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(प्रकाशन के क्षेत्र में 53 वर्षों
से अधिक का अनुभव)

BILINGUAL

ADVANCE
MATHS

CGL (TIER-I & II), CHSL एवं
अन्य परीक्षाओं के लिए उपयोगी

बीजगणित

निर्देशांक ज्यामिति

त्रिकोणमिति

ऊँचाई एवं दूरी

ज्यामिति

क्षेत्रमिति

2020
तक सम्पन्न
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एवं अन्य परीक्षाओं के लिए उपयोगी

- ALGEBRA (बीजगणित)
- CO-ORDINATE GEOMETRY (निर्देशांक ज्यामिति)
- TRIGONOMETRY (त्रिकोणमिति)
- HEIGHT & DISTANCE (ऊँचाई एवं दूरी)
- GEOMETRY (ज्यामिति)
- MENSURATION (2D & 3D) (क्षेत्रमिति)

2020

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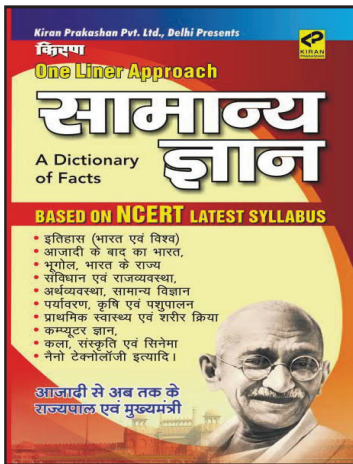
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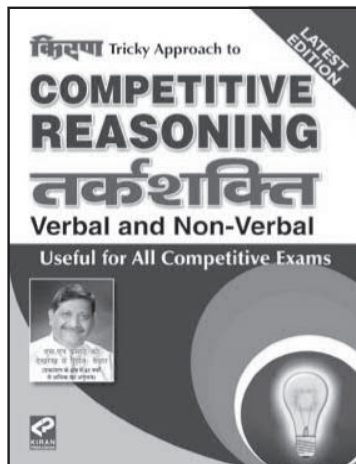
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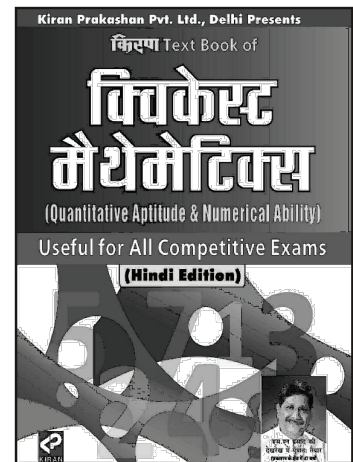
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अनुक्रमणिका

- 1. बीजगणित (ALGEBRA)..... BLAM-5**
- PREVIOUS YEARS' QUESTIONS BLAM-13
 - ☐ Based on Square and Cubic Formulae
 - ☐ Based on $a + \frac{1}{a}$ or $a - \frac{1}{a}$ Formulae
 - ☐ Factor Theorem and Questions Based on Other Formulae
 - ADVANCED LEVEL QUESTIONS BLAM-77
- 2. निर्देशांक ज्यामिति (CO-ORDINATE GEOMETRY) BLAM-91**
- PREVIOUS YEARS' QUESTIONS BLAM-101
 - ADVANCED LEVEL QUESTIONS BLAM-126
- 3. त्रिकोणमिति (TRIGONOMETRY) BLAM-131**
- PREVIOUS YEARS' QUESTIONS BLAM-145
 - ☐ Degree, Radians, इनके आपस में Conversions, clock के hands के बीच में बने angle पर based questions
 - ☐ Angles पर based questions
 - ☐ Trigonometric identities पर based questions
 - ☐ Trigonometric functions की minimum, maximum values, substitution, तथा series पर based questions
 - ☐ $\sin(x + y)$, $\cos(x + y)$, $\tan(x + y)$ etc. formulae पर based questions
 - ☐ Miscellaneous
 - ADVANCED LEVEL QUESTIONS BLAM-202
- 4. ऊँचाई एवं दूरी (HEIGHT AND DISTANCE) BLAM-219**
- PREVIOUS YEARS' QUESTIONS BLAM-221
 - CHALLENGER QUESTIONS BLAM-242

5. ज्यामिति (GEOMETRY) **BLAM-255**

■ PREVIOUS YEARS' QUESTIONS **BLAM-273**

- ☐ Questions Based on Angles, (Complementary, supplementary, angle bisector etc.
- ☐ Questions Based on Length of sides of a Triangle
- ☐ Questions Based on Polygons
- ☐ Questions Based on Quadrilaterals (Rhombus, Trapezium etc.)
- ☐ Questions Based on Circles

■ ADVANCED LEVEL QUESTIONS **BLAM-361**

6. क्षेत्रमिति (MENSURATION) **BLAM-375**

■ PREVIOUS YEARS' QUESTIONS **BLAM-389**

- ☐ Questions Based on Area and perimeter of Triangle, Quadrilaterals and Circle
- ☐ Questions Based on Area and Perimeter of Four Walls of a Room
- ☐ Questions Based on Surface Area & Volume of Cube and Cuboid
- ☐ Questions Based on Cylinder, Cone, Sphere, Hemisphere etc.

■ ADVANCED LEVEL QUESTIONS **BLAM-446**

गणित विषयक प्रश्नों को चुटकियों में हल करने के लिए क्या
आपका **CONFIDENCE** फीज करने लायक है ?

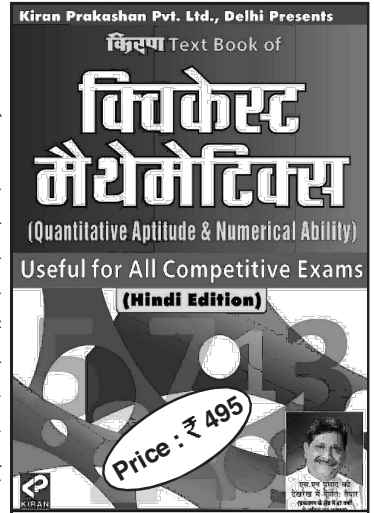
पुस्तक की विशेषताएँ :

↑ प्रस्तुत पुस्तक में अध्यायवार प्रश्नों का संकलन निम्नलिखित अध्यायों के अन्तर्गत किया गया है।

- संख्या पद्धति ● द्विआधारीय अंकन पद्धति ● जोड़ और घटाव ● वैदिक गणित ● गुणा
- भाग ● विभाजकता ● लघुत्तम समापवर्त्य और महत्तम समापवर्तक ● दशमलव संख्या
- और भिन्न ● घात, घातांक, वर्गमूल और घनमूल ● बीजगणित ● रेखीय समीकरणों के ग्राफ
- सरलीकरण ● प्रतिशतता ● लाभ और हानि ● औसत ● अनुपात और समानुपात ● मिश्रण
- साझेदारी ● आयु ● साधारण ब्याज ● चक्रवृद्धि ब्याज ● समय और कार्य
- कार्य और मजदूरी ● समय और दूरी ● रेलगाड़ी ● नाव और धारा ● दौड़ और खेल
- त्रिभुज ● वृत्त ● चतुर्भुज ● क्षेत्रफल और परिमिति ● पृष्ठीय क्षेत्रफल और आयतन
- त्रिकोणमितीय अनुपात ● त्रिकोणमितीय सहस्रुप्यता ● ऊँचाई और दूरी ● संख्या श्रेणी
- श्रेणीक्रम और अनुक्रम ● क्रमचय और संचय ● प्रायिकता ● लघुगणक ● कैलेन्डर
- आँकड़ों का विश्लेषण ● आँकड़ों की पर्याप्तता ● आँकड़ों की व्याख्या

↑ पुस्तक की पाठ्य सामग्री को विविध प्रतियोगिता परीक्षाओं में पूछे गये प्रश्नों के पैटर्न एवं उनकी गुणवत्ता को वैज्ञानिक एवं तथ्यपूर्ण विश्लेषण के पश्चात् तैयार किया गया है।

↑ आप शायद इतने अध्यायों में वस्तुपरक एवं वस्तुनिष्ठ प्रश्नों का संकलन एक पुस्तक में कहीं नहीं पाएँगे।





बीजगणित (ALGEBRA)

Algebra पर based questions लगभग हर competitive exams में पूछे जाते हैं। चूँकि algebra से सभी Candidates भली-भाँति अवगत होंगे इसलिए algebra based questions करने में ज्यादा कठिनाई नहीं होती है। यहाँ पर जरूरत है तो बस questions के Type को जानने तथा formulae को सही प्रकार से questions में प्रयोग करने की।

Constants : Generally, वह सभी symbols जिनकी value change नहीं होती है constant कहलाते हैं, for e.g. 4, 5, $\frac{2}{5}$, π etc. इनको a, b, c etc. से भी दर्शाया जाता है।

Variables : वह सभी symbols जिनकी value change होती रहती है variables कहलाते हैं। For e.g. circle का circumference होता है $c = 2\pi r$ यहाँ 2, π constants है तथा r (radius) variable है।

Algebraic Expressions किसी भी ऐसी equation को दर्शाती है जिसमें constants तथा variables एक दूसरे के साथ (+, -, \times , \div) के साथ जुड़े होते हैं।

For example,

$$4 + 5x - 7x^2 + \frac{1}{3}x^3 \text{ एक algebraic expression है}$$

जिसकी 4 terms है 4, $5x$, $-7x^2$ तथा $\frac{1}{3}x^3$.

Polynomials : एक ऐसी algebraic expression जिसके variables की power integers होती है को polynomial कहते हैं।

Polynomials के विभिन्न रूप

(i) $3 + 4x^2 + 7x^3$ - polynomial जिसमें सिर्फ एक variable x है।

(ii) $5x^2y + 3xy^2 + 7$ - polynomial जिसमें दो variables x तथा y है।

(iii) $5x^2 + 7x^{5/2} + 7$ - polynomial नहीं है क्योंकि इसकी एक term में x की power $5/2$ है जो कि integer नहीं है।

Degree of Polynomials in one variable :

एक variable वाले polynomial में उस variable की अधिकतम highest power ही polynomial की degree कहलाती है।

Example :

(i) $2x - 3$ एक polynomial है जिसमें x की power 1 है, इसलिए इस polynomial की degree 1 होगी।

(ii) $5x^4 - 3x^2 + 5$ polynomial की degree 4 है क्योंकि x की अधिकतम power 4 है।

Degree of polynomial in Two or more variables :

यदि किसी polynomial में दो या दो से ज्यादा variables होते हैं तो polynomial की degree हर एक term में variables की जो अधिकतम power होती है उसके बराबर होती है।

Example :

(i) $7x^4y - 5x^3y + 9y^2$ polynomial की degree 5 है क्योंकि x^4y variable की power 5 है जो कि इस equation में सबसे अधिक है।

(ii) $3x^3 - 5x^4y^3 + 9y^2$ polynomial की degree 7 है क्योंकि variable x^4y^3 की power 7 है जो कि इस equation में सबसे अधिक है।

Classification of polynomials on the basis of degrees.

(i) **Linear equation :** जिस किसी polynomial की degree 1 होती है उसे linear polynomial कहते हैं।

e.g. : $3 + 5x$, $5 - 3y$

(ii) **Quadratic equation :** जिस किसी polynomial की degree 2 होती है उसे quadratic polynomial कहते हैं।

e.g. : $5x^2 + 4x + 3$, $3y^2 - 2y + 1$

(iii) **Cubic Polynomial :** जिस किसी polynomial की degree 3 होती है उसे Cubic polynomial कहते हैं।

e.g. : $x^3 + 3x^2 + 5x + 3$ etc.

