



## MATHS

### NCERT - NCERT MATHEMATICS(HINGLISH)

### POLYNOMIALS

#### Exercise 2.4

1. Find the value of  $k$ , if  $x - 1$  is a factor of  $p(x)$  in each of the following cases:

(i)  $p(x) = x^2 + x + k$  (ii)  $p(x) = 2x^2 + kx + \sqrt{2}$

(iii)  $p(x) = kx^2 - \sqrt{2}x + 1$  (iv)  $p(x) = kx^2 - 3x + k$

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2. Use the Factor Theorem to determine whether  $g(x)$  is a factor of  $p(x)$  in each of the following cases:(i)

$$p(x) = 2x^3 + x^2 - 2x - 1, g(x) = x + 1$$

$$(ii) p(x) = x^3 + 3x^2 + 3x + 1, g(x) = x + 2$$

$$(iii) p(x) = x^3 + 4x^2 + x + 6, g(x) = x - 3$$

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3. Determine which of the following polynomials has  $(x + 1)$  a factor.

$$(i) \quad x^3 + x^2 + x + 1 \quad (ii) \quad x^4 + x^3 + x^2 + x + 1 \quad (iii)$$

$$x^4 + 3x^3 + 3x^2 + x + 1 (iv) \quad x^3 - x^2 - (2 + \sqrt{2})x + \sqrt{2}$$

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4. Factorise:

$$(i) \quad x^3 - 2x^2 - x + 2$$

$$(ii) \quad x^3 - 3x^2 - 9x - 5$$

(iii)  $x^3 + 13x^2 + 32x + 20$

(iv)  $2y^3 + y^2 - 2y - 1$

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5. Factorise: (i)  $12x^2 - 7x + 1$  (ii)  $2x^2 + 7x + 3$  (iii)  $6x^2 + 5x - 6$  (iv)  $3x^2 - x - 4$

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### Exercise 2 3

1. Find the remainder when  $x^3 - ax^2 + 6x - a$  is divided by  $x - a$ .

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2. Check whether  $7 + 3x$  is a factor of  $3x^3 + 7x$ .

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3. Find the remainder when  $x^3 + 3x^2 + 3x + 1$  is divided by (i)  $x + 1$   
(ii)  $x - \frac{1}{2}$  (iii)  $x$  (iv)  $x + \pi$  (v)  $5 + 2x$

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## Exercise 2 2

1. Verify whether the following are zeroes of the polynomial, indicated against them. (i)  $p(x) = 3x + 1, x = -\frac{1}{3}$  (ii)  $p(x) = 5x - \pi, x = \frac{4}{5}$   
(iii)  $p(x) = x^2 - 1, x = 1, -1$  (iv)  $p(x) = (x + 1)(x + 2), x = -1, 2$  (v)  $p(x) = x^2, x = 0$  (vi)  $p(x) = lx + m, x = -\frac{m}{l}$

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2. Find  $p(0)$ ,  $p(1)$  and  $p(2)$  for each of the following polynomials:(i)

$$p(y) = y^2 - y + 1 \text{ (ii) } p(t) = 2 + t + 2t^2 - t^3 \text{ (iii) } p(x) = x^3 \text{ (iv)}$$

$$p(x) = (x - 1)(x + 1)$$

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3. Find the value of the polynomial  $5x - 4x^2 + 3$  at

$$\text{(i) } x = 0 \text{ (ii) } x = -1 \text{ (iii) } x = 2$$

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4. Find the zero of the polynomial in each of the following cases:(i)

$$p(x) = x + 5 \text{ (ii) } p(x) = x - 5 \text{ (iii) } p(x) = 2x + 5 \text{ (iv) } p(x) = 3x - 2$$

$$\text{(v) } p(x) = 3x \text{ (vi) } p(x) = ax, a \neq 0 \text{ (vii) } p(x) = cx + d, c \neq 0, c, d$$

are real numbers.

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## Exercise 2 1

1. Write the degree of each of the following polynomials:

(i)  $5x^3 + 4x^2 + 7x$

(ii)  $4 - y^2$

(iii)  $5t - \sqrt{7}$

(iv) 3



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2. Classify the following as linear, quadratic and cubic polynomials:

(i)  $x^2 + x$

(ii)  $x - x^3$

(iii)  $y + y^3 + 4$

(iv)  $1 + x$

(v)  $3t$

(vi)  $r^2$

(vii)  $7x^3$



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3. Which of the following expressions are polynomials in one variable and which are not? State reasons for your answer.

(i)  $4x^2 - 3x + 7$

(ii)  $y^2 + \sqrt{2}$

(iii)  $3\sqrt{t} + t\sqrt{2}$

(iv)  $y + \frac{2}{y}$

(v)  $x^{10} + y^3 + t^{50}$



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4. Write the coefficients of  $x^2$  in each of the following:

(i)  $2 + x^2 + x$

(ii)  $2 - x^2 + x^3$

(iii)  $\frac{\pi}{2}x^2 + x$

(iv)  $\sqrt{2}x - 1$

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5. Give one example each of a binomial of degree 35. and of a monomial of degree 100.

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## Solved Examples

1. Factorise  $4x^2 + y^2 + z^2 - 4xy - 3yz + 4xz$ .

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2. Expand  $(4a - 2b - 3c)^2$

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3. Find the remainder when  $x^4 + x^3 - 2x^2 + x + 1$  is divided by  $x - 1$ .

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4. Write the following cubes in the expanded form:

(i)  $(3a + 4b)^3$     (ii)  $(5p - 3q)^3$

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5. Factorise :  $8x^3 + y^3 + 27z^3 - 18xyz$ .

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6. Factorise  $8x^3 + 27y^3 + 36x^2y + 54xy^2$ .

