Class 10 Maths Chapter 2: Polynomials - Notes, Important Questions and MCQs (2026-27)

Free PDF notes from Nextoper.in | Session 2026-27 | Read online:
https://nextoper.in/class-10-maths-chapter-2-pdf-notes/

These Polynomials Class 10 notes cover NCERT Class 10 Maths Chapter 2: types of polynomials, the geometric meaning of zeroes, the relationship between zeroes and coefficients of a quadratic polynomial, and how to form a polynomial from given zeroes – with solved examples, exam-style questions, 10 MCQs and a free PDF.

Use the table of contents below to jump to the part you need, or read top to bottom for a complete revision of the chapter.

Table of Contents

- Chapter Overview
- Important Topics and Concepts
- Solved Examples
- Graph Shape and Number of Zeroes
- Key Formulas at a Glance
- Important Formulas and Definitions
- Short Answer Questions
- Long Answer Questions
- MCQs with Answers
- Quick Revision Points
- Chapter Summary
- Exam Tips and PYQ Pattern
- Frequently Asked Questions
- Conclusion

Want notes for every chapter? Explore the full Class 10 Maths notes on Nextoper, arranged book-wise and chapter-wise.

Chapter Overview

A polynomial is an algebraic expression made of terms with whole-number powers of a variable. The highest power is its degree. A zero of a polynomial p(x) is a value k for which p(k) = 0.

Graphically, the zeroes of y = p(x) are the x-coordinates of the points where the graph meets the x-axis. For a quadratic polynomial $ax^2 + bx + c$, the sum of zeroes is $-b/a$ and the product is c/a – the most important result of the chapter.

Important Topics and Concepts

Types of Polynomials by Degree

- Linear polynomial: degree 1, e.g. $2x + 3$ – at most 1 zero.
- Quadratic polynomial: degree 2, e.g. $x^2 - 3x - 4$ – at most 2 zeroes.
- Cubic polynomial: degree 3, e.g. $x^3 - 4x$ – at most 3 zeroes.
- A polynomial of degree n has at most n zeroes.

Geometric Meaning of Zeroes

- The graph of a linear polynomial is a straight line that cuts the x-axis at exactly one point.
- The graph of a quadratic polynomial is a parabola: opening upwards if $a > 0$, downwards if $a < 0$.
- A parabola can cut the x-axis at two points (2 zeroes), touch it at one point (1 zero), or not meet it at all (no real zero).
- Count the x-axis intersection points on a graph to read off the number of zeroes.

Relationship Between Zeroes and Coefficients

- If α and β are zeroes of $ax^2 + bx + c$ ($a \neq 0$): $\alpha + \beta = -b/a$ and $\alpha\beta = c/a$.
- Example: $x^2 + 7x + 10 = (x + 2)(x + 5)$; zeroes -2 and -5. Sum $= -7 = -7/1$, product $= 10 = 10/1$.
- For a cubic $ax^3 + bx^2 + cx + d$ with zeroes α, β, γ: $\alpha + \beta + \gamma = -b/a$, $\alpha\beta + \beta\gamma + \gamma\alpha = c/a$, $\alpha\beta\gamma = -d/a$ (useful extension).

Forming a Quadratic Polynomial

- If the sum S and product P of zeroes are known, the polynomial is $k(x^2 - Sx + P)$, where k is any non-zero constant.
- Example: sum $= 1/4$, product $= -1 \rightarrow x^2 - (1/4)x - 1$, or $4x^2 - x - 4$.

Solved Examples

Board-pattern questions with full working.

- Find the zeroes of $6x^2 - 7x - 3$ and verify. $6x^2 - 9x + 2x - 3 = 3x(2x - 3) + 1(2x - 3) = (3x + 1)(2x - 3)$. Zeroes: $-1/3$ and $3/2$. Sum $= 7/6 = -(-7)/6$ ✓; product $= -1/2 = -3/6$ ✓.
- Find the zeroes of $x^2 - 3$ and verify. $x^2 - 3 = (x - \sqrt{3})(x + \sqrt{3})$; zeroes $\sqrt{3}$, $-\sqrt{3}$. Sum $= 0 = -0/1$ ✓; product $= -3 = -3/1$ ✓.
- Find a quadratic polynomial whose zeroes are 2 and -3. Sum $= -1$, product $= -6 \rightarrow x^2 + x - 6$.
- If α, β are zeroes of $x^2 - 5x + 6$, find $1/\alpha + 1/\beta$. $\alpha + \beta = 5$, $\alpha\beta = 6 \rightarrow 1/\alpha + 1/\beta = (\alpha + \beta)/\alpha\beta = 5/6$.