(iv) **Bi Quadratic Polynomial :** जिस किसी polynomial की degree 4 होती है उसे bi quadratic polynomial कहते हैं।

e.g. : $8x^4 + 3x^3 + 5x^2 + 4$ etc.

Number of terms in a Polynomial :

किसी भी polynomial को उसकी terms की संख्या के अनुसार monomial, binomial, trinomial etc. के रूप में classify करते हैं।

Example :

(i) **Monomials** में सिर्फ एक term होती है, 4 , $7x$, $9xy$, $5x^2yz$ etc.

(ii) **Binomials** में दो terms होती है, $4 + 3x$, $5x - 3y$, $3x^2 + 2y$ etc.

(iii) **Trinomials** में तीन terms होती है, $5x^3 + 2x + 3$, $xy + yz + zx$ etc.

Constant polynomial : एक ऐसा polynomial जिसकी सिर्फ एक term होगी और वो भी constant उसे constant polynomial कहा जाता है।

Example : 3, 5, -5, 7 etc.

Terms of polynomial in ascending or descending order.

यदि किसी polynomial की terms बढ़ते क्रम में हो तो उसे ascending polynomial कहेंगे और यदि terms की power घटते क्रम में हो तो descending polynomial कहेंगे।

Ex. : (i) $3 - 5x + 7x^2 - 9x^3$ (Ascending polynomial)

(ii) $9x^3 + 7x^2 - 5x + 3$ (Descending polynomial)

Like Terms : वह सभी terms जिनके variables तथा exponents same होते हैं like terms कहलाती है अन्यथा उन्हें unlike terms की category में रखा जाता है।

Example :

(i) $3x^2, 5x^2, -7x^2$ - Like terms

(ii) $5x^2y, 3xy^2, 7x^4$ - Unlike terms.

Mathematical operations on two or more polynomials.

(i) Rule for addition and subtraction.

दो या दो से अधिक polynomials की like terms को ही आपस में add या subtract किया जा सकता है। Unlike terms में addition तथा subtraction करने पर terms same रहती है सिर्फ subtraction में उनका चिह्न बदल जाता है।

Ex. (i) Add

$$\begin{array}{r} 3x^2 - 5xy + 7y^2 - 3x \\ 5x^2 - 7xy + 3y^2 \\ + \quad x^2 - 2xy \quad + 8x \\ \hline 9x^2 - 14xy + 10y^2 + 5x \end{array}$$

(ii) Subtract $3x^2 + 5x + 7$ from $5x^2 + 9x + 8$

Sol. :

$$\begin{array}{r} 5x^2 + 9x + 8 \\ 3x^2 + 5x + 7 \\ - \quad - \quad - \\ \hline 2x^2 + 4x + 1 \end{array}$$

Sign convention :

Algebraic expression में sign convention बहुत important होता है। इन rules को ध्यान से समझें।

Rule I : (+) + (+) = Add करें और sign (+) का आएगा

Ex. : $2x + 3x = 5x$

Rule II : (+) + (-) = Subtract करें और sign हमेशा बड़ी संख्या के sign जैसा होगा।

Ex. (i) $4x^2 - 9x^2 = -5x^2$ (- sign क्योंकि संख्या 9 बड़ी है और इसका sign (-) का है)।

(ii) $15x^2 - 10x^2 = 5x^2$ (+ sign क्योंकि संख्या 15 बड़ी है और इसका sign (+) का है)

Rule III : (-) + (-) = Add करें और sign (-) का होगा।

Ex. (i) $-4x^2 - 9x^2 = -13x^2$

Rule for Multiplication :

(i) Like signs वाली दो values को multiply करने पर sign +ve होता है तथा unlike sign की दो values को multiply करने पर sign negative होता है।

For Ex. $5 \times 4 = 20$ (like signs)

$$-5 \times -4 = 20 \text{ (like signs)}$$

$$5 \times -4 = -20 \text{ (unlike signs)}$$

(ii) जब दो या दो से ज्यादा variables को multiply करते हैं तथा उनके base same हो तो powers add हो जाती है।

like $x^m \times x^n = x^{m+n}$ (Bases are same)

Ex. $7x^3 \times -5x^4 = -35x^7$

$$(2x^2 - 5)(3x + 3) = 6x^3 + 6x^2 - 15x - 15$$

Division of a polynomial by a polynomial एक polynomial को दूसरे से तब तक हम divide करते हैं जब तक की remainder zero या remainder lowest form में न आ जाए।

Example

$$\begin{array}{r} 5x^2 - 9x + 3 \\ 2x^2 + 7x - 1 \overline{) 10x^4 + 17x^3 - 62x^2 + 3x - 5} \\ \underline{10x^4 + 35x^3 - 5x^2} \\ -18x^3 - 57x^2 + 3x - 5 \\ \underline{-18x^3 - 63x^2 + 9x} \\ 6x^2 - 6x - 5 \\ \underline{6x^2 + 21x - 3} \\ -27x - 2 \end{array}$$

Remember :

Dividend = Divisor Quotient + Remainder

भाज्य = भाजक भागफल + शेष

Division method से remainder पता करने में बहुत समय लगता है इसलिए remainder theorem का प्रयोग किया जाता है।

जब किसी polynomial (degree ≥ 1) को $x - a$ से divide किया जाए तो सबसे आसान तरीका है इसका remainder निकालने का

(i) $x - a = 0$ ($x - a$ को zero put करें)

$$\Rightarrow x = a$$

अब $x = a$ की value polynomial में $p(x)$ के जगह रख दें।

यदि $p(a) = 0$ हो तो $x - a$ दिए गए polynomial का factor होगा; नहीं तो factor नहीं होगा।

Ex.1. Without actual division, find the remainder when $x^4 - 3x^3 + 4x^2 - 6x + 7$ is divided by $x - 1$ / बिना भाग की क्रिया किये शेषफल पता करें जब $x^4 - 3x^3 + 4x^2 - 6x + 7$ को $x - 1$ से भाग दिया जाता है।

Sol. यहाँ $(x - 1)$ divisor है

इसलिए, $x = 1$

$$\therefore (x-1) \text{ से divide करने पर remainder} = P(1)$$

$$\therefore P(1) = (1)^4 - 3(1)^3 + 4(1)^2 - 6(1) + 7 = 1 - 3 + 4 - 6 + 7 = 3$$

Ex.2. If the expressions $Px^3 + 3x^2 - 3$ and $2x^3 - 5x + P$ when divided by $x - 4$ leave same remainder. Find the value of P / यदि expressions $Px^3 + 3x^2 - 3$ और $2x^3 - 5x + P$ को जब $x - 4$ से divide किया जाता है तो remainder समान आता है। P का मान क्या है?

Sol. Remainders होंगे

$$R_1 = f(4) = P(4)^3 + 3(4)^2 - 3 = 64P + 45$$

$$R_2 = f(4) = 2(4)^3 - 5(4) + P = P + 108$$

∴ जबकि, $R_1 = R_2$, इसलिए

$$64P + 45 = P + 108$$

$$\text{or, } 63P = 63 \Rightarrow P = 1$$

Divisibility की Conditions.

- (i) $x^n + a^n$ तब ही $(x + a)$ से divisible होगा। जब n की value odd होगी।
- (ii) $x^n + a^n, (x + a)$ से divisible नहीं होगा जब n की value even होगी।
- (iii) $x^n + a^n, (x - a)$ से कभी divisible नहीं होगा।
- (iv) $x^n - a^n, (x + a)$ से तभी divisible होगा जब n की value even होगी।
- (v) $x^n - a^n, (x - a)$ से हमेशा divisible होगा चाहे n odd हो या even.

FACTORIZING A POLYNOMIAL

List of Important Formulae :

- (1) $(a + b)^2 = a^2 + 2ab + b^2$
- (2) $(a - b)^2 = a^2 - 2ab + b^2$
- (3) $(a + b)^2 = (a - b)^2 + 4ab$
- (4) $(a - b)^2 = (a + b)^2 - 4ab$
- (5) $a^2 - b^2 = (a + b)(a - b)$
- (6) $a^2 + b^2 = (a + b)^2 - 2ab$
- (7) $a^2 + b^2 = (a - b)^2 + 2ab$
- (8) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$
- (9) $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
- (10) $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
- (11) $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
- (12) $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$
- (13) $a^3 + b^3 = (a + b)^3 - 3ab(a + b)$
- (14) $a^3 - b^3 = (a - b)^3 + 3ab(a - b)$
- (15) $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac)$
 $= (a + b + c) \frac{1}{2} (2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ac)$
 $= \frac{1}{2} (a + b + c) [(a - b)^2 + (b - c)^2 + (c - a)^2]$
- (16) $(a + b + c)^3 = a^3 + b^3 + c^3 + 3(b + c)(c + a)(a + b)$
- (17) यदि $a^3 + b^3 + c^3 = 3abc$
 तब (i) $a + b + c = 0$
 (ii) $\frac{1}{2} [(a - b)^2 + (b - c)^2 + (c - a)^2] = 0$
 $\Rightarrow a = b = c$
- (18) $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$
- (19) $(a + b)^2 - (a - b)^2 = 4ab$
- (20) $a^4 + b^4 + a^2b^2 = (a^2 + b^2 + ab)(a^2 + b^2 - ab)$
- (21) $a^4 - b^4 = (a + b)(a - b)(a^2 + b^2)$
- (22) $a^8 - b^8 = (a - b)(a + b)(a^2 + b^2)(a^4 + b^4)$

Some Important Results :

(A)

यदि $x + \frac{1}{x} = a$ हो तो

(1) यदि $a = 2$ तो $x^n + \frac{1}{x^n} = 2$

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

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

(4) $x^4 + \frac{1}{x^4} = (a^2 - 2)^2 - 2$

(5) $x^5 + \frac{1}{x^5} = (a^3 - 3a)(a^2 - 2) - a = a^5 - 5a^3 + 5a$

(6) $x^6 + \frac{1}{x^6} = (a^3 - 3a)^2 - 2$

(7) $x^7 + \frac{1}{x^7} = \{(a^2 - 2)^2 - 2\} \times (a^3 - 3a) - a$

(8) $x^8 + \frac{1}{x^8} = \{(a^2 - 2)^2 - 2\}^2 - 2$

(B)

यदि $x - \frac{1}{x} = a$ हो तो

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

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

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

(4) $x^5 - \frac{1}{x^5} = (a^3 + 3a)(a^2 + 2) - a = a^5 + 5a^3 + 5a$

(5) $x^7 - \frac{1}{x^7} = \{a^2 + 2\}^2 - 2 \times (a^3 + 3a) + a$

Example For A :

If $x + \frac{1}{x} = 3$ then find that

(i) $x^2 + \frac{1}{x^2} = 3^2 - 2 = 7$

$$(ii) x^3 + \frac{1}{x^3} = 3^3 - 3 \times 3 = 18$$

$$(iii) x^4 + \frac{1}{x^4} = (3^3 - 2)^2 - 2 \\ = (7)^2 - 2 \\ = 49 - 2 = 47$$

$$(iv) x^5 + \frac{1}{x^5} = (3^3 - 3 \times 3) (3^2 - 2) - 3 \\ = 18 \times 7 - 3 \\ = 123$$

$$(v) x^6 + \frac{1}{x^6} = (3^3 - 3 \times 3)^2 - 2 \\ = (18)^2 - 2 \\ = 322$$

$$(vi) x^7 + \frac{1}{x^7} = \{(3^2 - 2)^2 - 2\} \times (3^3 - 3 \times 3) - 3 \\ = (49 - 2) (27 - 9) - 3 \\ = 47 \times 18 - 3 \\ = 846 - 3 = 843$$

$$(vii) x^8 + \frac{1}{x^8} = \{(3^2 - 2)^2 - 2\}^2 - 2 \\ = (49 - 2)^2 - 2 \\ = (47)^2 - 2 \\ = 2209 - 2 = 2207$$

