CBSE Test Paper 01
CH-2 Polynomials

1. If p(x) = x + 3, then p(x) + p(-x) is equal to
   a. 2x
   b. 3
   c. 0
   d. 6
2. If x+y+z = 0, then $x^3 + y^3 + z^3$ is
   a. 3xyz
   b. xyz
   c. 2xyz
   d. 0
3. The degree of constant function is
   a. 0
   b. 3
   c. 1
   d. 2
4. (x + 1) is a factor of the polynomial
   a. $x^3 + x^2 - x + 1$
   b. $x^3 + x^2 + x + 1$
   c. $x^4 + 3x^3 + 3x^2 + x + 1$
   d. $x^4 + x^3 + x^2 + 1$
5. The coefficient of 'x' in the expansion of $(x + 3)^3$ is
   a. 1
   b. 27
   c. 9
   d. 18
6. Fill in the blanks: A polynomial containing one non-zero term is called a________.
7. Fill in the blanks: The highest power of the variable in a polynomial is called the ________of the polynomial.
8. Write $(-3x + y + z)^2$ in the expanded form:

9. Evaluate the following by using identities: $0.54 \times 0.54 - 0.46 \times 0.46$
10. Evaluate: $185 \times 185 - 15 \times 15$
11. Evaluate 105×108 without multiplying directly.
12. Simplify $(x + y)^3 - (x - y)^3 - 6y(x + y)(x - y)$.
13. Factorize : $(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3$
14. If both $x - 2$ and $x - \frac{1}{2}$ are factors of $px^2 + 5x + r$, show that $p = r$.
15. If the polynomials $az^3 + 4z^2 + 3z - 4$ and $z^3 - 4z + a$ leave the same remainder when divided by $z - 3$, find the value of a.

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Solution

1. (d) 6

   Explanation:

   p(x) = x + 3

   And p(-x) = -x + 3

   Then, p(x) + p(-x)

   = x + 3 - x + 3

   = 6
2. (a) 3xyz

   Explanation:

   $x^3+y^3+z^3-3xyz=(x+y+z)\left(x^2+y^2+z^2-xy-yz-zx\right)$ =>
   $x^3+y^3+z^3-3xyz=(0)\left(x^2+y^2+z^2-xy-yz-zx\right)$ =>
   $x^3+y^3+z^3-3xyz=0$ => $x^3+y^3+z^3=3xyz$ If x+y+z = 0, then
   $x^3+y^3+z^3$ is 3xyz
3. (a) 0

   Explanation: The degree of any constant term 5 (say)

   We can write 5 as 5 x 1 = $5x^0$ [Since a^0= 1]

   Therefore the degree of any constant term is 0
4. (b) x^3+x^2+x+1

   Explanation: x^3+x^2+x+1 = $x^3(x+1)+1(x+1)$ = $\left(x^3+1\right)(x+1)$
5. (b) 27

   Explanation: $(x+3)^3$ = $x^3+(3)^3+3\times x\times 3\,(x+3)$ = $x^3+27+9x^2+27x$ = $x^3+9x^2+27x+27$ Therefore, the coefficient of x, in the expansion of $(x+3)^3$ is 27.
6. monomial
7. degree
8. We have,

   $(-3x + y + z)^2$

   Using identity $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$= (-3x)^2 + y^2 + z^2 + 2 \times (-3x) \times y + 2 \times y \times z + 2 \times z \times (-3x)$

$= 9x^2 + y^2 + z^2 - 6xy + 2yz - 6zx$

9. We have,

$0.54 \times 0.54 - 0.46 \times 0.46$

$= (0.54)^2 - (0.46)^2 = (0.54 + 0.46)(0.54 - 0.46) = 1 \times 0.08 = 0.08$

10. $185 \times 185 - 15 \times 15$

$(185)^2 - (15)^2$ [Using $a^2 - b^2 = (a-b)(a+b)$]

$(185 + 15)(185 - 15)$

$200 \times 170 = 34000$

11. $105 \times 108 = (100 + 5)(100 + 8)$

Using identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

We get, $105 \times 108 = 100^2 + (5 + 8)100 + 5 \times 8$

$= 10000 + 1300 + 40 = 11340$

12. $(x + y)^3 - (x - y)^3 - 6y(x + y)(x - y)$

$= (x + y)^3 - (x - y)^3 - 3.2y(x + y)(x - y)$

$= (x + y)^3 - (x - y)^3 - 3(x + y - x + y)(x + y)(x - y)$

$= [x + y - x + y)]^3$ [$\therefore a^3 - b^3 - 3ab(a - b) = (a - b)^3$]

$= (2y)^3 = 8y^3$

13. Let $x = a^2 - b^2$, $y = b^2 - c^2$ and $z = c^2 - a^2$. Then,

$x + y + z = a^2 - b^2 + b^2 - c^2 + c^2 - a^2 = 0$

$\therefore x^3 + y^3 + z^3 = 3xyz$

$\Rightarrow (a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3 = 3(a^2 - b^2)(b^2 - c^2)(c^2 - a^2)$

$\Rightarrow (a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3 = 3(a + b)(a - b)(b + c)(b - c)(c + a)(c - a)$

$\Rightarrow (a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3 = 3(a + b)(b + c)(c + a)(a - b)(b - c)(c - a)$

14. Let $f(x) = px^2 + 5x + r$ be the given polynomial. Since $x - 2$ and $x - \frac{1}{2}$ are factors of f(x).

$\therefore f(2) = 0$ and $f\left(\frac{1}{2}\right) = 0$

$\Rightarrow p \times 2^2 + 5 \times 2 + r = 0$ and $p(\frac{1}{2})^2 + 5 \times \frac{1}{2} + r = 0$

$\Rightarrow 4p + 10 + r = 0$ and $\frac{p}{4} + \frac{5}{2} + r = 0$

$\Rightarrow 4p + r = -10$ and $\frac{p + 4r + 10}{4} = 0$

$\Rightarrow 4p + r = -10$ and $p + 4r + 10 = 0$

$\Rightarrow$ 4p + r = -10 and p + 4r = -10

$\Rightarrow$ 4p + r = p + 4r [RHS of the two equations are equal]

$\Rightarrow$ 3p = 3r $\Rightarrow$ p = r

15. Let $p(z) = az^3 + 4z^2 + 3z - 4$

And $q(z) = z^3 - 4z + a$

As these two polynomials leave the same remainder, when divided by z - 3, then p(3) = q(3).

$\therefore$ $p(3) = a(3)^3 + 4(3)^2 + 3(3) - 4$

= 27a + 36 + 9 - 4

Or p(3) = 27a + 41

And $q(3) = (3)^3 - 4(3) + a$

= 27 - 12 + a = 15 + a

Now, p(3) = q(3)

$\Rightarrow$ 27a + 41 = 15 + a

$\Rightarrow$ 26a = -26; a = -1

Hence, the required value of a = -1.