GENERAL

# algebra grade 8 test polynomials

Published: September 19, 2026 | Index ID: #-

## Introduction

When students reach the eighth grade, algebra becomes a pivotal part of their academic journey. Among the many concepts they encounter, polynomials stand out as a cornerstone that links algebraic reasoning with real world applications. Whether it's modeling the growth of a savings account, predicting the trajectory of a projectile, or simply solving a textbook problem, a solid grasp of polynomials is essential. This article serves as a comprehensive guide for students, parents, and teachers preparing for the **algebra grade 8 test polynomials**. We'll break down key ideas, explore common test questions, provide practice exercises, and share study strategies that help learners master polynomial concepts with confidence.

## What Are Polynomials? A Quick Overview

In algebra, a polynomial is an expression that combines constants, variables, and exponents using only addition, subtraction, multiplication, and non negative integer exponents. A typical polynomial looks like this:

- 5x3 - 4x2 + 7x - 9

Key terms:

1. Term – Each individual component separated by a plus or minus sign.
2. Coefficient – The numerical factor attached to a variable term (e.g., 5 in 5x3).
3. Variable – The symbol that represents an unknown value (commonly x).
4. Exponent – The power to which the variable is raised.
5. Degree – The highest exponent in the polynomial.

Understanding these fundamentals is the first step toward tackling more advanced polynomial problems on the grade 8 test.

## Types of Polynomials Students Encounter in Grade 8

### Linear Polynomials

A linear polynomial has a degree of one, meaning its highest exponent is 1. Example: **3x + 5**. On the test, students often need to identify linear expressions or solve simple equations like **2x + 7 = 15**.

### Quadratic Polynomials

Quadratic polynomials have a degree of two. The general form is **ax<sup>2</sup> + bx + c**. Common test tasks involve factoring quadratics, completing the square, or applying the quadratic formula. Example: **x<sup>2</sup> - 5x + 6**.

### Cubic Polynomials

Cubic polynomials reach a degree of three. They're less common in grade 8 but may appear in advanced sections or application problems. Example: **2x<sup>3</sup> - 3x<sup>2</sup> + x - 4**.

### Higher Degree Polynomials

These polynomials have degrees greater than three. While they're rarely the focus of grade 8 tests, understanding them prepares students for future coursework.

## Identifying Polynomial Expressions on the Test

Teachers often include questions that ask students to confirm whether a given expression is a polynomial. Criteria to check:

1. All exponents are whole numbers (non  negative integers).
2. Only addition, subtraction, and multiplication are used; division by a variable is not allowed.
3. Coefficients and constants are real numbers.

Example: **(x + 2)(x - 3)** expands to **x<sup>2</sup> - x - 6**, which is a polynomial. In contrast, **1/x + 4**is not a polynomial because of the division by x.

## Simplifying Polynomials: The Art of Combining Like Terms

Combining like terms is a fundamental skill tested in grade 8 algebra. Like terms share the same variable and exponent. Here's how to simplify:

1. Identify terms with the same variable and exponent.
2. Add or subtract their coefficients.
3. Rewrite the simplified expression.

Example:

- Given 4x2 - 3x + 2x2 + 5x - 7, combine like terms:

**(4x<sup>2</sup> + 2x<sup>2</sup>) + (-3x + 5x) - 7 = 6x<sup>2</sup> + 2x - 7**

## Operations on Polynomials

### Addition and Subtraction

Follow the same approach as simplifying: combine like terms after aligning expressions. Example:

**(3x<sup>2</sup> + 4x + 5) + (2x<sup>2</sup> - x + 1) = 5x<sup>2</sup> + 3x + 6**

### Multiplication

Use the distributive property or FOIL (First, Outer, Inner, Last) for binomials. Example:

**(x + 3)(x - 2) = x<sup>2</sup> - 2x + 3x - 6 = x<sup>2</sup> + x - 6**

### Division

Polynomial division can be performed via long division or synthetic division, especially when dividing by a linear factor. Example:

Divide **2x<sup>3</sup> + 3x<sup>2</sup> - x - 5** by **(x - 1)** using synthetic division.

Students will often encounter division problems on the test that require factoring the dividend first.

## Factoring Polynomials: A Skill Set for the Test

Factoring transforms a polynomial into a product of simpler expressions. Mastery of factoring is essential for solving

equations and simplifying expressions.

### Common Factoring Techniques

1. Greatest Common Factor (GCF) – Identify the largest common factor among all terms.
2. Factoring by Grouping – Group terms in pairs and factor each group.
3. Quadratic Trinomials – Use the “ac” method for expressions like ax2 + bx + c.
4. Difference of Squares – Recognize patterns such as a2 - b2 = (a + b)(a - b).
5. Perfect Square Trinomials – Identify and factor expressions like (x + 3)2 = x2 + 6x + 9.

Example: Factor **x<sup>2</sup> + 5x + 6**:

- Find two numbers that multiply to 6 and add to 5 !’ 2 and 3.
- Rewrite as (x + 2)(x + 3).

## Solving Polynomial Equations on the Grade 8 Test

Equations set a polynomial equal to zero or another expression. The goal is to find the values of the variable that satisfy the equation.

### Linear Equations

Example: Solve **4x - 12 = 0**. **x = 3**.

### Quadratic Equations

Methods to solve:

1. Factoring – Set each factor equal to zero.
2. Quadratic Formula – x = [-b ± " (b2 - 4ac)] / 2a.
3. Completing the Square – Transform the equation into a perfect square.

Example: Solve **x<sup>2</sup> - 4x - 5 = 0** using factoring: **(x - 5)(x + 1) = 0** !**x = 5** or **x = -1**.

### Cubic Equations

These are less common but may appear in application problems. Techniques include factoring by grouping, synthetic division, or using the Rational Root Theorem to test possible roots.

## Sample Test Questions and Step by Step Solutions

### Question 1: Identify the Polynomial

Is the following expression a polynomial? **(3x<sup>2</sup> + 2x)/x**

**Answer:**No, because dividing by x introduces a variable in the denominator, which violates the polynomial definition.

### Question 2: Simplify

Simplify **5x<sup>2</sup> - 3x + 7x<sup>2</sup> + 4x - 9**.

**Solution:**

- Combine like terms: (5x2 + 7x2) + (-3x + 4x) - 9 = 12x2 + x - 9.

### Question 3: Factor

Factor **2x<sup>2</sup> + 5x + 2**.

**Solution:**

- Find numbers that multiply to (2)(2) = 4 and add to 5 !’ 4 and 1.
- Rewrite: 2x2 + 4x + x + 2.
- Group: (2x2 + 4x) + (x + 2) = 2x(x + 2) + 1(x + 2).
- Factor out (x + 2): (2x + 1)(x + 2).

### Question 4: Solve the Equation

Find all real solutions to **3x<sup>2</sup> - 12x + 9 = 0**.

**Solution:**

- Divide by 3: x2 - 4x + 3 = 0.
- Factor: (x - 3)(x - 1) = 0.
- Solutions: x = 3 or x = 1.

### Question 5: Application Problem

A rectangular garden has a length that is 3 meters longer than twice its width. If the area of the garden is 70 square meters, find the width.

**Solution:**

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