Example For B :

If $x - \frac{1}{x} = 4$ then find that

$$(i) x^2 + \frac{1}{x^2} = 4^2 + 2 = 18$$

$$(ii) x^3 - \frac{1}{x^3} = 4^3 + 3 \times 4 = 76$$

$$(iii) x^4 + \frac{1}{x^4} = (4^2 + 2)^2 - 2 \\ = 324 - 2 \\ = 322$$

$$(iv) x^5 - \frac{1}{x^5} = (4^3 + 3 \times 4) (4^2 + 2) - 4 \\ = (76 \times 18) - 4 \\ = 1368 - 4 = 1364$$

$$(v) x^7 - \frac{1}{x^7} = \{(4^2 + 2)^2 - 2\} \times \{4^3 + 3 \times 4\} + 4 \\ = (324 - 2) (64 + 12) + 4 \\ = (322 \times 76) + 4 \\ = 24472 + 4 = 24476$$

$$(1) \text{ यदि } x^4 + \frac{1}{x^4} = a, \text{ तब}$$

$$(i) x^2 + \frac{1}{x^2} = \sqrt{a+2} = b$$

$$(ii) x + \frac{1}{x} = \sqrt{b+2}$$

$$(iii) x - \frac{1}{x} = \sqrt{b-2}$$

$$\text{Ex. यदि } x^4 + \frac{1}{x^4} = 119$$

$$\therefore x^2 + \frac{1}{x^2} = \sqrt{119+2} = 11$$

$$x + \frac{1}{x} = \sqrt{11+2} = \sqrt{13}; x - \frac{1}{x} = \sqrt{11-2} = 3$$

$$(2) \text{ यदि } x + \frac{1}{x} = 2, \text{ तब } x = 1 \text{ होगा}$$

$$(3) \text{ If } x + \frac{1}{x} = -2 \text{ तब } x = -1 \text{ होगा}$$

$$(4) x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right)$$

$$(5) x^3 - \frac{1}{x^3} = \left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right)$$

$$(6) \text{ यदि } x + \frac{1}{x} = 1, \text{ तब } x^3 = -1$$

$$(7) \text{ यदि } x + \frac{1}{x} = -1 \text{ तब } x^3 = 1,$$

$$(8) \text{ यदि } x + \frac{1}{x} = \sqrt{3} \text{ या } \left(x + \frac{1}{x}\right)^2 = 3$$

$$\text{तब } x^3 + \frac{1}{x^3} = 0 \quad x^6 = -1$$

$$\text{या} \\ x^6 + 1 = 0$$

Ex. यदि $x + \frac{1}{x} = 6$ हो, तो इन सबकी value निकालिए

$$(i) x^2 + \frac{1}{x^2} \quad (ii) x^4 + \frac{1}{x^4} \quad (iii) x^8 + \frac{1}{x^8}$$

$$\text{Sol. } x^2 + \frac{1}{x^2} = 6^2 - 2 = 34$$

$$x^4 + \frac{1}{x^4} = 34^2 - 2 = 1154$$

$$x^8 + \frac{1}{x^8} = 1154^2 - 2 = 1331714$$

Quadratic equation and its Roots

(द्विघात समीकरण तथा इसके मूल)

Quadratic equation (द्विघात समीकरण):— कोई समीकरण $ax^2 + bx + c = 0$ के form में हो जहाँ $a \neq 0$ तथा a, b, c सभी Real Numbers हो तो वह समीकरण Quadratic equation कहलाता है।

where,
 $a =$ coefficient of x^2
 $b =$ coefficient of x
 $c =$ constant (अचर राशि)

For Ex—

$$\left. \begin{aligned} (i) 4x^2 - 3x + 1 &= 0 \\ (ii) 3x^2 - 2x + 4 &= 0 \\ (iii) 9x^2 - 3x + \frac{1}{2} &= 0 \end{aligned} \right\} \text{are Quadratic eq}^n.$$

Note : वैसा equation जिसका power (degree), rational Numbers या Negative Integers में हो वह Quadratic eqⁿ. के अन्तर्गत नहीं आयेगा

For Ex—

$$\left. \begin{aligned} (1) 4x^{-2} + 3x + 2 &= 0 \\ (2) 5x^{\frac{3}{4}} + 2x^{-1} + 1 &= 0 \end{aligned} \right\} \text{are not Quadratic eq}^n.$$

Roots of Quadratic equation (द्विघात समीकरण के मूल):

Quadratic eqⁿ ($ax^2 + bx + c = 0$) के दो Roots α तथा β होते हैं

where,

$$\alpha = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad \& \quad \beta = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

$$\text{Sum of Root : } \alpha + \beta = \frac{-b}{a}$$

$$\text{Product of Root : } \alpha\beta = \frac{c}{a}$$

$$ax^2 + bx + c = 0$$

$$\Rightarrow x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

$$x^2 - \left(\frac{-b}{a}\right)x + \frac{c}{a} = 0$$

$$\boxed{x^2 - (\text{Sum of Root})x + \text{Product of Root} = 0}$$

- * अगर, α और β एक दूसरे के Reciprocal हैं तब,
 $a = c$
- * अगर, α और β magnitude में Equal हैं और Sign opposite है तब,
 $b = 0$
- * अगर, a, b, c Rational number हैं तब
 पहला Root $= a + \sqrt{b}$, दूसरा Root $= a - \sqrt{b}$
मूलों की प्रकृति (Nature of Roots) :-
 Quadratic eqⁿ ($ax^2 + bx + c = 0$) के Discriminant विवेचक या विविक्तकर) होंगे
 $D = b^2 - 4ac$

Conditions (शर्तें)

- (i) $D < 0$ तो roots Real नहीं होंगे अर्थात् roots Imaginary होंगे।
- (ii) $D = 0$ तो roots Real तथा equal होंगे
- (iii) $D > 0$ तो roots Real तथा unequal (असमान) होंगे

Note : यदि D का Value एक Perfect Square Number आता है, तो roots Rational (परिमेय) होगा अन्यथा Irrational (अपरिमेय)

For ex—

The roots of $2x^2 - 6x + 3 = 0$ are—
 समीकरण $2x^2 - 6x + 3 = 0$ के मूल होंगे

- (a) Real, Unequal and rational (वास्तविक, समान तथा परिमेय)
- (b) Real, Unequal and Irrational (वास्तविक, असमान तथा अपरिमेय)
- (c) Real and equal (वास्तविक तथा समान)
- (d) Imaginary (काल्पनिक)

Sol.(b) Given,

$$2x^2 - 6x + 3 = 0$$

$$a = 2, b = -6, c = 3$$

So,

$$\begin{aligned} D &= b^2 - 4ac \\ &= (-6)^2 - 4 \times 2 \times 3 \\ &= 36 - 24 \\ &= 12 \end{aligned}$$

Here; $D > 0$ and D is not a Perfect square so roots are real, unequal and Irrational.

2. The roots of $3x^2 + 7x + 2 = 0$ are—

- (a) Real, unequal and rational (वास्तविक, समान तथा परिमेय)
- (b) Real, unequal and Irrational (वास्तविक, असमान तथा अपरिमेय)
- (c) Real and equal (वास्तविक तथा समान)
- (d) Imaginary (काल्पनिक)

Sol. (a) $3x^2 + 7x + 2 = 0$

$$D = (7)^2 - 4 \times 3 \times 2 = 49 - 24 = 25$$

$D > 0$ and D is a Perfect Square

hence, roots of given eqⁿ are real, unequal and rational.

Ex. (1). Find the Quadratic Equation whose one Root is $5 + \sqrt{5}$

Sol. 1st Root $= 5 + \sqrt{5}$

$$\text{2nd Root} = 5 - \sqrt{5}$$

$$\text{Sum} = (5 + \sqrt{5}) + (5 - \sqrt{5}) = 10$$

$$\text{Product} = (5 + \sqrt{5})(5 - \sqrt{5}) = 20$$

$$x^2 - (\text{sum of Root})x + \text{Product of Root} = 0$$

$$x^2 - 10x + 20 = 0$$

Ex. (2) Which of the following equations has real roots?

निम्न में से कौन-सा समीकरण का मूल वास्तविक है?

- (a) $3x^2 + 4x + 5 = 0$
 (b) $x^2 + x + 4 = 0$
 (c) $(x - 1)(2x - 5) = 0$
 (d) $2x^2 - 3x + 4 = 0$

Sol.(c) The eqⁿ has Real roots If $b^2 - 4ac > 0$

option (a) $3x^2 + 4x + 5 = 0$

$$D = (4)^2 - 4 \times 3 \times 5$$

$$= -44 \quad (D < 0)$$

option (b) $x^2 + x + 4 = 0$

$$D = (1)^2 - 4 \times 1 \times 4$$

$$= 1 - 16$$

$$= -15 \quad (D < 0)$$

option (c) $(x - 1)(2x - 5) = 0$

$$2x^2 - 7x + 5 = 0$$

$$\therefore D = (-7)^2 - 4 \times 2 \times 5$$

$$= 9 \quad (D > 0)$$

option (d) $2x^2 - 3x + 4 = 0$

$$D = (-3)^2 - 4 \times 2 \times 4$$

$$= -23 < 0$$

option (c) is Right answer.

Ex (3). If the sum of the squares of the roots of $x^2 - (P - 2)x - (P + 1) = 0$ (where, $P \in \mathbb{R}$) is 5, then what is the value of P?

यदि $x^2 - (P - 2)x - (P + 1) = 0$ (जहाँ $P \in \mathbb{R}$) समीकरण के मूलों के वर्गों का योग 5 है तो P का मान क्या होगा?

- (A) 0 (B) -1 (C) 1 (D) $\frac{3}{2}$

Sol.(c) Given,

$$x^2 - (P - 2)x - (P + 1) = 0$$

$$\therefore \alpha + \beta = (P - 2), \quad \alpha\beta = -(P + 1)$$

According to Question

$$\alpha^2 + \beta^2 = 5$$

$$\Rightarrow (\alpha + \beta)^2 - 2\alpha\beta = 5$$

$$\Rightarrow (P - 2)^2 + 2(P + 1) = 5$$

$$\Rightarrow (P^2 - 4P + 4 + 2P + 2) = 5$$

$$\Rightarrow P^2 - 2P + 1 = 0$$

$$\Rightarrow (P - 1)^2 = 0$$

$$\therefore P = 1$$

Ex (4). If α and β are the roots of the equation $ax^2 + bx + b = 0$ then what is the value of

$$\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{b}{a}} = ?$$

यदि α तथा β दिये गये समीकरण $ax^2 + bx + b = 0$ के मूल हैं

तो $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{b}{a}}$ का मान क्या होगा?

