Polynomials

Standard difficulty · 20 questions · 40 marks · Time: 38 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. The sum of the zeroes of the polynomial $x^2 - 8x + 7$ is:

(a) 7 **(b)** −8 **(c)** 9 **(d)** 8

2. The product of the zeroes of the polynomial $4x^2 - 56x + 180$ is:

(a) 180 **(b)** 14 **(c)** 45 **(d)** −45

3. The zeroes of the polynomial $x^2 + 4x - 45$ are:

(a) −9 and 5 **(b)** −5 and 9 **(c)** 5 and 9 **(d)** −9 and −5

4. A quadratic polynomial whose zeroes have sum −3 and product 5 is:

(a) $x^2 + 3x + 5$ **(b)** $x^2 - 3x - 5$ **(c)** $x^2 - 3x + 5$ **(d)** $x^2 - 5x - 3$

5. A quadratic polynomial can have at most:

(a) one zero **(b)** two zeroes
(c) three zeroes **(d)** infinitely many zeroes

6. If −7 is a zero of the polynomial $x^2 + kx - 7$, then k is:

(a) 6 **(b)** 1 **(c)** −6 **(d)** −7

7. The sum of the zeroes of the cubic polynomial $x^3 - 8x^2 + 11x + 20$ is:

(a) −20 **(b)** −8 **(c)** 11 **(d)** 8

8. Assertion (A): The sum of the zeroes of $3x^2 - 27x + 60$ is 10.
Reason (R): For $ax^2 + bx + c$, the sum of the zeroes is $-b/a$.

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. Find the zeroes of $6y^2 - 25y + 25$ and verify the relationship between the zeroes and the coefficients.

10. Find a quadratic polynomial whose zeroes have sum 3/5 and product 1/5.

11. Find the zeroes of $t^2 + 10t$.

12. Find the zeroes of $121y^2 - 4$.

13. If α and β are the zeroes of $x^2 - 10x + 24$, find the value of $\alpha^2 + \beta^2$.

14. If α and β are the zeroes of $x^2 - x - 30$, find the value of $1/\alpha + 1/\beta$.

15. For the cubic polynomial $x^3 - 5x^2 - 9x + 45$, find the sum of the zeroes, the sum of the products of the zeroes taken two at a time, and the product of the zeroes.

16. One zero of $3x^2 - 21x - 24$ is 8. Find the other zero.

Section C — Word problems — 4 × 4 = 16 marks

17. A toy rocket is launched straight up from the ground. Its height after t seconds is $h(t) = -5t^2 + 60t$ metres. Find the zeroes of h(t) and say what they mean.

18. A shop's daily profit, in hundreds of rupees, from selling x dozen kites is $P(x) = -x^2 + 22x - 117$. Find the zeroes of P(x). What do they tell the shopkeeper?

19. A rectangular garden has a perimeter of 86 m and an area of 450 m^2. Write a quadratic polynomial whose zeroes are its length and breadth, and find them.

20. Without drawing it, find where the graph of $y = x^2 - 9x + 20$ meets the x-axis and the y-axis.

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Answer key

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Q	Answer	Working
1	**(d) 8**	sum of zeroes = −b/a = 8
2	**(c) 45**	product of zeroes = c/a = 45
3	**(a) −9 and 5**	$x^2 + 4x - 45 = (x + 9)(x - 5)$
4	**(a) $x^2 + 3x + 5$**	x^2 − (sum of zeroes)x + (product of zeroes) = $x^2 + 3x + 5$
5	**(b) two zeroes**	the degree is 2
6	**(a) 6**	$(-7)^2 + k \times (-7) - 7 = 0$, so k = 6
7	**(d) 8**	sum of zeroes = −b/a = 8
8	**(d) A is false, but R is true.**	A is false: −b/a = 9, not 10. R is true.
9	**5/3 and 5/2**	$6y^2 - 25y + 25 = (2y - 5)(3y - 5)$; sum = 25/6 = −b/a, product = 25/6 = c/a
10	**$5x^2 - 3x + 1$ (or any non-zero multiple of it)**	$k[x^2 - (3/5)x + (1/5)]$; take k = 5 to clear the fractions
11	**0 and −10**	t(t + 10) = 0, so t = 0 or t = −10
12	**−2/11 and 2/11**	(11y − 2)(11y + 2) = 0
13	**52**	$\alpha + \beta = 10$, $\alpha\beta = 24$; $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = 100 - 48 = 52$
14	**−1/30**	$1/\alpha + 1/\beta = (\alpha + \beta)/\alpha\beta = 1 \div (-30) = -1/30$
15	**5; −9; −45**	−b/a = 5, c/a = −9, −d/a = −45
16	**−1**	sum of zeroes = −b/a = 7, so the other zero = 7 − 8 = −1
17	**t = 0 and t = 12: it leaves the ground at t = 0 and lands back after 12 seconds**	$-5t(t - 12) = 0$
18	**x = 9 and x = 13: there is no profit or loss at 9 or 13 dozen, and a profit in between**	$-x^2 + 22x - 117 = -(x - 9)(x - 13)$
19	**$x^2 - 43x + 450$; length 25 m, breadth 18 m**	sum of zeroes = half the perimeter = 43, product = area = 450
20	**x-axis at (4, 0) and (5, 0); y-axis at (0, 20)**	y = 0 at the zeroes: (x − 4)(x − 5) = 0; at x = 0, y = 20

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