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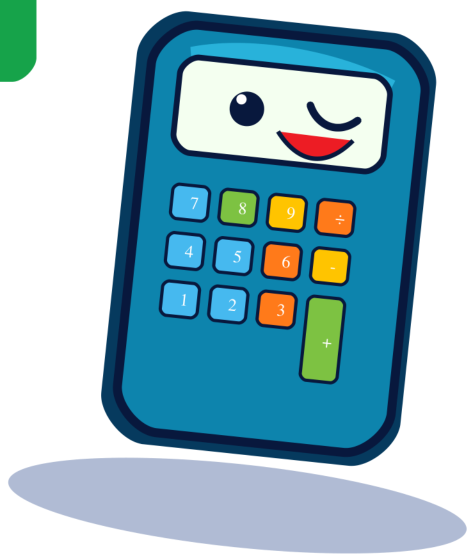

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Contents

1.1.2 Simplifying Algebraic Expressions

The process of simplifying algebraic expressions involves combining like terms and using the distributive property where necessary.

Definition 1.3 **Like terms** are terms whose variables (and their exponents) are the same. Only the coefficients of these terms can differ.

For instance, in the expression $3x+4x^2+5x$, the terms $3x$ and $5x$ are like terms.

■ **Example 1.2** Simplify the expression $5x+3+4x-2$.
Solution: Combine the like terms:

$$(5x+4x)+(3-2)=9x+1$$

The simplified expression is $9x+1$.

Another important tool in simplifying expressions is the distributive property.

Definition 1.4 The **distributive property** states that $a(b+c)=ab+ac$.

■ **Example 1.3** Simplify the expression $2(x+3)+4(x-1)$.
Solution: Apply the distributive property:

$$2(x+3)=2x+6$$

$$4(x-1)=4x-4$$

Combine all the terms:

$$2x+6+4x-4=(2x+4x)+(6-4)=6x+2$$

The simplified expression is $6x+2$.

1.1.3 Types of Algebraic Expressions

Algebraic expressions can be classified based on the number of terms they contain:

- **Monomial:** An expression with a single term, for example, $7x$.
- **Binomial:** An expression with two terms, for example, $3x+2$.
- **Trinomial:** An expression with three terms, for example, x^2+3x+4.
- **Polynomial:** An expression with more than one term, which may include monomials, binomials, and trinomials.

Exercise 1.6

1. Calculate the product and simplify:

$$(x+5)(x-5)$$

Explain why this produces a difference of squares.

2. Simplify the division of the following expressions:

$$\frac{x^3+3x^2-x+2}{x-1}$$

Using synthetic division.

3. Understand and apply the distributive property by expanding:

$$(2x+3)(x^2-x+6)$$

4. Writing an algebraic expression: A number is tripled and then decreased by 7. Translate this into an algebraic expression.

Answers with Explanations

Solution:

1. For the expression $3x^2-2x+4+(2x^2+x-5)$, combine like terms:

$$(3x^2+2x^2)+(-2x+x)+(4-5)$$
$$=5x^2-x-1.$$

2. For $(4x-3)+(2x^2+x)$:

$$2x^2+4x+x-3=2x^2+5x-3.$$

3. For multistep operation:
   a. Addition:

$$(5a^2+3a-1)+(3a^2-a+4)$$
$$=(5a^2+3a^2)+(3a-a)+(-1+4)$$
$$=8a^2+2a+3.$$

   b. Subtraction:

$$(2a^2+3)-(a^2-4a+5)$$
$$=2a^2-a^2+4a+3-5$$
$$=a^2+4a-2.$$

   c. Combining (i) and (ii):

$$8a^2+2a+3+a^2+4a-2 \qquad =9a^2+6a+1.$$

■ **Example 2.1** Solve the equation $5x-7=3$.

Solution:

To solve $5x-7=3$, we begin by isolating x on one side of the equation.

$$\begin{aligned}5x-7&=3\\5x&=3+7\\5x&=10\\x&=\frac{10}{5}\\x&=2\end{aligned}$$

Thus, the solution is $x=2$.

2.1.3 Solving Linear Equations

To solve linear equations, one can use various algebraic techniques to simplify the equation and isolate the variable. Key steps involve:

1. **Simplifying Both Sides**: Use operations such as addition, subtraction, multiplication, or division to simplify each side.
2. **Isolating the Variable**: Rearrange the equation such that the variable appears on one side.
3. **Elimination of Fractions**: Multiply all terms by the least common denominator if the equation involves fractions.
4. **Verification**: Substitute the solution back into the original equation to verify correctness.

■ **Example 2.2** Solve the equation $\frac{2x}{3}+4=10$.

Solution:

First, clear the fraction by multiplying every term by 3.

$$\begin{aligned}3\left(\frac{2x}{3}+4\right)&=3\times 10\\2x+12&=30\end{aligned}$$

Next, isolate x.

$$\begin{aligned}2x&=30-12\\2x&=18\\x&=\frac{18}{2}\\x&=9\end{aligned}$$