- (A) -1 (B) 0 (C) 1 (D) 2

Sol.(b) Given,

$$ax^2 + bx + b = 0$$

$$\therefore \alpha + \beta = \frac{-b}{a} \quad \text{and} \quad \alpha\beta = \frac{b}{a}$$

Now, we have

$$\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{b}{a}}$$

$$= \frac{\alpha + \beta}{\sqrt{\alpha\beta}} + \sqrt{\frac{b}{a}} = \frac{-b}{a} \times \sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} = -\sqrt{\frac{b}{a}} + \sqrt{\frac{b}{a}} = 0$$

Ex (5). If $x = a^2 + b^2$, $y = \sqrt{2} ab$ then find the value of

$$\frac{a^4 + b^4}{a^2 - \sqrt{2}ab + b^2} ?$$

यदि $x = a^2 + b^2$ तथा $y = \sqrt{2} ab$ तो $\frac{a^4 + b^4}{a^2 - \sqrt{2}ab + b^2}$ का

मान होगा-

- (A) $x - y$ (B) $2xy$ (C) xy (D) $x + y$

Sol.(D) $\frac{a^4 + b^4}{a^2 - \sqrt{2}ab + b^2} = \frac{(a^2)^2 + (b^2)^2}{(a^2 + b^2 - \sqrt{2}ab)}$

$$= \frac{(a^2 + b^2)^2 - (\sqrt{2}ab)^2}{(a^2 + b^2 - \sqrt{2}ab)} = \frac{x^2 - y^2}{x - y}$$

$$= x + y$$

Ex (6). If $x^2 + x = 5$ then find the value of $(x + 3)^3 +$

$$\frac{1}{(x + 3)^3} ?$$

यदि $x^2 + x = 5$ तो $(x + 3)^3 + \frac{1}{(x + 3)^3}$ का मान ज्ञात करें?

- (A) 250 (B) 150 (C) 110 (D) 220

Sol. (c) : Let $P = x + 3$

$$\therefore x = P - 3$$

we have,

$$x^2 + x = 5$$

$$\Rightarrow (P - 3)^2 + (P - 3) = 5$$

$$\Rightarrow P^2 + 9 - 6P + P - 3 = 5$$

$$\Rightarrow P^2 - 5P + 1 = 0$$

$$\Rightarrow P^2 + 1 = 5P$$

$$\therefore P + \frac{1}{P} = 5$$

Now

$$P^3 + \frac{1}{P^3} = 5^3 - 3 \times 5 = 110$$

put the value of P

$$(x + 3)^3 + \frac{1}{(x + 3)^3} = 110.$$

Ex (7). If $x^2 + y + z$, $y^2 = x + z$, $z^2 = x + y$ then what is

the value of $\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$?

यदि $x^2 = y + z$, $y^2 = x + z$, $z^2 = x + y$ तो

$\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$ का मान क्या होगा?

- (A) 1 (B) 0 (C) -1 (D) 2

Sol. (a) Given, $x^2 = y + z$

Adding Both sides by x

$$x^2 + x = x + y + z$$

$$\Rightarrow x(x + 1) = x + y + z$$

$$\frac{x}{x + y + z} = \frac{1}{x + 1}$$

$$\therefore \frac{1}{x + 1} = \frac{x}{x + y + z}$$

Similarly, $\frac{1}{y + 1} = \frac{x}{x + y + z}$

$$\frac{1}{z + 1} = \frac{z}{x + y + z}$$

Now,

$$\frac{1}{x + 1} + \frac{1}{y + 1} + \frac{1}{z + 1}$$

$$= \frac{x}{x + y + z} + \frac{y}{x + y + z} + \frac{z}{x + y + z} = \frac{x + y + z}{x + y + z} = 1.$$

Ex (8). If $ab - b + 1 = 0$ and $bc - c + 1 = 0$, then what is $(a - ac)$ equal to?

यदि $ab - b + 1 = 0$ तथा $bc - c + 1 = 0$ तो $(a - ac)$ किसके बराबर हैं?

- (A) -1 (B) 0 (C) 1 (D) 2

Sol. (c) : Given $ab - b + 1 = 0$

$$\Rightarrow b(a - 1) = -1$$

$$\therefore b = \frac{-1}{a - 1} = \frac{1}{1 - a}$$

and, $bc - c + 1 = 0 \Rightarrow bc = c - 1 \dots (1)$

Now, Put the value of b in eqⁿ

$$bc = c - 1$$

$$\Rightarrow \frac{1}{1 - a} \times c = c - 1$$

$$\Rightarrow c = (c - 1)(1 - a)$$

$$\Rightarrow c = c - 1 - ac + a$$

$$\therefore a - ac = 1$$

Ex (9). If $y + \frac{1}{z} = 1$ and $x + \frac{1}{y} = 1$. What is the Value of xyz ?

यदि $y + \frac{1}{z} = 1$ तथा $x + \frac{1}{y} = 1$ तो xyz का मान क्या होगा?

- (A) 1 (B) -1 (C) 0 (D) $\frac{1}{2}$

Sol. (b) Given $y + \frac{1}{z} = 1$

$$\Rightarrow \frac{1}{z} = 1 - y \therefore z = \frac{1}{1 - y} \text{ and, } x + \frac{1}{y} = 1$$

$$x = 1 - \frac{1}{y} = \frac{y - 1}{y} = \frac{-(1 - y)}{y}$$

$$\text{Now, } xyz = \frac{-(1 - y)}{y} \times y \times \frac{1}{(1 - y)} = -1.$$

Ex (10). If a, b, c , are all positive then the minimum value of the expression

$$\frac{(a^2 + a + 1)(b^2 + b + 1)(c^2 + c + 1)}{abc} \text{ is:}$$

यदि a, b, c , सभी घनात्मक हो तो व्यंजक

$$\frac{(a^2 + a + 1)(b^2 + b + 1)(c^2 + c + 1)}{abc} \text{ का न्यूनतम मान क्या}$$

होगा?

- (A) 3 (B) 9 (C) 27 (D) 1

Sol. (c) Expression का Minimum Value होगा

जब $a = b = c$

$$\therefore \text{Min. Value} = \frac{(1 + 1 + 1)}{1} \times \frac{(1 + 1 + 1)}{1} \times \frac{(1 + 1 + 1)}{1} \\ = 3 \times 3 \times 3 \\ = 27$$

Condition for Common Roots :-

Let the two quadratic Equation be

$$(i) p_1x^2 + q_1x + r_1 = 0$$

$$(ii) p_2x^2 + q_2x + r_2 = 0$$

अगर एक Root Common हो, तब

$$(p_1q_2 - p_2q_1)(q_1r_2 - q_2r_1) = (r_1p_2 - r_2p_1)^2$$

अगर दो Roots common हो, तब

$$\frac{p_1}{p_2} = \frac{q_1}{q_2} = \frac{r_1}{r_2}$$

* Quadratic equation की maximum तथा minimum value

(i) जब $a > 0$ हो तब

$$\text{minimum (न्यूनतम) value} = \frac{4ac - b^2}{4a}$$

(ii) जब $a < 0$ हो तब

$$\text{maximum (अधिकतम) value} = \frac{4ac - b^2}{4a}$$

(iii) यदि x, y दिए हो तो, $x + y$ की value minimum होगी जब $x = y$ होगा।

Examples :

- $x + y$ की minimum value निकालें, यदि $xy = 16$
Minimum value के लिए
 $x = y = 4$
 \Rightarrow Minimum value $x + y = 4 + 4 = 8$
- यदि $x + y + z = 24$ हो तो $(x - 1)(y - 2)(z + 3)$ की maximum value बताएँ ?

Sol. maximum value के लिए

$$(x-1) = (y-2) = (z+3) = m$$

$$\Rightarrow x = m + 1$$

$$y = m + 2$$

$$z = m - 3$$

$$x + y + z = 24$$

x, y तथा z की value equation में रखने पर $m + 1 + m + 2 + m - 3 = 24$

$$\Rightarrow m = 8$$

$$\therefore \text{maximum value} = m^3 = 8^3 = 512$$

3 The minimum value of $(x-2)(x-9)$ is ?

$(x-2)(x-9)$ का न्यूनतम मान क्या है?

Sol. Expression = $(x-2)(x-9)$

$$= x^2 - 11x + 18 = ax^2 + bx + c$$

$$\text{Minimum value} = \frac{4ac - b^2}{4a} \quad (a > 0)$$

$$= \frac{4 \times 1 \times 18 - 121}{4} = \frac{-49}{4}$$

4. If x is real, then the minimum value of $(x^2 - x + 1)$ is ?

यदि x एक वास्तविक संख्या है, तो $(x^2 - x + 1)$ का निम्नतम मान होगा-

Sol. Expression $ax^2 + bx + c, a > 0$ के लिए minimum

$$\text{value} = \frac{4ac - b^2}{4a}$$

Here, for $x^2 - x + 1, a = 1, b = -1, c = 1$

$$\therefore \text{Minimum value} = \frac{4 \times 1 \times 1 - 1}{4 \times 1} = \frac{3}{4}$$

5. Find the value of x for which the expression $2 - 3x - 4x^2$ has the greatest value.

x का मान ज्ञात कीजिए जिसके लिए व्यंजक $2 - 3x - 4x^2$ का महत्तम मान है-

Sol. Expression = $2 - 3x - 4x^2 = -(4x^2 + 3x - 2)$

$$= - \left[(2x)^2 + 2 \times 2x \times \frac{3}{4} + \left(\frac{3}{4}\right)^2 - \left(\frac{3}{4}\right)^2 - 2 \right]$$

$$= - \left[\left(2x + \frac{3}{4}\right)^2 + \left(\frac{3}{4}\right)^2 + 2 \right]$$

Expression का मान maximum होगा यदि

$$2x + \frac{3}{4} = 0 \Rightarrow 2x = -\frac{3}{4}$$

$$\Rightarrow x = -\frac{3}{8}$$

Method to Find Maximum & Minimum value by using Differentiation.

(i) Take Differentiation of given equation

$$\text{i.e. } x^n = nx^{n-1}$$

$$x^3 = 3x^2$$

$$x^2 = 2x$$

(ii) Put Differentiation = 0, then Final value of x .

(iii) x का मान Equation में रखें और Maximum & Minimum value ज्ञात करें।

Note :

Quadratic Equation को Differentiate करने के बाद x का coefficient अगर +ve रहे तो Minimum value निकलेगा, x का coefficient -ve रहे तो Maximum value निकलेगा।

Ex. $y = x^2 - 6x + 10$

$$\frac{dy}{dx} = 2x - 6 + 0$$

$$\frac{dy}{dx} = 0$$

$$2x - 6 = 0$$

$$x = \frac{6}{2} = 3 \quad (y \text{ में रखने पर Minimum value निकलेगा,}$$

x का coefficient + ve है)

$$\therefore \text{Minimum value} = x^2 - 6x + 10 \\ = (3)^2 - 6 \times 3 + 10 \\ = 1$$

* **How to Find Minimum value, अगर Expression**

$$x^2 + \frac{1}{x^2}, \text{ जहाँ } x \in \mathbb{R} \text{ या } x + \frac{1}{x}, x \text{ Positive रहे}$$

$$x^2 + \frac{1}{x^2} = \left(x - \frac{1}{x}\right)^2 + 2$$

$$\text{So, Minimum value} = 2, \text{ जब } x - \frac{1}{x} = 0 \Rightarrow x^2 = 1$$

Ex. Find the minimum value of $x^2 + \frac{1}{x^2} - 5$

$$\text{Sol. } x^2 + \frac{1}{x^2} - 5 = 2 - 5 = -3$$

* अगर $x + y$ दिया है, तब xy Maximum होगा

जब $x = y$

$$\text{e.g. } x + y = k \text{ (given)}$$

$$x = y = \frac{K}{2}$$

$$xy = \frac{K}{2} \times \frac{K}{2} = \frac{K^2}{4} \text{ (Maximum)}$$

Ex. If $x + y = 8$, then Maximum value of xy

$$\text{Sol. } x = y = \frac{8}{2} = 4$$

$$xy = 4 \times 4 = 16$$

* अगर xy दिया है, तब $x + y$ Minimum होगा

जब $x = y$ (x & y are positive Numbers)

$$\text{e.g. } xy = 64 \text{ (given)}$$

$$x = y = K$$

$$K.K = 64$$

$$K^2 = 64$$

$$K = 8$$

$$\therefore x + y = 8 + 8 = 16 \text{ (Minimum)}$$

PREVIOUS YEARS' QUESTIONS

Type-1

Based on Square and Cubic Formulae

1. If $a = 23$ and $b = -29$ then the value of $25a^2 + 40ab + 16b^2$ is :

यदि $a = 23$ तथा $b = -29$ हो, तो $25a^2 + 40ab + 16b^2$ का मान क्या होगा ?

