CHAPTER TEST: POLYNOMIALS
Mathematics | Class IX (2026/POLYN/09/002)

Time: 1.5 Hours **Max. Marks: 40**

GENERAL INSTRUCTIONS

– All questions are compulsory.

– The question paper consists of **five sections: A, B, C, D, and E**.

– Section A contains **8 Multiple Choice Questions (MCQs)** of **1 mark each**.

– Section B contains **4 Very Short Answer questions** of **2 marks each**.

– Section C contains **3 Short Answer questions** of **3 marks each**.

– Section D contains **2 Long Answer questions** of **5 marks each**.

– Section E contains **1 Case Study–based question** of **5 marks**.

– Use of calculators or any electronic devices is **not permitted**, unless stated otherwise.

– All necessary working steps must be clearly shown for full marks.

– The use of appropriate units and correct mathematical symbols is compulsory.

Section A (Multiple Choice Questions)

1. The degree of the polynomial $p(x) = (x+1)(x^2 - x - x^4 + 1)$ is:

   (a) 2
   (b) 3
   (c) 4
   (d) 5

2. If $p(x) = x^2 - 2\sqrt{2}x + 1$, then $p(2\sqrt{2})$ is equal to:

   (a) 0
   (b) 1
   (c) $4\sqrt{2}$
   (d) $8\sqrt{2} + 1$

3. A polynomial of the form $ax^3 + bx^2 + cx + d$ is called a:

   (a) Linear polynomial
   (b) Quadratic polynomial
   (c) Cubic polynomial
   (d) Biquadratic polynomial

4. The zero of the polynomial $f(x) = \frac{2}{3}x + \frac{1}{2}$ is:

   (a) $-3/4$
   (b) $3/4$
   (c) $-4/3$
   (d) $-1/2$

5. If $(x + 1)$ is a factor of $x^2 - k$, then the value of k is:

   (a) -1
   (b) 1
   (c) 0
   (d) 2

6. The graph of a linear polynomial $y = 3x - 6$ cuts the y-axis at:

   (a) $(2, 0)$
   (b) $(0, 2)$
   (c) $(0, -6)$
   (d) $(-6, 0)$

7. Which of the following is the expansion of $(x - y)(x + y)(x^2 + y^2)$?

   (a) $x^4 + y^4$
   (b) $x^4 - y^4$
   (c) $(x^2 - y^2)^2$
   (d) $(x - y)^4$

8. The coefficient of x in the expansion of $(x + 3)^2$ is:

   (a) 3
   (b) 9
   (c) 6
   (d) 1

Section B (Very Short Answer Questions)

1. Determine the degree of the following polynomials: (i) $\frac{x^3+2x+1}{x}$ (ii) $5x^4 - \pi x^2 + 10$ (2)
2. Evaluate the product (103×107) using the identity $(x + a)(x + b)$. (2)
3. Find the value of $p(1)$ and $p(-2)$ for the polynomial $p(t) = 2 + t + 2t^2 - t^3$. (2)
4. If $x^2 - 1$ is divisible by $ax + b$, find the relationship between a and b for the zero of the linear polynomial. (2)

Section C (Short Answer Questions)

1. Verify that $x = 3$ and $x = 0$ are zeroes of the polynomial $p(x) = x^2 - 3x$. Illustrate the relationship between the zeroes and the graph of this polynomial. (3)
2. If $x - \frac{1}{x} = 4$, find the value of $x^2 + \frac{1}{x^2}$ using algebraic identities. (3)
3. Factorise using appropriate identities: (i) $4y^2 - 4y + 1$ (ii) $9x^2 - \frac{y^2}{100}$ (3)

Section D (Long Answer Questions)

1. (i) Find the zeroes of the polynomial $p(x) = (x - 2)^2 - (x + 2)^2$. (ii) Is the resulting polynomial linear or quadratic? Justify by expanding the expression. (iii) Plot the graph of the resulting polynomial $p(x)$ and find its intersection with the axes. (5)
2. (i) Expand $(3a - 5b)^2$ and $(2x + 1)(2x - 1)$. (ii) If the area of a rectangle is given by the polynomial $x^2 + 7x + 10$, find the expressions for its possible length and breadth using the identity $(x + a)(x + b)$. (iii) Find the perimeter of the rectangle if $x = 5$ units. (5)

Section E (Case Study Based Question)

A group of engineers is designing a new high-thrill roller coaster. The vertical profile of a specific section of the track is modeled using polynomial functions to ensure a smooth ride. The height of the track $H(d)$ relative to the ground depends on the horizontal distance d from the start of the section. A linear segment of the track, used for a steady climb, is represented by $L(d) = md + c$, while the curved drops and peaks are represented by quadratic or cubic polynomials. The points where the track would theoretically touch the ground are the "zeroes" of the track's height polynomial. The lead engineer notes that the degree of the polynomial determines how many times the track can change direction (peaks and valleys). For safety, they must calculate the exact height at various intervals and ensure that the transitions between linear and curved sections are mathematically continuous.

