Basic operation questions for CDSE, CGL Tier 2, CGLTier 1 and SSC 10+2

Basic operation quiz 2

Direction: Study the following questions carefully and choose the right answer.

1. If x = 2 then the value of $x^3 + 27x^2 + 243x + 631$ is:

A. 1211 B. 1231

C. 1233 D. 1321

2. $\mathbf{If\ x = \frac{1}{\sqrt{2}+1}\ then\ (x+1)\ equals\ to:}$

A. 2 B. (√2 + 1)

C. (√2 – 1) D. √2

3. $\mathbf{if\ x + \frac{1}{x} = 99,\ find\ the\ value\ of\ \frac{100x}{2x^2+102x+2}}$

A. 1/6 B. 1/2

C. 1/3 D. 1/4

4. The expression $x^4 - 2x^2 + k$ will be a perfect square when the value of k is

A. 2 B. 1

C. –1 D. –2

5. $\mathbf{If\ x + \frac{1}{2x} = 2,\ find\ the\ value\ of\ 8x3 + \frac{1}{x^3}.}$

A. 48 B. 88

C. 40 D. 44

6. If (x – 1) and (x + 3) are the factor of $x^2 + k_1x + k_2$ then

A. $k_1 = -2, k_2 = -3$

B. $k_1 = 2, k_2 = -3$

C. $k_1 = 2, k_2 = 3$

D. $k_1 = -2, k_2 = 3$

7. If $\frac{5x}{2x^2 + 5x + 1} = \frac{1}{3}$, then the value of $\left(x + \frac{1}{2x}\right)$ is

A. 15

B. 10

C. 20

D. 5

8. If a = 2.234, b = 3.121 and c = –5.355, then the value of $a^3 + b^3 + c^3 - 3abc$ is

A. –1

B. 0

C. 1

D. 2

9. If $x^2 + y^2 + 1 = 2x$, then the value of $x^3 + y^5$ is

A. 2

B. 0

C. –1

D. 1

10. If. $\left(a + \frac{1}{a}\right)^2 = 3$, then the value of $a3 + \frac{1}{a^3 is}$

A. 0

B. 1

C. 2

D. 6

Correct answers:

1	2	3	4	5	6	7	8	9	10
C	D	C	B	C	B	D	B	D	A

Explanations:

1). Given equatin,

$f(x) = x^3 + 27x^2 + 243x + 631$

$\Rightarrow x(x^2 + 27x + 243) + 631$

Now, put the value of x = 2

$\Rightarrow 2(2^2 + 27 \times 2 + 243) + 631$

$\Rightarrow 2(4 + 54 + 243) + 631$

$\Rightarrow 2(301) + 631 = 602 + 631 = 1233.$

Hence, option C is correct.

2). On multiplying the numerator and denominator by the conjugate of the existing denominator, we get,

$x = \frac{1}{\sqrt{2} + 1} \times \frac{\sqrt{2} - 1}{\sqrt{2} - 1}$

$\Rightarrow x = \frac{\sqrt{2} - 1}{2 - 1} \Rightarrow x = \sqrt{2} - 1$

Then $(x + 1) = \sqrt{2} - 1 + 1 = \sqrt{2}$

Hence, option D is correct.

3).

$$x + \frac{1}{x} = 99$$

$$\therefore \frac{100x}{2x^2 + 102x + 2} = \frac{100x}{2x^2 + 2 + 102x}$$

On dividing by x,

$$= \frac{100x}{2x + \frac{2}{x} + 102} = \frac{100}{2(x + \frac{1}{x}) + 102}$$

$$= \frac{100}{2 \times 99 + 102} = \frac{100}{300} = \frac{1}{3}$$

Hence, option C is correct.

4). **Method I:**

$(a - b)^2 = a^2 - 2ab + b^2$

$x^4 - 2x^2 + k = (x^2)^2 - 2.x^2.1 + k$

$\Rightarrow (1^2)^2 - 2.(1)^2.1 + k = 0$

$\Rightarrow 1 - 2 + k = 0$

$\Rightarrow - 1 + k = 0$

For a perfect square,

k = 1.

Method II:

Let's assume $x^2 = m$, therefore the given eq. will be:

$m^2 - 2m + k$ which is a quadratic equation ($ax^2 + bx + c$).