- (1) 1 (2) -1 (3) 0 (4) 2

(SSC Assistant Grade-III Exam.05.02.2012 (Paper-I))

2. If $a + b = 5$, $a^2 + b^2 = 13$, then the value of $(a - b)$ (where $a > b$)—

यदि $a + b = 5$, $a^2 + b^2 = 13$, तो $a - b$ का मान बताएँ (जहाँ $a > b$)—

- (1) 1 (2) -2 (3) 2 (4) -1

(SSC COP SI Assistant Intelligence Officer Exam, 2012)

3. Factors of $48x^3 - 8x^2 - 93x - 45$ are ?

$48x^3 - 8x^2 - 93x - 45$ के गुणखंड क्या हैं?

- (1) $(4x + 3)(4x - 3)(3x - 5)$
 (2) $(4x - 3)(4x - 3)(3x - 5)$
 (3) $(4x + 3)(4x + 3)(3x - 5)$
 (4) $(4x - 3)(4x + 3)(3x + 5)$

(SSC CHSL - 2017)

4. Which of the following is not a quadratic equation?

इनमें से कौन-सा एक द्विघात समीकरण नहीं है?

- (1) $2x(x + 4) - 11 = x(x - 3) + 6$
 (2) $4x(x + 4) - 11 = 5x(x - 3) + 5$
 (3) $x(x + 2) - 15 = x(x - 5) + 11$
 (4) $2x^2 + 8x - 11 = 0$

(SSC CHSL-2017)

5. If $a^2 + b^2 + \frac{1}{a^2} + \frac{1}{b^2} = 4$, then the value of $a^2 + b^2$:

यदि $a^2 + b^2 + \frac{1}{a^2} + \frac{1}{b^2} = 4$ हो, तो $a^2 + b^2$ का मान होगा :

- (1) 1 (2) $1\frac{1}{2}$ (3) 2 (4) $2\frac{1}{2}$

(SSC CGL Tier-II Exam, 01.08.2010)

6. For positive numbers a and b if $a^2 + b^2 = 24$ and $ab = 6$, then $(a^3 + b^3)$ will equal to :

दो धनात्मक संख्याओं a तथा b के लिए, यदि $a^2 + b^2 = 24$ तथा $ab = 6$ है तो $(a^3 + b^3)$ बराबर होगा—

- (1) 96 (2) 100 (3) 102 (4) 108

(SSC SAS Exam, 27.06.2010)

7. If $x^3 + y^3 = 35$ and $x + y = 5$, then the value of $\frac{1}{x} + \frac{1}{y}$ will be :

यदि $x^3 + y^3 = 35$ तथा $x + y = 5$ हो, तो $\frac{1}{x} + \frac{1}{y}$ का मान क्या होगा?

- (1) $\frac{1}{3}$ (2) $\frac{5}{6}$ (3) 6 (4) $\frac{2}{3}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting))

8. If $x - y = \frac{x + y}{7} = \frac{xy}{4}$, the numerical value of xy is

यदि $x - y = \frac{x + y}{7} = \frac{xy}{4}$ हो, तो xy का मान कितना होगा ?

- (1) $\frac{4}{3}$ (2) $\frac{3}{4}$ (3) $\frac{1}{4}$ (4) $\frac{1}{3}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (1st Sitting (East Zone)))

9. If $a^2 = 2$, then $(a + 1)$ equal to :

यदि $a^2 = 2$ हो, तो $(a + 1)$ बराबर होगा :

- (1) $a - 1$ (2) $\frac{2}{a - 1}$ (3) $\frac{a + 1}{3 - 2a}$ (4) $\frac{a - 1}{3 - 2a}$

(SSC CGL Tier-II Exam, 01.08.2010)

10. If $x = b + c - 2a$, $y = c + a - 2b$, $z = a + b - 2c$, then the value of $x^2 + y^2 - z^2 + 2xy$ is

यदि $x = b + c - 2a$, $y = c + a - 2b$, $z = a + b - 2c$, हो, तो $x^2 + y^2 - z^2 + 2xy$ का मान क्या होगा?

- (1) 0 (2) $a + b + c$
 (3) $a - b + c$ (4) $a + b - c$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (1st Sitting (East Zone)))

11. If $x^2 + y^2 - 2x + 6y + 10 = 0$, then the value of $x^2 + y^2$:

यदि $x^2 + y^2 - 2x + 6y + 10 = 0$ हो, तो $(x^2 + y^2)$ का मान होगा :

- (1) 4 (2) 6 (3) 8 (4) 10

(SSC CGL Tier-II Exam, 01.08.2010)

12. If $a + b + c = 27$, then what is the value of $(a - 7)^3 + (b - 9)^3 + (c - 11)^3 - 3(a - 7)(b - 9)(c - 11)$?

यदि $a + b + c = 27$, तो $(a - 7)^3 + (b - 9)^3 + (c - 11)^3 - 3(a - 7)(b - 9)(c - 11)$ का मान क्या है?

- (1) 0 (2) 9 (3) 27 (4) 81
(SSC CGL - 2017)

13. If $\frac{x^2}{yz} + \frac{y^2}{zx} + \frac{z^2}{xy} = 3$ then What is the Value of $(x + y + z)^3$?

यदि $\frac{x^2}{yz} + \frac{y^2}{zx} + \frac{z^2}{xy} = 3$ तो $(x + y + z)^3$ का मान क्या है?

- (1) 0 (2) 1 (3) 2 (4) 3
(SSC CGL - 2017)

14. If $x = a - b$, $y = b - c$, $z = c - a$, then the numerical value of the algebraic expression $x^3 + y^3 + z^3 - 3xyz$ will be

यदि $x = a - b$, $y = b - c$, $z = c - a$ हो, तो बीजीय व्यंजक $x^3 + y^3 + z^3 - 3xyz$ का संख्यात्मक मान क्या होगा ?

- (1) $a + b + c$ (2) 0
(3) $4(a + b + c)$ (4) $3abc$
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

15. If $a(a + b + c) = 45$, $b(a + b + c) = 75$ and $c(a + b + c) = 105$, then what is the value of $(a^2 + b^2 + c^2)$?

यदि $a(a + b + c) = 45$, $b(a + b + c) = 75$ तथा $c(a + b + c) = 105$ तो $(a^2 + b^2 + c^2)$ का मान क्या होगा?

- (1) 78 (2) 83 (3) 217 (4) 225
(SSC CGL - 2017)

16. If $a = 1.21$, $b = 2.12$ and $c = -3.33$, then the value of $a^3 + b^3 + c^3 - 3abc$ is

यदि $a = 1.21$, $b = 2.12$ और $c = -3.33$ हो, तो $a^3 + b^3 + c^3 - 3abc$ का मान है-

- (1) 0 (2) 1 (3) 2 (4) 3
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone))

17. If $x + y = 7$, then the value of $x^3 + y^3 + 21xy$ is

यदि $x + y = 7$ हो, तो $x^3 + y^3 + 21xy$ का मान होगा-

- (1) 243 (2) 143 (3) 343 (4) 443
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting))

18. $(y - z)^3 + (z - x)^3 + (x - y)^3$ equal to / बराबर होगा :

- (1) $3(y - z)(z - x)(x - y)$ (2) $(x - y)(y + z)(x - z)$
(3) $3(y - z)(z - x)(x - y)$ (4) $(y - z)(z - x)(x - y)$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (1st Sitting (East Zone)))

19. If $x = a(b - c)$, $y = b(c - a)$ and $z = c(a - b)$, then

यदि $x = a(b - c)$, $y = b(c - a)$ और $z = c(a - b)$, तो

$$\left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3 =$$

- (1) $\frac{xyz}{3abc}$ (2) $3xyzabc$ (3) $\frac{3xyz}{abc}$ (4) $\frac{xyz}{abc}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (1st Sitting (Delhi Zone)))

20. If $x + y = a$ and $xy = b^2$, then the value of $x^3 - x^2y - xy^2 + y^3$ in terms of a and b is :

यदि $x + y = a$ और $xy = b^2$, तो a तथा b के रूप में $x^3 - x^2y - xy^2 + y^3$ का मान है:

- (1) $(a^2 + 4b^2)a$ (2) $a^3 - 3b^2$
(3) $a^3 - 4b^2a$ (4) $a^3 + 3b^2$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (1st Sitting (Delhi Zone)))

21. If $\frac{11-13x}{x} + \frac{11-13y}{y} + \frac{11-13z}{z} = 5$ then what is

the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = ?$

यदि $\frac{11-13x}{x} + \frac{11-13y}{y} + \frac{11-13z}{z} = 5$ तो

$\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ का मान क्या होगा?

- (1) 1 (2) $\frac{13}{11}$ (3) $\frac{13}{5}$ (4) 4
(SSC CGL - 2017)

22. If $x^3 + 3x^2 + 3x = 7$, then x is equal to :

यदि $x^3 + 3x^2 + 3x = 7$ हो, तो x बराबर होगा :

- (1) 2 (2) $\sqrt[3]{6}$ (3) 1 (4) -1
(SSC CGL, Tier-II Exam. 01.08.2010)

23. If $\frac{5x-y}{5x+y} = \frac{3}{7}$ then what is the value of

$\frac{(4x^2 + y^2 - 4xy)}{(9x^2 + 16y^2 + 24xy)}$ का मान क्या होगा?

- (1) 0 (2) $\frac{3}{7}$ (3) $\frac{18}{49}$ (4) $\frac{1}{6}$

24. If $(x + y)^2 = xy + 1$ and $x^3 - y^3 = 1$ then what is the value of $x - y$?

यदि $(x + y)^2 = xy + 1$ तथा $x^3 - y^3 = 1$ तब $x - y$ का मान क्या होगा?

- (1) 1 (2) 0 (3) -1 (4) 2

25. If $x = y = 333$ and $z = 334$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is

यदि $x = y = 333$ और $z = 334$, हो, तो $x^3 + y^3 + z^3 - 3xyz$ का मान क्या होगा?

- (1) 0 (2) 667 (3) 1000 (4) 2334
(SSC Graduate Level Tier-II Exam. 29.09.2013)

26. If $x + y + z = 6$ and $x^2 + y^2 + z^2 = 20$ then the value of $x^3 + y^3 + z^3 - 3xyz$ is

यदि $x + y + z = 6$ और $x^2 + y^2 + z^2 = 20$ तो $x^3 + y^3 + z^3 - 3xyz$ का मान क्या होगा ?

- (1) 64 (2) 70 (3) 72 (4) 76

(SSC Graduate Level Tier-I Exam. 21.04.2013)

27. If $a - b = 3$ and $a^3 - b^3 = 117$ then $|a + b|$ is equal to

यदि $a - b = 3$ तथा $a^3 - b^3 = 117$ हो, तो $|a + b|$ किसके बराबर होगा?

- (1) 3 (2) 5 (3) 7 (4) 9

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

28. If $(x - 2)$ and $(x + 3)$ are the factors of the equation $x^2 + k_1x + k_2 = 0$ then what are the values of k_1 and k_2 ?

यदि समीकरण $x^2 + k_1x + k_2 = 0$ के गुणखंड $(x - 2)$ तथा $(x + 3)$ हैं तो k_1 तथा k_2 का मान क्या है?