Based on the above information, answer the following questions:

1. If a segment of the track is given by $H(d) = d^2 - 4d + 4$, what is its height at $d = 2$ meters?
   (a) 4 meters
   (b) 2 meters
   (c) 0 meters
   (d) 8 meters
2. For the linear segment $L(d) = 2d + 5$, what is the "coefficient" of the variable d?
   (a) 2
   (b) 5
   (c) d
   (d) 0

3. If the track profile is $H(d) = (d-3)(d-5)$, at which horizontal distances does the track touch the ground level?

   (a) $d = 0$ and $d = 3$

   (b) $d = 3$ and $d = 5$

   (c) $d = -3$ and $d = -5$

   (d) $d = 8$ and $d = 15$

4. A track section modeled by a cubic polynomial can have a maximum of how many peaks/valleys (points of direction change)?

   (a) 1

   (b) 2

   (c) 3

   (d) 4

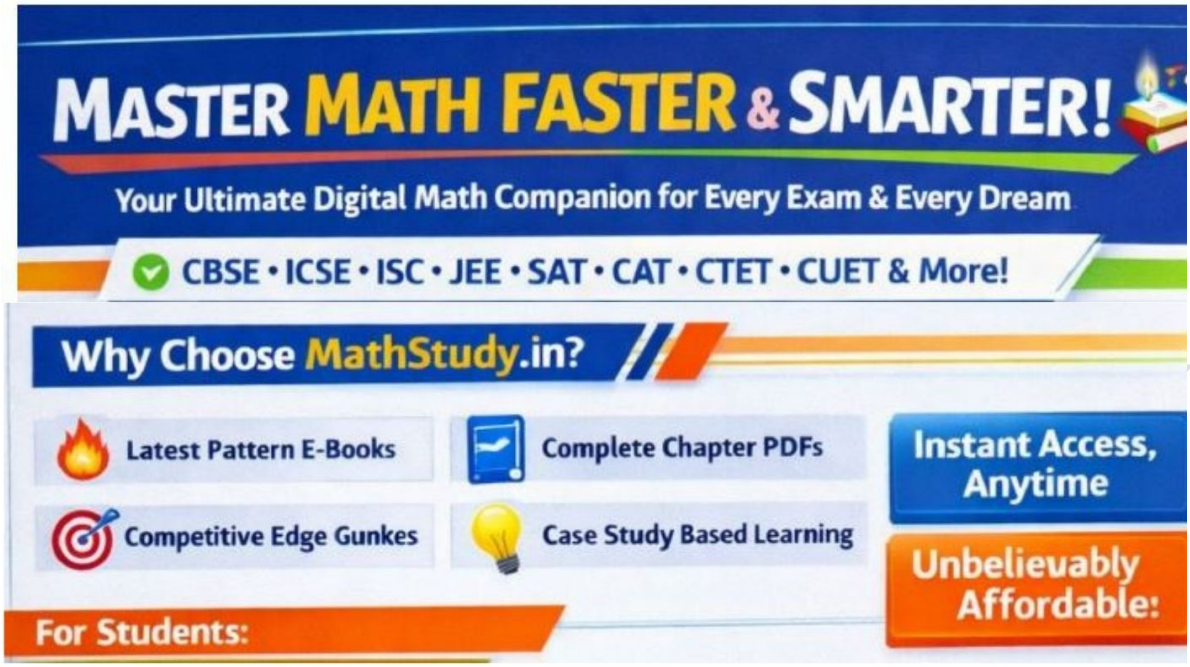
5. Which algebraic identity would be most useful to simplify the expression $(d+5)^2 - (d-5)^2$ for track height difference calculations?

   (a) $(a+b)(a-b)$

   (b) $(x+a)(x+b)$

   (c) $a^2 + 2ab + b^2$

   (d) Both (a) and (c) can be applied



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