Now we know that a quadratic eqn. is a perfect square if its discriminant ($b^2 - 4ac$) is equal to zero.

In the eq. a = 1, b = – 2, c = k

$\therefore \quad (-2)^2 - 4(1).k = 0$

$-4k = -4$

$\therefore k = 1$

Hence, option B is correct.

5).

$x + \frac{1}{2x} = 2$

Multiplying both sides by 2

$\Rightarrow 2x + \frac{2}{2x} = 4$

$\Rightarrow 2x + \frac{1}{x} = 4$

On Cubing both sides, we get

$\Rightarrow (2x + \frac{1}{x})^3 = (4)^3$

$\Rightarrow 8x^3 + \frac{1}{x^3} + 3 \times 2x \times \frac{1}{x}(2x + \frac{1}{x}) = 64$

$\Rightarrow \ 8x^3 + \frac{1}{x^3} + 6 \times 4 = 64$

$\Rightarrow \ 8x^3 + \frac{1}{x^3} = 64 - 24 = 40.$

Hence, option C is correct.

6). $f(x) = x^2 + k_1x + k_2$

$(x - 1)$ is a factor of $f(x)$.

$\therefore \quad f(1) = 0$

$\Rightarrow 1 + k_1 + k_2 = 0$

$\Rightarrow k_1 + k_2 = -1 \qquad ...(i)$

Again,

$f(-3) = 0 \quad \Rightarrow (-3)^2 + k_1(-3) + k_2 = 0$

$\Rightarrow 9 - 3k_1 + k_2 = 0 \quad \Rightarrow \quad 3k_1 - k_2 = 9 \qquad ...(ii)$

On adding both equations,

$4k_1 = 8 \ \Rightarrow \ k_1 = 2$

From eq.(i) ,

$k_1 + k_2 = -1 \ \Rightarrow \ 2 + k_2 = -1 \ \Rightarrow \ k_2 = -3.$

Hence, option B is correct.

7).

$$\frac{5x}{2x^2 + 5x + 1} = \frac{1}{3}$$

Dividing numerator & denominator by 2x

$$= \frac{\frac{5}{2}}{x + \frac{5}{2} + \frac{1}{2x}} = \frac{1}{3}$$

$$= \frac{\frac{5}{2}}{x + \frac{1}{2x} + \frac{5}{2}} = \frac{1}{3}$$

$$\Rightarrow (x + \frac{1}{2x}) + \frac{5}{2} = \frac{15}{2}$$

$$\Rightarrow (x + \frac{1}{2x}) = \frac{15}{2} - \frac{5}{2}$$

$$\Rightarrow (x + \frac{1}{2x}) = 5$$

Hence, option D is correct.

8). $a + b + c = 2.234 + 3.121 - 5.355 = 0$

If $a + b + c = 0$, then $a^3 + b^3 + c^3 - 3abc = 0$, which can be proved as under

$a + b = -c$

Cubing both sides, we get

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

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

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

$\Rightarrow a^3 + b^3 - 3abc = -c^3$

$\Rightarrow a^3 + b^3 + c^3 - 3abc = 0$

Hence, option B is correct.

9). $x^2 + y^2 + 1 = 2x$

$\Rightarrow x^2 + y^2 + 1 - 2x = 0$

$\Rightarrow x^2 - 2x + 1 + y^2 = 0$

$\Rightarrow (x - 1)^2 + y^2 = 0$

In the above eq. the L.H.S. can only become zero when the base of terms; $(x - 1)$ and y becomes zero because for any other value the sum of their squares will always be a positive integer.

Taking $(x - 1) = 0$

and $y = 0$

Therefore, $x = 1$ and $y = 0$

$\therefore \quad x^3 + y^5 = 1 + 0 = 1.$

Hence, option D is correct.

10).