Graph Shape and Number of Zeroes

Read the number of zeroes from the graph.

Graph of $y = ax^2 + bx + c$	Number of real zeroes
Cuts x-axis at two distinct points	2
Touches x-axis at one point	1 (equal zeroes)
Does not meet x-axis	0

Graph of $y = ax^2 + bx + c$	Number of real zeroes
Straight line (linear) cutting x-axis once	1

Key Formulas at a Glance

Polynomial	Relations
$ax^2 + bx + c$ (zeroes α, β)	$\alpha + \beta = -b/a$; $\alpha\beta = c/a$
Quadratic from S and P	$k(x^2 - Sx + P)$
$ax^3 + bx^2 + cx + d$ (zeroes α, β, γ)	$\Sigma\alpha = -b/a$; $\Sigma\alpha\beta = c/a$; $\alpha\beta\gamma = -d/a$
Useful identities	$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$; $1/\alpha + 1/\beta = (\alpha + \beta)/\alpha\beta$

Important Formulas and Definitions

Formula / Term	Meaning / Use
Polynomial	Expression with whole-number powers of a variable, e.g. $3x^2 + 2x - 1$
Degree	Highest power of the variable
Coefficient	Number multiplying a power of the variable
Zero of p(x)	A value k such that p(k) = 0
Parabola	U-shaped graph of a quadratic polynomial
Linear polynomial	Degree 1
Quadratic polynomial	Degree 2
Cubic polynomial	Degree 3

Short Answer Questions

Q1. Find the zeroes of $x^2 - 2x - 8$ and verify the relationship with coefficients.

$x^2 - 4x + 2x - 8 = (x - 4)(x + 2)$; zeroes 4 and −2. Sum = 2 = −(−2)/1; product = −8 = −8/1.

Q2. Find the zeroes of $4s^2 - 4s + 1$.

$(2s - 1)^2 = 0 \rightarrow s = 1/2, 1/2$ (equal zeroes). Sum = 1 = 4/4; product = 1/4.

Q3. Find a quadratic polynomial with sum of zeroes −1/4 and product 1/4.

$x^2 + (1/4)x + 1/4$, or $4x^2 + x + 1$.

Q4. Find a quadratic polynomial with sum of zeroes 0 and product √5.

$x^2 + \sqrt{5}$.

Q5. How many zeroes can a cubic polynomial have at most?

At most 3.

Q6. If one zero of $x^2 - 4x + k$ is 1, find k.

$p(1) = 1 - 4 + k = 0 \rightarrow k = 3$.

$\alpha + \beta = -5$, $\alpha\beta = 6$. $\alpha^2 + \beta^2 = 25 - 12 = 13$.

Q8. The graph of $y = p(x)$ meets the x-axis at 3 points. How many zeroes does p(x) have?

3 zeroes.

Long Answer Questions

Q1. Find the zeroes of $3x^2 - x - 4$ and verify the relationship between zeroes and coefficients.

Split the middle term: $3x^2 - 4x + 3x - 4 = x(3x - 4) + 1(3x - 4) = (x + 1)(3x - 4)$.

Zeroes: $x = -1$ and $x = 4/3$.

Sum $= -1 + 4/3 = 1/3$; $-b/a = -(-1)/3 = 1/3$ ✓.

Product $= -1 \times 4/3 = -4/3$; $c/a = -4/3$ ✓.

Hence the relationship is verified.

Q2. If α and β are the zeroes of $2x^2 - 5x + 7$, find a polynomial whose zeroes are $2\alpha + 3\beta$ and $3\alpha + 2\beta$.

$\alpha + \beta = 5/2$, $\alpha\beta = 7/2$.

New sum $= 5(\alpha + \beta) = 25/2$.

New product $= (2\alpha + 3\beta)(3\alpha + 2\beta) = 6(\alpha^2 + \beta^2) + 13\alpha\beta = 6[(\alpha + \beta)^2 - 2\alpha\beta] + 13\alpha\beta = 6(25/4 - 7) + 91/2 = -9/2 + 91/2 = 41$.

Required polynomial: $k(x^2 - (25/2)x + 41)$.

Taking $k = 2$: $2x^2 - 25x + 82$.

Q3. Verify that 3, −1, −1/3 are the zeroes of $3x^3 - 5x^2 - 11x - 3$, and verify the relationships.

$p(3) = 81 - 45 - 33 - 3 = 0$; $p(-1) = -3 - 5 + 11 - 3 = 0$; $p(-1/3) = -1/9 - 5/9 + 11/3 - 3 = 0$.