- (1) $k_1 = 6, k_2 = -1$ (2) $k_1 = 1, k_2 = -6$
(3) $k_1 = 1, k_2 = 6$ (4) $k_1 = -6, k_2 = 1$

29. If $a + b + c = 6, a^2 + b^2 + c^2 = 14$ and $a^3 + b^3 + c^3 = 36$, then the value of abc is

यदि $a + b + c = 6, a^2 + b^2 + c^2 = 14$ और $a^3 + b^3 + c^3 = 36$ हों, तो abc का मान क्या होगा ?

- (1) 3 (2) 6 (3) 9 (4) 12

(SSC Graduate Level Tier-II Exam. 16.09.2012)

30. If $a^3 + b^3 = 9$ and $a + b = 3$, then the value of $\frac{1}{a} + \frac{1}{b}$ is

$\frac{1}{a} + \frac{1}{b}$ is

यदि $a^3 + b^3 = 9$ और $a + b = 3$ है, तो $\frac{1}{a} + \frac{1}{b}$ का मान है—

- (1) $\frac{1}{2}$ (2) $\frac{3}{2}$ (3) $\frac{5}{2}$ (4) -1

(SSC CHSL DEO Exam. 02.11.2014 (1st Sitting))

31. If $x = 997, y = 998$ and $z = 999$, then the value of $x^2 + y^2 + z^2 - xy - yz - zx$ is

यदि $x = 997, y = 998$ और $z = 999$ है, तो $x^2 + y^2 + z^2 - xy - yz - zx$ का मान है—

- (1) 0 (2) 1 (3) -1 (4) 3

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting))

32. If $x - y = 7$ then what is the value of $(x - 15)^3 - (y - 8)^3$?

यदि $x - y = 7$ हो तो $(x - 15)^3 - (y - 8)^3$ का मान क्या है?

- (1) 0 (2) 343 (3) 392 (4) 2863

33. If $x - y - \sqrt{18} = 1$ and $x + y - 3\sqrt{2} = 1$ then what is the value of $12xy(x^2 - y^2)$?

यदि $x - y - \sqrt{18} = -1$ तथा $x + y - 3\sqrt{2} = 1$ हो तो $12xy(x^2 - y^2)$ का मान क्या है?

- (1) 0 (2) 1 (3) $512\sqrt{2}$ (4) $612\sqrt{2}$

34. If $p = 99$, then the value of $p(p^2 + 3p + 3)$ is

यदि $p = 99$ तो $p(p^2 + 3p + 3)$ का मान क्या होगा?

- (1) 10000000 (2) 999000
(3) 999999 (4) 990000

(SSC CGL Tier-II Exam. 21.09.2014)

35. If a, b, c are real numbers and $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, then the value of $a + b + c$ is

यदि a, b, c वास्तविक संख्याएँ हैं और $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, तो $a + b + c$ का मान क्या होगा ?

- (1) -1 (2) 1 (3) 3 (4) 0

(SSC CGL Tier-II Exam. 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

36. If $x^2 + y^2 + z^2 = 2(x + z - 1)$, then what is the value of $x^3 + y^3 + z^3 = ?$

यदि $x^2 + y^2 + z^2 = 2(x + z - 1)$, तो निम्नलिखित का मान है $x^3 + y^3 + z^3 = ?$

- (1) 2 (2) 0 (3) -1 (4) 1

(SSC CGL Tier-I Exam. 16.08.2015 (IInd Sitting))

37. If $x = z = 225$ and $y = 226$, then the value of :

$x^3 + y^3 + z^3 - 3xyz$ is

यदि $x = z = 225$ और $y = 226$ तो निम्नलिखित का मान है :

$x^3 + y^3 + z^3 - 3xyz$

- (1) 765 (2) 676 (3) 576 (4) 674

(SSC CGL Tier-I Exam. 16.08.2015 (IInd Sitting) TF No. 2176783)

38. If $a^2 + b^2 + c^2 + 3 = 2(a + b + c)$, then the value of $(a + b + c)$ is

यदि $a^2 + b^2 + c^2 + 3 = 2(a + b + c)$ तो $(a + b + c)$ का मान है—

- (1) 2 (2) 3 (3) 4 (4) 5

(FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (1st Sitting))

39. If $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, then the value of $(a + b + c)$ is—

यदि $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, तो $(a - b + c)$ का मान है—

- (1) -1 (2) 3 (3) 1 (4) -2

(SSC CGL Tier-II Exam, 04.09.2011)

40. If the expression $px^3 - 2x^2 - qx + 18$ is completely divisible by $(x^2 - 9)$, then what is the ratio between p and q respectively?

यदि व्यंजक $px^3 - 2x^2 - qx + 18, (x^2 - 9)$ से पूर्णतः विभाजित है तो क्रमशः p तथा q के बीच का अनुपात क्या होगा?

- (1) 1 : 9 (2) 1 : 3 (3) 3 : 1 (4) 1 : 2
 41. If $(x + y - z)^2 + (y + z - x)^2 + (z + x - y)^2 = 0$, then what will be the value of $(x + y + z)$?
 यदि $(x + y - z)^2 + (y + z - x)^2 + (z + x - y)^2 = 0$ हो, तो $x + y + z$ का मान क्या होगा ?

- (1) $\sqrt{3}$ (2) $3\sqrt{3}$ (3) 3 (4) 0

(SSC CHSL DEO and LDC Exam, 11.12.2011
 (1st Sitting (East Zone))

42. If $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$ and $x + y + z = 9$ then what is the value of $x^3 + y^3 + z^3 - 3xyz$?

यदि $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$ तथा $x + y + z = 9$ तो $x^3 + y^3 + z^3 - 3xyz$ का मान क्या होगा ?

- (1) 81 (2) 361 (3) 729 (4) 6561

(SSC CGL - 2017)

43. If $a + b + c = 9$ (where a, b, c are real numbers), then the maximum value of $a^2 + b^2 + c^2$ is
 यदि $a + b + c = 9$ (जहाँ a, b, c वास्तविक संख्याएँ हैं), तो $a^2 + b^2 + c^2$ का अधिकतम मान है -

- (1) 100 (2) 9 (3) 27 (4) 81

(SSC CHSL DEO & LDC Exam, 20.10.2013)

44. If $x^2 + y^2 + 1 = 2x$, then the value of $x^3 + y^5$ is
 यदि $x^2 + y^2 + 1 = 2x$, तो $x^3 + y^5$ का मान क्या है ?

- (1) 2 (2) 0 (3) -1 (4) 1

(SSC CGL Tier-I Exam, 19.10.2014)

45. If $x + y + z = 0$, then the value of $\frac{x^2 + y^2 + z^2}{x^2 - yz}$ is

यदि $x + y + z = 0$, तो $\frac{x^2 + y^2 + z^2}{x^2 - yz}$ का मान क्या है ?

- (1) -1 (2) 0 (3) 1 (4) 2

(SSC CGL Tier-I Exam, 19.10.2014 TF No. 022 MH 3)

46. If $x + y + z = 0$, then what is the value of $\frac{(3y^2 + x^2 + z^2)}{(2y^2 - xz)}$?

यदि $x + y + z = 0$, हो, तो $\frac{(3y^2 + x^2 + z^2)}{(2y^2 - xz)}$ का मान क्या है ?

- (1) 2 (2) 1 (3) $\frac{3}{2}$ (4) $\frac{5}{3}$

(SSC CGL Tier-II (CBE) Exam, 17.02.2018)

47. If $a^3 + 3a^2 + 9a = 81$, then what is the value of $a^3 + \frac{3}{a}$?

यदि $a^3 + 3a^2 + 9a = 81$, तो $a^3 + \frac{3}{a}$ का मान क्या होगा ?

- (1) 31 (2) 26 (3) 28 (4) 24

(SSC CGL Tier-II (CBE) Exam, 17.02.2018)

48. If $\frac{(a+b)}{c} = \frac{6}{5}$ and $\frac{(b+c)}{a} = \frac{9}{2}$, then what is the value of $\frac{(a+c)}{b}$?

यदि $\frac{(a+b)}{c} = \frac{6}{5}$ तथा $\frac{(b+c)}{a} = \frac{9}{2}$ हैं, तो $\frac{(a+c)}{b}$ का मान क्या है ?

- (1) $\frac{9}{5}$ (2) $\frac{11}{7}$ (3) $\frac{7}{11}$ (4) $\frac{7}{4}$

(SSC CGL Tier-II (CBE) Exam, 17.02.2018)

49. If $x^3 + y^3 + z^3 = 3(1 + xyz)$, $P = y + z - x$, $Q = z + x - y$ and $R = x + y - z$, then what is the value of $P^3 + Q^3 + R^3 - 3PQR$?

यदि $x^3 + y^3 + z^3 = 3(1 + xyz)$, $P = y + z - x$, $Q = z + x - y$ तथा $R = x + y - z$ हैं, तो $P^3 + Q^3 + R^3 - 3PQR$ का मान क्या है ?

- (1) 9 (2) 8 (3) 12 (4) 6

(SSC CGL Tier-II (CBE) Exam, 17.02.2018)

50. If $x_1 x_2 x_3 = 4(4 + x_1 + x_2 + x_3)$, then what is the value of $\left[\frac{1}{(2+x_1)} \right] + \left[\frac{1}{(2+x_2)} \right] + \left[\frac{1}{(2+x_3)} \right]$?

यदि $x_1 x_2 x_3 = 4(4 + x_1 + x_2 + x_3)$ हो, तो $\left[\frac{1}{(2+x_1)} \right] +$

$\left[\frac{1}{(2+x_2)} \right] + \left[\frac{1}{(2+x_3)} \right]$ का मान क्या है ?

- (1) 1 (2) $\frac{1}{2}$ (3) 2 (4) $\frac{1}{3}$

(SSC CGL Tier-II (CBE) Exam, 17.02.2018)

51. If $3x + 5y + 7z = 49$ and $9x + 8y + 21z = 126$, then what is the value of y ?

यदि $3x + 5y + 7z = 49$ तथा $9x + 8y + 21z = 126$ हैं, तो y का मान क्या है ?

- (1) 4 (2) 2 (3) 3 (4) 5

(SSC CHSL DEO & LDC Exam, 17.02.2018)

52. If $x + y + z = 0$ then what is the value of

$$\frac{x^2}{3z} + \frac{y^3}{3xz} + \frac{z^2}{3x} ?$$

यदि $x + y + z = 0$ तो $\frac{x^2}{3z} + \frac{y^3}{3xz} + \frac{z^2}{3x}$ का मान क्या है?

- (1) 0 (2) xy (3) y (4) $3y$
(SSC CGL 2017)

53. If $x + y + z = 22$ and $xy + yz + zx = 35$, then what is the value of $(x - y)^2 + (y - z)^2 + (z - x)^2$?

यदि $x + y + z = 22$ तथा $xy + yz + zx = 35$ हैं, तो $(x - y)^2 + (y - z)^2 + (z - x)^2$ का मान क्या है?

- (1) 793 (2) 681 (3) 758 (4) 715
(SSC CGL Tier-II (CBE) Exam. 17.02.2018)

54. If $\frac{(x+y)}{z} = 2$, then what is the value of

$$\left[\frac{y}{(y-z)} \right] + \left[\frac{x}{(x-z)} \right] ?$$

यदि $\frac{(x+y)}{z} = 2$ है, तो $\left[\frac{y}{(y-z)} \right] + \left[\frac{x}{(x-z)} \right]$ का मान क्या है?

- (1) 0 (2) 1 (3) 2 (4) -1
(SSC CGL Tier-II (CBE) Exam. 17.02.2018)

55. If $a^4 + 1 = \left[\frac{a^2}{b^2} \right] (4b^2 - b^4 - 1)$, then what is the value of $a^4 + b^4$?

यदि $a^4 + 1 = \left[\frac{a^2}{b^2} \right] (4b^2 - b^4 - 1)$ है, तो $a^4 + b^4$ का मान क्या है?