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7. Check whether  $-2$  and  $2$  are zeroes of the polynomial  $x + 2$ .

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8. Find the value of each of the following polynomials at the indicated

value of variables: (i)  $p(x) = 5x^2 - 3x + 7$  at  $x = 1$  (ii)

$q(y) = 3y^3 - 4y + \sqrt{11}$  at  $y = 2$  (iii)  $p(t) = 4t^4 + 5t^3 - t^2 + 6$  at

$t = a$

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9. Find the degree of each of the polynomials given below: (i)

$x^5 - x^4 + 3$  (ii)  $2 - y^2 - y^3 + 2y^8$  (iii)  $2$

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10. Divide the polynomial  $3x^4 - 4x^3 - 3x - 1$  by  $x - 1$

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11. Divide  $p(x)$  by  $g(x)$ , where  $p(x) = x + 3x^2 - 1$  and  $g(x) = 1 + x$

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12. Verify whether 2 and 0 are zeroes of the polynomial  $x^2 - 2x$ .

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13. Find a zero of the polynomial  $p(x) = 2x + 1$ .

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14. Factorise: (i)  $49a^2 + 70ab + 25b^2$  (ii)  $\frac{25}{4}x^2 - \frac{y^2}{9}$

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15. Write  $(3a + 4b + 5c)^2$  in expanded form.

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16. Check whether the polynomial  $q(t) = 4t^3 + 4t^2 - t - 1$  is a multiple of  $2t + 1$

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17. Examine whether  $x + 2$  is a factor of  $x^3 + 3x^2 + 5x + 6$  and of  $2x + 4$ .

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18. Find the value of  $k$ , if  $x - 1$  is a factor of  $4x^3 + 3x^2 - 4x + k$ .

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19. Factorize  $6x^2 + 17x + 5$

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20. Factorise  $y^2 - 5y + 6$  using the Factor Theorem.

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21. Factorise  $x^3 - 23x^2 + 142x - 120$ .

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22. Find the following products using appropriate identities:

(i)  $(x + 3)(x + 3)$       (ii)  $(x + 3)(x + 5)$

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23. Evaluate  $105 \times 106$  without multiplying directly.

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24. Evaluate each of the following using suitable identities: (i)  $(104)^3$

(ii)  $(999)^3$

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25. Find the remainder obtained on dividing  $p(x) = x^3 + 1$  by  $x + 1$

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1. Factorise: (i)  $4x^2 + 9y^2 + 16z^2 + 12xy - 24yz - 16xz$

(ii)  $2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8xz$

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2. Use suitable identities to find the following products:

(i)  $(x + 4)(x + 10)$

(ii)  $(x + 8)(x - 10)$

(iii)  $(3x + 4)(3x - 5)$

(iv)  $\left(y^2 + \frac{3}{2}\right)\left(y^2 - \frac{3}{2}\right)$

(v)  $(3 - 2x)(3 + 2x)$

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3. Factorise each of the following: (i)  $27y^3 + 125z^3$  (ii)  $64m^3 - 343n^3$

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4. Factorise each of the following:

(i)  $8a^3 + b^3 + 12a^2b + 6ab^2$

(ii)  $8a^3 - b^3 - 12a^2b + 6ab^2$

(iii)  $27 - 125b^3 - 135a + 225a^2$

(iv)  $64a^3 - 27a^3 - 144a^2b + 108ab^2$

(v)  $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$

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5. Factorise the following using appropriate identities:(i)

$9x^2 + 6xy + y^2$  (ii)  $4x^2 - 4y + 1$  (iii)  $x^2 - \frac{y^2}{100}$

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6. What are the possible expressions for the dimensions of the cuboids

whose volumes are given below?(i) Volume:  $3x^2 - 12x$  (ii) Volume:

$12ky^2 + 8kx - 20k$





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7. Verify : (i)  $x^3 + y^3 = (x + y)(x^2 - xy + y^2)$  (ii)  
 $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$



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8. Verify that  
 $x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z) \left[ (x - y)^2 + (y - z)^2 + (z - x)^2 \right]$



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9. Write the following cubes in expanded form: (i)  $(2x + 1)^3$  (ii)  
 $(2a - 3b)^3$  (iii)  $\left[ \frac{3}{2}x + 1 \right]^3$  (iv)  $\left[ x - \frac{2}{3}y \right]^3$



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10. Give possible expressions for the length and breadth of each of the following rectangles, in which their areas are given: Area:

$$25a^2 - 35a + 12 \quad \text{Area: } 35y^2 + 13y - 12 \quad \text{(i) (ii)}$$

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11. Factorise:  $27x^3 + y^3 + z^3 - 9xyz$

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12. Evaluate the following using suitable identities:

$$(i)(99)^2 \quad (ii)(102)^3 \quad (iii)(998)^3$$

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13. Without actually calculating the cubes, find the value of each of the following: (i)  $(-12)^3 + (7)^3 + (5)^3$  (ii)  $(28)^3 + (-15)^3 + (-13)^3$

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14. Expand each of the following, using suitable identities:

(i)  $(x + 2y + 4z)^2$  (ii)  $(2x - y + z)^2$  (iii)  $(-2x + 3y + 2z)^2$

(iv)  $(3a - 7b - c)^2$  (v)  $(-2x + 5y - 3z)^2$  (vi)  $\left[\frac{1}{4}a - \frac{1}{2}b + 1\right]^2$

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15. If  $x + y + z = 0$  show that  $x^3 + y^3 + z^3 = 3xyz$ .

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16. Evaluate the following products without multiplying directly:(i)

$103 \times 107$  (ii)  $95 \times 96$  (iii)  $104 \times 96$

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