Sum $= 3 - 1 - 1/3 = 5/3 = -b/a = 5/3$ ✓.

Sum of products in pairs $= -3 + 1/3 - 1 = -11/3 = c/a$ ✓.

Product $= 3 \times (-1) \times (-1/3) = 1 = -d/a = 3/3$ ✓.

All relationships are verified.

MCQs with Answers

1. The degree of $4x^3 - 2x + 7$ is(a) 1 (b) 2 (c) 3 (d) 4Answer: (c) 3

2. A quadratic polynomial has at most how many zeroes?(a) 1 (b) 2 (c) 3 (d) infinitely manyAnswer: (b) 2

3. Sum of zeroes of $2x^2 - 8x + 6$ is(a) −4 (b) 4 (c) 3 (d) −3Answer: (b) 4 – $-(-8)/2$

4. Product of zeroes of $x^2 + 7x + 10$ is(a) 7 (b) −7 (c) 10 (d) −10Answer: (c) 10

5. A quadratic polynomial with zeroes 3 and −2 is(a) $x^2 - x - 6$ (b) $x^2 + x - 6$ (c) $x^2 - 5x + 6$ (d) $x^2 + 5x + 6$Answer: (a) $x^2 - x - 6$ – sum 1, product −6

6. If the graph of $y = p(x)$ does not meet the x-axis, p(x) has(a) one zero (b) two zeroes (c) no

7. If one zero of $x^2 + kx - 6$ is 2, then k =(a) 1 (b) −1 (c) 2 (d) 3Answer: (a) 1 – 4 + 2k − 6 = 0

8. Zeroes of $x^2 - 9$ are(a) 3, 3 (b) −3, −3 (c) 3, −3 (d) 9, −9Answer: (c) 3, −3

9. The graph of a quadratic polynomial with $a < 0$ opens(a) upwards (b) downwards (c) sideways (d) is a lineAnswer: (b) downwards

10. If α, β are zeroes of $x^2 - 6x + 8$, then αβ(α + β) =(a) 48 (b) 14 (c) −48 (d) 2Answer: (a) 48 – 8 × 6

Quick Revision Points

- Degree 1, 2, 3 → linear, quadratic, cubic; at most n zeroes.
- Zeroes = x-coordinates where the graph meets the x-axis.
- Quadratic: $\alpha + \beta = -b/a$, $\alpha\beta = c/a$.
- Form quadratic: $k(x^2 - Sx + P)$.
- Cubic: $\Sigma\alpha = -b/a$, $\Sigma\alpha\beta = c/a$, $\alpha\beta\gamma = -d/a$.
- $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$.

Chapter Summary

Polynomials are classified by degree, and a polynomial of degree n has at most n zeroes. The zeroes are the x-intercepts of its graph – a line for linear and a parabola for quadratic polynomials.

For $ax^2 + bx + c$ the sum of zeroes is $-b/a$ and the product is c/a. These relations let you verify zeroes, find unknown coefficients, evaluate symmetric expressions like $\alpha^2 + \beta^2$, and build a polynomial from given zeroes as $k(x^2 - Sx + P)$.

Exam Tips and PYQ Pattern

- “Find the zeroes and verify the relationship” is a sure 2–3 mark question; always show both checks.
- Reading the number of zeroes from a graph is a common 1-mark MCQ.
- Learn $\alpha^2 + \beta^2$ and $1/\alpha + 1/\beta$ identities for higher-order questions.
- When forming a polynomial, clear fractions by choosing a suitable k.
- Division algorithm questions are not in the 2026-27 syllabus.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the NCERT Class 10 Mathematics textbook and the rationalised CBSE syllabus for 2026-27.

Can I download these notes as a PDF?

Yes. Use the free PDF link at the top of this page – no signup needed.

What is the relationship between zeroes and coefficients of a quadratic?

For $ax^2 + bx + c$ with zeroes α and β, $\alpha + \beta = -b/a$ and $\alpha\beta = c/a$.

Count the points where the graph cuts or touches the x-axis.

Conclusion

Polynomials is a short, high-scoring chapter: factorise carefully, apply the sum and product formulas, and read graphs correctly. Revise the formula table and MCQs here, and keep the free PDF handy.

More Notes: Class 10 Maths Chapter 1: Real Numbers notes | Class 10 Maths Chapter 3: Pair of Linear Equations in Two Variables notes | All Class 10 Maths notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE mathematics educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 10 Maths textbook, Mathematics (Reprint 2026-27), and the CBSE syllabus for the 2026-27 session. Last checked on 16 November 2026.