- (1) 2 (2) 16 (3) 32 (4) 64
(SSC CGL Tier-II (CBE) Exam. 17.02.2018)

56. If $3\sqrt{\frac{1-a}{a}} + 9 = 19 - 3\sqrt{\frac{a}{1-a}}$, then what is the value of a ?

यदि $3\sqrt{\frac{1-a}{a}} + 9 = 19 - 3\sqrt{\frac{a}{1-a}}$ है, तो a का मान क्या है?

- (1) $\frac{3}{10}, \frac{7}{10}$ (2) $\frac{1}{10}, \frac{9}{10}$
(3) $\frac{2}{5}, \frac{3}{5}$ (4) $\frac{1}{5}, \frac{4}{5}$
(SSC CGL Tier-II (CBE) Exam. 17.02.2018)

57. If $a + b = 10$ and $\sqrt{\frac{a}{b}} - 13 = -\sqrt{\frac{b}{a}} - 11$, then what is the value of $3ab + 4a^2 + 5b^2$?

यदि $a + b = 10$ तथा $\sqrt{\frac{a}{b}} - 13 = -\sqrt{\frac{b}{a}} - 11$ हैं, तो $3ab + 4a^2 + 5b^2$ का मान क्या है?

- (1) 450 (2) 300 (3) 600 (4) 750
(SSC CGL Tier-II (CBE) Exam. 17.02.2018)

58. If $3x + 4y - 2z + 9 = 17$, $7x + 2y + 11z + 8 = 23$ and $5x + 9y + 6z - 4 = 18$, then what is the value of $x + y + z - 34$?

यदि $3x + 4y - 2z + 9 = 17$, $7x + 2y + 11z + 8 = 23$ तथा $5x + 9y + 6z - 4 = 18$ है, तो $x + y + z - 34$ का मान क्या है?

- (1) -28 (2) -14 (3) -31 (4) -45
(SSC CGL Tier-II (CBE) Exam. 17.02.2018)

59. If $x + 3y - \frac{2z}{4} = 6$, $x + \frac{2}{3}(2y + 3z) = 33$ and $\frac{1}{7}(x + y + z) + 2z = 9$, then what is the value of $46x + 131y$?

यदि $x + 3y - \frac{2z}{4} = 6$, $x + \frac{2}{3}(2y + 3z) = 33$ तथा $\frac{1}{7}(x + y + z) + 2z = 9$ हैं, तो $46x + 131y$ का मान क्या है?

- (1) 414 (2) 364 (3) 384 (4) 464
(SSC CGL Tier-II (CBE) Exam. 17.02.2018)

60. If $f(x) = \frac{1}{x} - \frac{1}{x+1}$, then what is the value of $f(1) + f(2) + f(3) + \dots + f(10)$?

यदि $f(x) = \frac{1}{x} - \frac{1}{x+1}$ है, तो $f(1) + f(2) + f(3) + \dots + f(10)$ का मान क्या है?

- (1) $\frac{9}{10}$ (2) $\frac{10}{11}$
(3) $\frac{11}{12}$ (4) $\frac{12}{13}$
(SSC CGL Tier-II (CBE) Exam. 09.03.2018)

61. What is the simplified value of $(2 + 1)(2^2 + 1)(2^4 + 1)(2^8 + 1)$?

$(2 + 1)(2^2 + 1)(2^4 + 1)(2^8 + 1)$ का सरलीकृत मान क्या है?
(1) $2^8 - 1$ (2) $2^{16} - 1$
(3) $2^{32} - 1$ (4) $2^{64} - 1$
(SSC CPO - 2017)

62. If $a^2 + b^2 = 4b + 6a - 13$, then what is the value of $a + b$?

यदि $a^2 + b^2 = 4b + 6a - 13$ है, तो $a + b$ का मान क्या है?

- (1) 3 (2) 2
(3) 5 (4) 10

(SSC CGL Tier-II (CBE) Exam. 09.03.2018)

63. x and y are positive integers. If $x^4 + y^4 + x^2y^2 = 481$ and $xy = 12$, then what is the value of $x^2 - xy + y^2$?

x तथा y एक धनात्मक पूर्णांक है। यदि $x^4 + y^4 + x^2y^2 = 481$ तथा $xy = 12$ है, तो $x^2 - xy + y^2$ का मान क्या है?

- (1) 16 (2) 13
(3) 11 (4) 15

(SSC CGL Tier-II (CBE) Exam. 09.03.2018)

64. If $A = 1 + 2^p$ and $B = 1 + 2^{-p}$, then what is the value of B ?

यदि $A = 1 + 2^p$ तथा $B = 1 + 2^{-p}$ है, तो B का मान क्या है?

- (1) $\frac{A+1}{A-1}$ (2) $\frac{A+2}{A+1}$

- (3) $\frac{A}{A-1}$ (4) $\frac{A-2}{A+1}$

(SSC CGL Tier-II (CBE) Exam. 09.03.2018)

65. If $\sqrt{(1-p^2)(1-q^2)} = \frac{\sqrt{3}}{2}$, then what is the value

of $\sqrt{2p^2+2q^2+2pq} + \sqrt{2p^2+2q^2-2pq}$?

यदि $\sqrt{(1-p^2)(1-q^2)} = \frac{\sqrt{3}}{2}$ है, तो $\sqrt{2p^2+2q^2+2pq}$

+ $\sqrt{2p^2+2q^2-2pq}$ का मान क्या है?

- (1) 2 (2) $\sqrt{2}$
(3) 1 (4) None of these

(SSC CGL Tier-II (CBE) Exam. 09.03.2018)

66. If $(a+b)^2 - 2(a+b) = 80$ and $ab = 16$, then what can be the value of $3a - 19b$?

यदि $(a+b)^2 - 2(a+b) = 80$ तथा $ab = 16$ है, तो $3a - 19b$ का मान क्या हो सकता है?

- (1) -16 (2) -14 (3) -18 (4) -20

(SSC CGL Tier-II (CBE) Exam. 09.03.2018)

67. If $x^{y+z} = 1$, $y^{x+z} = 1024$ and $z^{x+y} = 729$ (x , y and z are natural numbers), then what is the value of $(z+1)^{y+x+1}$?

यदि $x^{y+z} = 1$, $y^{x+z} = 1024$ तथा $z^{x+y} = 729$ (x , y तथा z प्राकृतिक संख्याएँ हैं), तो $(z+1)^{y+x+1}$ का मान क्या है?

- (1) 6561 (2) 10000 (3) 4096 (4) 14641

(SSC CGL Tier-II (CBE) Exam. 09.03.2018)

68. If $P = 7 + 4\sqrt{3}$ and $PQ = 1$, then what is the value

of $\left(\frac{1}{P^2}\right) + \left(\frac{1}{Q^2}\right)$?

यदि $P = 7 + 4\sqrt{3}$ तथा $PQ = 1$ हैं, तो $\left(\frac{1}{P^2}\right) + \left(\frac{1}{Q^2}\right)$ का

मान क्या है?

- (1) 148 (2) 189
(3) 194 (4) 204

(SSC CGL Tier-II (CBE) Exam. 18.02.2018)

69. If $x = 2 + \sqrt{3}$, $y = 2 - \sqrt{3}$ and $z = 1$, then what is

the value of $\left(\frac{x}{yz}\right) + \left(\frac{y}{xz}\right) + \left(\frac{z}{xy}\right) + 2$

$\left[\left(\frac{1}{x}\right) + \left(\frac{1}{y}\right) + \left(\frac{1}{z}\right)\right]$?

यदि $x = 2 + \sqrt{3}$, $y = 2 - \sqrt{3}$ तथा $z = 1$ हैं, तो $\left(\frac{x}{yz}\right) +$

$\left(\frac{y}{xz}\right) + \left(\frac{z}{xy}\right) + 2\left(\frac{1}{x}\right) + \left(\frac{1}{y}\right) + \left(\frac{1}{z}\right)$ का मान क्या है?

- (1) 25 (2) 22
(3) 17 (4) 43

(SSC CGL Tier-II (CBE) Exam. 18.02.2018)

70. If $x + y = 3$, then what is the value of $x^3 + y^3 + 9xy$?

यदि $x + y = 3$ हो, तो $x^3 + y^3 + 9xy$ का मान क्या है?

- (1) 15 (2) 81
(3) 27 (4) 9

(SSC CGL Tier-II (CBE) Exam. 18.02.2018)

71. $A = \frac{(x^8 - 1)}{(x^4 + 1)}$ and $B = \frac{(y^4 - 1)}{(y^2 + 1)}$ If $x = 2$ and $y = 9$,

then what is the value of $A^2 + 2AB + AB^2$?

$A = \frac{(x^8 - 1)}{(x^4 + 1)}$ तथा $B = \frac{(y^4 - 1)}{(y^2 + 1)}$ हैं। यदि $x = 2$ तथा $y = 9$

हैं, तो $A^2 + 2AB + AB^2$ का मान क्या है?

- (1) 96475 (2) 98625
(3) 92425 (4) 89125

(SSC CGL Tier-II (CBE) Exam. 18.02.2018)

72. If $x - 4y = 0$ and $x + 2y = 24$, then what is the value

of $\frac{(2x + 3y)}{(2x - 3y)}$?

यदि $x - 4y = 0$ तथा $x + 2y = 24$ हैं, तो $\frac{(2x + 3y)}{(2x - 3y)}$ का मान क्या है?

- (1) $\frac{9}{5}$ (2) $\frac{11}{5}$ (3) $\frac{13}{7}$ (4) $\frac{9}{7}$

(SSC CGL Tier-II (CBE) Exam. 18.02.2018)

73. If $\left(\frac{x}{a}\right) + \left(\frac{y}{b}\right) = 3$ and $\left(\frac{x}{b}\right) - \left(\frac{y}{a}\right) = 9$, then what

is the value of $\frac{x}{y}$?

यदि $\left(\frac{x}{a}\right) + \left(\frac{y}{b}\right) = 3$ तथा $\left(\frac{x}{b}\right) - \left(\frac{y}{a}\right) = 9$ हैं, तो $\frac{x}{y}$ का मान क्या है?

- (1) $\frac{(b + 3a)}{(a - 3b)}$ (2) $\frac{(a + 3b)}{(b - 3a)}$
 (3) $\frac{(1 + 3a)}{(a + 3b)}$ (4) $\frac{(a + 3b^2)}{(b - 3a^2)}$

(SSC CGL Tier-II (CBE) Exam. 18.02.2018)

74. x , y and z are prime numbers and $x + y + z = 38$. What is the maximum value of x ?

x , y तथा z अभाज्य संख्याएँ हैं तथा $x + y + z = 38$ है। x का अधिकतम मान क्या है?

- (1) 19 (2) 23 (3) 31 (4) 29

(SSC CGL Tier-II (CBE) Exam. 19.02.2018)

75. If x and y are natural numbers such that $x + y = 2017$, then what is the value of $(-1)^x + (-1)^y$?

यदि x तथा y प्राकृतिक संख्याएँ इस प्रकार हैं कि $x + y = 2017$ हैं, तो $(-1)^x + (-1)^y$ का मान क्या है?

- (1) 2 (2) -2
 (3) 0 (4) 1

(SSC CGL Tier-II (CBE) Exam. 19.02.2018)

76. If $x + \left(\frac{1}{x}\right) = \frac{(\sqrt{3} + 1)}{2}$, then what is the value of x^4

$+ \left(\frac{1}{x^4}\right)$?

