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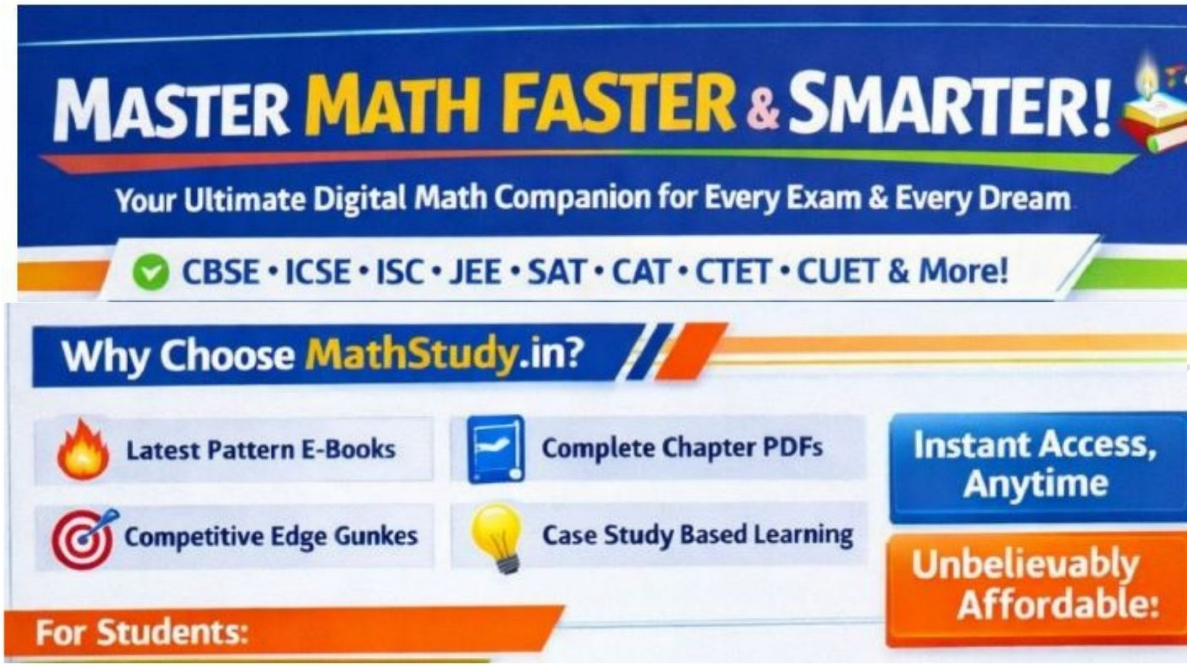

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CHAPTER TEST: POLYNOMIALS
Mathematics | Class IX (2026/Poly/09/NCERT/001)
Time: 1.5 Hours **Max. Marks: 33**

Section A: Basic Concepts

1. **(c)** $x^2 + \sqrt{2}x + 1$ is a polynomial because all exponents of x are whole numbers. (a) and (d) have negative/fractional powers in the denominator.

2. **(d)** Not defined. By convention, the degree of the zero polynomial is not defined.

3. **(d)** $p(x) = x + 3$. $p(-x) = -x + 3$.
Sum: $(x + 3) + (-x + 3) = 3 + 3 = 6$.

4. **(c)** Any real number. For a zero polynomial $p(x) = 0$, any value k substituted for x results in $p(k) = 0$.

5. **(d)** $10x + 2$.
Expression: $(5x - 1)(5x + 1) + (1 + 5x)^2$.
Taking $(5x + 1)$ common: $(5x + 1)[(5x - 1) + (5x + 1)] = (5x + 1)(10x)$.
Actually, $(5x + 1)(5x - 1 + 1 + 5x) = (5x + 1)(10x)$. Among options, $2(5x + 1) = 10x + 2$ is a factor.

Section B: Short Answer Questions

6. $p(x) = 5x - 4x^2 + 3$. For $x = -1$:
$p(-1) = 5(-1) - 4(-1)^2 + 3 = -5 - 4(1) + 3 = -5 - 4 + 3 = -6$.

7. $p(x) = 3x + 1$. For $x = -1/3$:
$p(-1/3) = 3(-1/3) + 1 = -1 + 1 = 0$.
Since $p(-1/3) = 0$, it is a zero of the polynomial.

8. $6x^2 + 5x - 6$ (Product $= -36$, Sum $= 5$)
$= 6x^2 + 9x - 4x - 6$
$= 3x(2x + 3) - 2(2x + 3) = (3x - 2)(2x + 3)$.

9. (a) $103 \times 107 = (100 + 3)(100 + 7) = 100^2 + (3 + 7)100 + (3 \times 7)$
$= 10000 + 1000 + 21 = 11021$.
(b) $99^3 = (100 - 1)^3 = 100^3 - 1^3 - 3(100)(1)(100 - 1)$
$= 1000000 - 1 - 300(99) = 1000000 - 1 - 29700 = 970299$.

Section C: Long Answer Questions

10. Let $p(x) = x^3 - 23x^2 + 142x - 120$. By trial, $p(1) = 1 - 23 + 142 - 120 = 0$.
Thus, $(x - 1)$ is a factor. Dividing $p(x)$ by $(x - 1)$, we get $x^2 - 22x + 120$.
Factorising $x^2 - 22x + 120$: $(x - 10)(x - 12)$.
Final factors: $(x - 1)(x - 10)(x - 12)$.

11. Identity: $x^3+y^3+z^3-3xyz=(x+y+z)(x^2+y^2+z^2-xy-yz-zx)$.
If $x+y+z=0$, then $x^3+y^3+z^3-3xyz=0 \implies x^3+y^3+z^3=3xyz$.
For $(-12)^3+7^3+5^3$, let $x=-12, y=7, z=5$. Since $-12+7+5=0$:
Value $=3(-12)(7)(5)=-36\times 35=-1260$.

12. (a) Use $(x+y+z)^2$: $(\frac{1}{4}a)^2+(-\frac{1}{2}b)^2+(1)^2+2(\frac{1}{4}a)(-\frac{1}{2}b)+2(-\frac{1}{2}b)(1)+2(1)(\frac{1}{4}a)$
$=\frac{1}{16}a^2+\frac{1}{4}b^2+1-\frac{1}{4}ab-b+\frac{1}{2}a$.
(b) $(2x+1)^3=(2x)^3+1^3+3(2x)^2(1)+3(2x)(1)^2=8x^3+1+12x^2+6x$.

13. $x+\frac{1}{x}=7$. Cubing both sides:
$(x+\frac{1}{x})^3=7^3 \implies x^3+\frac{1}{x^3}+3(x)(\frac{1}{x})(x+\frac{1}{x})=343$
$x^3+\frac{1}{x^3}+3(7)=343 \implies x^3+\frac{1}{x^3}=343-21=322$.

Section D: True or False

1. **True**. A binomial is defined as a polynomial having exactly two terms.
2. **True**. Since the zero polynomial is $p(x)=0$, any real number c gives $p(c)=0$.
3. **True**. By definition, a cubic polynomial has a degree of 3.
4. **True**. For $x+1$ to be a factor, $p(-1)$ must be 0. $(-1)^n+1=0$ only when n is odd.