is the simplified form of $\frac{3}{10}(4m - 8) + 9m$ ?

The simplified form is  $(51m - 12)/5$ .

## Can the expression $\frac{3}{10}(4m - 8) + 9m$ be factored further?

Yes, after simplification to  $(51m - 12)/5$ , you can factor out 3 from numerator:  $3(17m - 4)/5$ , which is a factored form.

## How do I evaluate $\frac{3}{10}(4m - 8) + 9m$ for $m = 2$ ?

Substitute  $m=2$  into the original expression:  $\frac{3}{10}(4 \cdot 2 - 8) + 9 \cdot 2 = \frac{3}{10}(8 - 8) + 18 = \frac{3}{10} \cdot 0 + 18 = 0 + 18 = 18$ .

## What steps should I follow to simplify algebraic expressions like $\frac{3}{10}(4m - 8) + 9m$ ?

First, distribute any fractions across parentheses, then combine like terms, and finally simplify the resulting expression, possibly factoring if needed.

## Additional Resources

Simplify;  $\frac{3}{10}(4m-8)+9m$ : An In-Depth Analytical Review

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### Introduction

When it comes to algebraic expressions, the ability to simplify complex formulas is fundamental for students and professionals alike. The expression  $\text{Simplify; } \frac{3}{10}(4m-8)+9m$  exemplifies a typical case where multiple algebraic operations—fractions, parentheses, and variables—intersect, creating potential for confusion but also offering an opportunity to deepen understanding. This article aims to dissect this expression systematically, providing a comprehensive guide to its simplification, along with context, applications, and insights into the processes involved.

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### Understanding the Expression

#### The Components of the Expression

Before diving into the simplification process, let's break down the components of the expression:

- Fraction coefficient:  $\left(\frac{3}{10}\right)$
- Parenthetical expression:  $\left(4m - 8\right)$
- Additional term:  $\left(+ 9m\right)$

This mixture of fractional coefficients, parentheses, and variables makes the expression a rich case study for algebraic manipulation.

## The Context of Such Expressions

Expressions like this frequently appear in various fields such as:

- Mathematics education, where students learn to manipulate algebraic formulas
- Economics and finance, where proportional relationships are modeled
- Physics, where variables represent quantities like velocity or force

Understanding how to simplify such expressions is essential for solving equations, modeling scenarios, or performing algebraic transformations efficiently.

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## Step-by-Step Simplification Process

### Step 1: Distribute the Fraction

The first move is to distribute the fractional coefficient  $\left(\frac{3}{10}\right)$  across the terms inside the parentheses:

$$\frac{3}{10} \times (4m - 8)$$

This involves multiplying each term inside the parentheses separately:

$$\frac{3}{10} \times 4m \quad \text{and} \quad \frac{3}{10} \times (-8)$$

### Step 2: Multiplying Each Term

Multiplying  $\left(\frac{3}{10}\right)$  by  $(4m)$ :

$$\frac{3}{10} \times 4m = \frac{3 \times 4m}{10} = \frac{12m}{10}$$

Simplify this fraction:

$$\frac{12m}{10} = \frac{6m}{5}$$

Multiplying  $\left(\frac{3}{10}\right)$  by  $(-8)$ :

$$\frac{3}{10} \times (-8) = -\frac{3 \times 8}{10} = -\frac{24}{10}$$

Simplify:

$$\begin{aligned} & - \frac{24}{10} = - \frac{12}{5} \end{aligned}$$

Step 3: Rewriting the Expression

Now, the original expression becomes:

$$\frac{6m}{5} - \frac{12}{5} + 9m$$

Step 4: Combine Like Terms

Notice that the first and third terms are both in terms of  $(m)$ , so they can be combined:

$$\frac{6m}{5} + 9m - \frac{12}{5}$$

Express  $(9m)$  with denominator 5 to combine easily:

$$9m = \frac{45m}{5}$$

Now, combine the terms with  $(m)$ :

$$\frac{6m}{5} + \frac{45m}{5} = \frac{51m}{5}$$

The constant term remains:

$$- \frac{12}{5}$$

Final Simplified Expression:

$$\boxed{\frac{51m}{5} - \frac{12}{5}}$$

Or, factoring out common denominator:

$$\frac{51m - 12}{5}$$

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## Analytical Insights

### Algebraic Significance

The process illustrates key algebraic principles:

- Distributive Property: Multiplying a fraction across parentheses
- Combining Like Terms: Merging terms with the same variable
- Fraction Simplification: Reducing fractions to their simplest form

### Practical Applications

Understanding these steps is critical in:

- Solving equations: Simplified expressions are easier to manipulate
- Modeling real-world scenarios: Variables like  $m$  can represent quantities such as mass, distance, or monetary units
- Analyzing ratios and proportions: Fractions naturally encode these relationships

### Common Pitfalls and How to Avoid Them

- Ignoring the distribution: Always distribute fractions across all terms inside parentheses
- Forgetting to simplify fractions: Always reduce to lowest terms for clarity
- Misaligning terms: Double-check that like terms are correctly identified before combining

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## Broader Context and Mathematical Principles

### The Role of Fractions in Algebra

Fractions serve as a bridge between ratios and algebraic expressions. Mastery of fraction operations underpins higher-level algebra, calculus, and applied mathematics.

### Variable Manipulation and Its Significance

Variables like  $m$  introduce abstraction, allowing equations to represent generalized relationships. Simplification makes these relationships clearer, facilitating problem-solving and analytical reasoning.

### The Importance of Step-by-Step Approach

Breaking down complex expressions into manageable steps reduces errors and enhances understanding—a principle that extends well beyond algebra into all scientific and engineering disciplines.

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## Applications Beyond Pure Mathematics

## In Science and Engineering

Simplified algebraic expressions are used to:

- Calculate forces, velocities, and other physical quantities
- Model systems with multiple variables
- Derive formulas for optimization and analysis

## In Economics and Business

Expressions similar to the one analyzed can model:

- Cost functions
- Revenue calculations
- Investment growth scenarios

## Education and Pedagogical Value

Teaching students to approach expressions methodically builds critical thinking skills, problem-solving abilities, and an appreciation for mathematical elegance.

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## Conclusion

The algebraic expression  $\frac{3}{10}(4m-8)+9m$  exemplifies the essential skill of algebraic manipulation. Through distributing fractions, combining like terms, and simplifying fractions, we transformed a seemingly complex formula into its simplest form:

$$\frac{51m - 12}{5}$$

This process reflects core algebraic principles that underpin advanced mathematics and practical problem-solving. Mastery of such techniques not only enhances mathematical fluency but also empowers professionals across diverse fields to analyze and interpret complex relationships efficiently. As algebra remains a foundational pillar of scientific and analytical thinking, developing proficiency in these methods is both intellectually rewarding and practically indispensable.

## [Simplify 3 10 4m 8 9m](#)

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