$(a + \frac{1}{a})^2 = 3$

$\Rightarrow a + \frac{1}{a} = \sqrt{3}$

On cubing both sides, we get

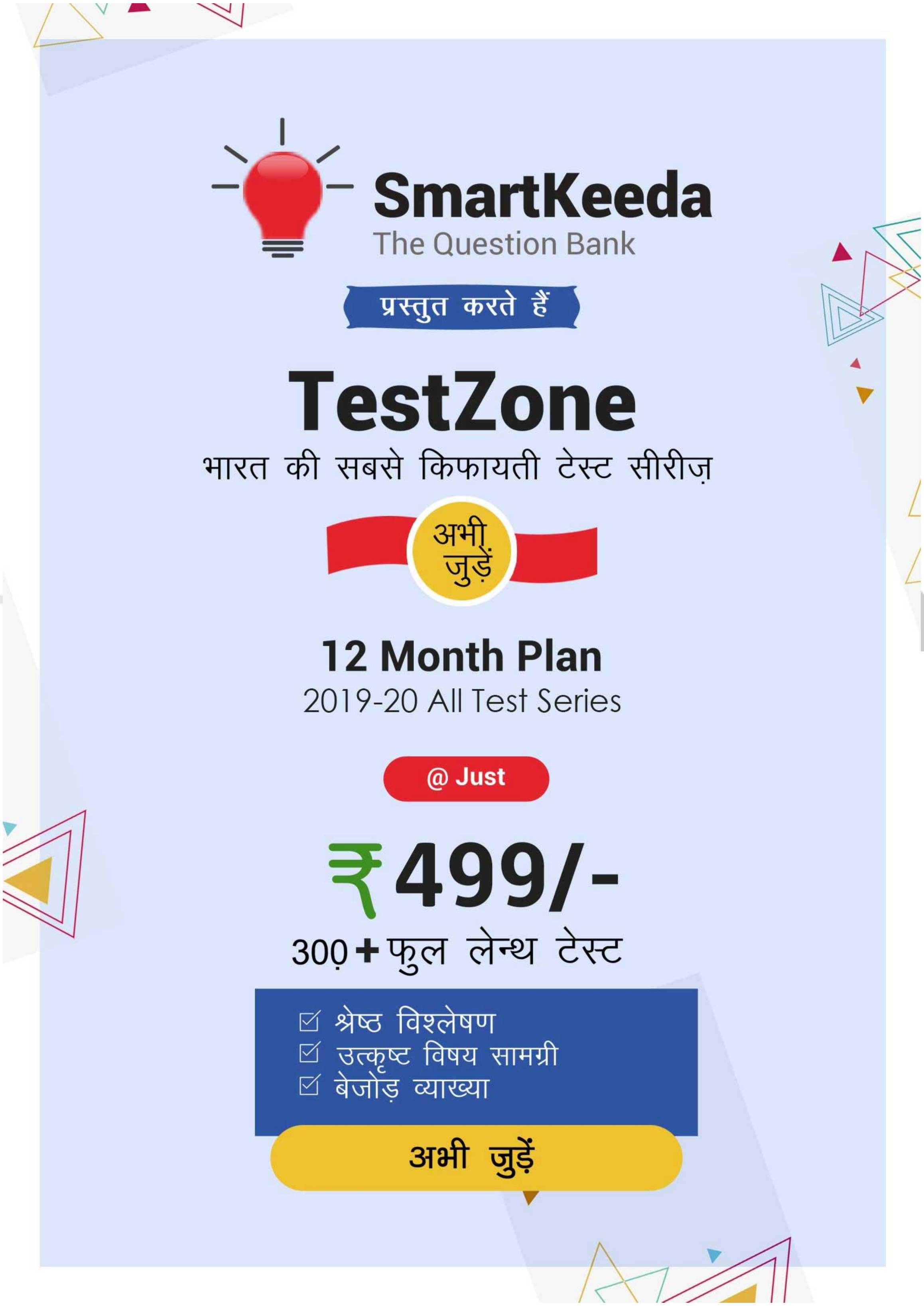
$\Rightarrow \left(a + \frac{1}{a}\right)^3 = \left(\sqrt{3}\right)^3$

$\Rightarrow a^3 + \frac{1}{a^3} + 3\left(a + \frac{1}{a}\right) = 3\sqrt{3}$

$\Rightarrow a^3 + \frac{1}{a^3} + 3\sqrt{3} = 3\sqrt{3}$

$\Rightarrow a^3 + \frac{1}{a^3} = 3\sqrt{3} - 3\sqrt{3} = 0$

Hence, option A is correct.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