यदि $x + \left(\frac{1}{x}\right) = \frac{(\sqrt{3} + 1)}{2}$ है, तो $x^4 + \left(\frac{1}{x^4}\right)$ का मान क्या है?

- (1) $\frac{(4\sqrt{3} - 1)}{4}$ (2) $\frac{(4\sqrt{3} + 1)}{2}$
 (3) $\frac{(-4\sqrt{3} - 1)}{4}$ (4) $\frac{(-4\sqrt{3} - 1)}{2}$

(SSC CGL Tier-II (CBE) Exam. 19.02.2018)

77. If $a + a^2 + a^3 - 1 = 0$, then what is the value of $a^3 + \left(\frac{1}{a}\right)$?

यदि $a + a^2 + a^3 - 1 = 0$ हो, तो $a^3 + \left(\frac{1}{a}\right)$ का मान क्या है?

- (1) 1 (2) 4
 (3) 2 (4) 3

(SSC CGL Tier-II (CBE) Exam. 19.02.2018)

78. If $\left[\sqrt{(a^2 + b^2 + ab)}\right] + \left[\sqrt{(a^2 + b^2 - ab)}\right] = 1$, then what is the value of $\sqrt{(1 - a^2)(1 - b^2)}$?

यदि $\left[\sqrt{(a^2 + b^2 + ab)}\right] + \left[\sqrt{(a^2 + b^2 - ab)}\right] =$

1 हो, तो $\sqrt{(1 - a^2)(1 - b^2)}$ का मान क्या है?

- (1) $\frac{1}{4}$ (2) $\frac{4}{7}$
 (3) $\frac{5}{4}$ (4) $\frac{3}{4}$

(SSC CGL Tier-II (CBE) Exam. 19.02.2018)

79. If $\frac{(p^2 + q^2)}{(r^2 + s^2)} = \frac{pq}{rs}$, then what is the value of

$\frac{(p - q)}{(p + q)}$ in terms of r and s ?

यदि $\frac{(p^2 + q^2)}{(r^2 + s^2)} = \frac{pq}{rs}$ है तो r तथा s के पद में $\frac{(p - q)}{(p + q)}$ का

मान क्या है?

- (1) $\frac{(r + s)}{(r - s)}$ (2) $\frac{(r - s)}{(r + s)}$
 (3) $\frac{(r - s)}{rs}$ (4) $\frac{rs}{(r - s)}$

(SSC CPO - 2017)

80. If α and β are the roots of the equation $x^2 - x + 3 = 0$, then what is the value of $\alpha^4 + \beta^4$?

यदि α तथा β समीकरण $x^2 - x + 3 = 0$ के मूल हैं तो $\alpha^4 + \beta^4$ का मान क्या होगा?

- (1) 7 (2) 9
(3) 11 (4) 13
(SSC CPO - 217)

81. If $a = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ and $b = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$, then what is the value of $a^2 + b^2 - ab$?

यदि $a = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ तथा $b = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$ हैं, तो $a^2 + b^2 - ab$

का मान क्या है ?

- (1) 97 (2) $(2\sqrt{3}) + 2$
(3) $(4\sqrt{6}) + 1$ (4) 98

(SSC CGL Tier-II (CBE) Exam. 21.02.2018)

82. If $x^2 - 16x + 59 = 0$, then what is the value of $(x - 6)^2 + \left[\frac{1}{(x - 6)^2} \right]$?

यदि $x^2 - 16x - 59 = 0$ है, तो $(x - 6)^2 + \left[\frac{1}{(x - 6)^2} \right]$ का मान

क्या है?

- (1) 14 (2) 18
(3) 16 (4) 20

(SSC CGL Tier-II (CBE) Exam. 21.02.2018)

83. If $2x + 3y - 5z = 18$, $3x + 2y + z = 29$ and $x + y + 3z = 17$, then what is the value of $xy + yz + zx$?

यदि $2x + 3y - 5z = 18$, $3x + 2y + z = 29$ तथा $x + y + 3z = 17$ हैं, तो $xy + yz + zx$ का मान क्या है?

- (1) 32 (2) 52
(3) 64 (4) 46

(SSC CGL Tier-II (CBE) Exam. 21.02.2018)

84. $\left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2} - 1\right)\left(x^2 + \frac{1}{x^2} + 1\right)$ is equal to ?

$\left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2} - 1\right)\left(x^2 + \frac{1}{x^2} + 1\right)$ किसके

बराबर है?

- (1) $x^6 - \frac{1}{x^6}$ (2) $x^8 + \frac{1}{x^8}$

- (3) $x^8 - \frac{1}{x^8}$ (4) $x^6 - \frac{1}{x^6}$

(SSC CPO SI - 2006)

85. If $5\sqrt{x} + 12\sqrt{x} = 13\sqrt{x}$ then x is equal to?

यदि $5\sqrt{x} + 12\sqrt{x} = 13\sqrt{x}$ है, तो x किसके बराबर है?

- (1) $\frac{25}{4}$ (2) 4
(3) 9 (4) 16

(SSC CPO SI-2008)

86. If $a^4 + b^4 = a^2b^2$, then $(a^6 + b^6)$ is equals to

यदि $a^4 + b^4 = a^2b^2$ है, तो $(a^6 + b^6)$ किसके बराबर है?

- (1) 0 (2) 1
(3) $a^2 + b^2$ (4) $a^2b^4 + a^4b^2$

(SSC CPO SI-2010)

87. If $a = \sqrt{7 + 2\sqrt{12}}$, $b = \sqrt{7 - 2\sqrt{12}}$ then $(a^3 + b^3)$ is equal to

यदि $a = \sqrt{7 + 2\sqrt{12}}$, $b = \sqrt{7 - 2\sqrt{12}}$ है, तो $(a^3 + b^3)$ का मान क्या होगा?

- (1) 40 (2) 44
(3) 48 (4) 52

(SSC SAS 2010)

88. If $\sqrt{1 - \frac{x^3}{100}} = \frac{3}{5}$, then $x = ?$

यदि $\sqrt{1 - \frac{x^3}{100}} = \frac{3}{5}$, है, तो $x = ?$

- (1) 2 (2) 4
(3) 16 (4) $(136)^{1/3}$

(SSC CGL Tier-I 2011)

89. If $a^2 + b^2 = 2$ and $c^2 + d^2 = 1$ then the value of $(ad - bc)^2 + (ac + bd)^2$ is

यदि $a^2 + b^2 = 2$ और $c^2 + d^2 = 1$ है, तो $(ad - bc)^2 + (ac + bd)^2$ का मान क्या होगा?

- (1) $\frac{4}{9}$ (2) $\frac{1}{2}$
(3) 1 (4) 2

(SSC CPO SI-2012)

90. If $\sqrt{x} = \sqrt{3} - \sqrt{5}$, then the value of $x^2 - 16x + 6$ is

यदि $\sqrt{x} = \sqrt{3} - \sqrt{5}$, है, तो $x^2 - 16x + 6$ का मान क्या होगा?

- (1) 0 (2) -2
(3) 2 (4) 4

(SSC CGL Tier-II 2013)

91. If यदि $a + b + c = 2S$, then तो

$\frac{(S-a)^2 + (S-b)^2 + (S-c)^2 + S^2}{a^2 + b^2 + c^2}$ किसके बराबर है?

- (1) $a^2 + b^2 + c^2$ (2) 0
(3) 1 (4) 2

(SSC CGL Tier-I 2013)

92. If $(x + k)$ is a common factor of $(x^2 + px + q)$ and $(x^2 + lx + m)$ then the value of k is:

यदि $(x + k)$ $(x^2 + px + q)$ तथा $(x^2 + lx + m)$ का उभयनिष्ठ गुणखंड हो तो k का मान क्या होगा?

- (1) $l + p$ (2) $m - q$
(3) $\frac{l-p}{m-q}$ (4) $\frac{m-q}{l-p}$

(SSC CGL Tier-II 2013)

93. One of the factors of $3x^3 + x^2 - 12x - 4$ is

$3x^3 + x^2 - 12x - 4$ का एक गुणखंड होगा-

- (1) $3x^2 - 2$ (2) $3x - 1$
(3) $3x + 1$ (4) $3x + 2$

94. If $2^x = 4^y = 8^z$ and $xyz = 288$ then value of

$\frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z}$ is:

यदि $2^x = 4^y = 8^z$ और $xyz = 288$ हो तो $\frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z}$
= ?

- (1) $\frac{11}{12}$ (2) $\frac{11}{96}$
(3) $\frac{29}{96}$ (4) None of these

95. If $a^x = (x + y + z)^y$, $a^y = (x + y + z)^z$, $a^z = (x + y + z)^x$ then

यदि $a^x = (x + y + z)^y$, $a^y = (x + y + z)^z$, $a^z = (x + y + z)^x$ है, तो

- (1) $3(x + y + z) = a$ (2) $2a = x + y + z$
(3) $x + y + z = 0$ (4) $x = y = z = \frac{a}{3}$

Type-II

Based on $a + \frac{1}{a}$ or $a - \frac{1}{a}$ Formulae

1. If $x + \frac{1}{x} = 4$, then what is the value of $x^6 + \frac{1}{x^6}$?

यदि $x + \frac{1}{x} = 4$ है, तो $x^6 + \frac{1}{x^6}$ का मान क्या है?

- (1) 52 (2) 256 (3) 1026 (4) 2702

(SSC CGL - 2017)

2. If $\frac{2p}{p^2 - 2p + 1} = \frac{1}{4}$, $p \neq 0$, then the value of $p + \frac{1}{p}$ is

यदि $\frac{2p}{p^2 - 2p + 1} = \frac{1}{4}$, $p \neq 0$, तो $p + \frac{1}{p}$ का मान है-

- (1) 4 (2) 5 (3) 10 (4) 12

FCI Assistant Grade-III Exam.25.02.2012 (Paper-I)
North Zone (1st Sitting)

3. If $2\left(x^2 + \frac{1}{x^2}\right) - \left(x - \frac{1}{x}\right) - 7 = 0$, then two values of x are

यदि $2\left(x^2 + \frac{1}{x^2}\right) - \left(x - \frac{1}{x}\right) - 7 = 0$ है, तो x के दो मान हैं-

- (1) 1, 2 (2) $2, -\frac{1}{2}$ (3) 0, 1 (4) $\frac{1}{2}, 1$

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting))

4. If $x^2 + \frac{1}{x^2} = 66$, then the value of $\frac{x^2 - 1 + 2x}{x} = ?$

यदि $x^2 + \frac{1}{x^2} = 66$, तो, $\frac{x^2 - 1 + 2x}{x}$ का मान = ?

- (1) ± 8 (2) 10, -6 (3) 6, -10 (4) ± 4

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

5. What is difference of the factors of the expression $x^2 + \frac{1}{x^2} - 6$?

व्यंजक $x^2 + \frac{1}{x^2} - 6$ के गुणखंडों का अंतर क्या है?

- (1) 0 (2) 1 (3) 2 (4) 4

(SSC CGL - 2017)

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

यदि $\frac{5x}{2x^2 + 5x + 1} = \frac{1}{3}$, तो $\left(x + \frac{1}{2x}\right)$ का मान क्या होगा ?

- (1) 15 (2) 10 (3) 20 (4) 5

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting))

7. If $2x - \frac{1}{2x} = 6$, then what will be the value of

$x^2 + \frac{1}{16x^2}$?

यदि $2x - \frac{1}{2x} = 6$ हो, तो $x^2 + \frac{1}{16x^2}$ का मान क्या होगा?

- (1) $\frac{19}{2}$ (2) $\frac{17}{2}$ (3) $\frac{18}{3}$ (4) $\frac{15}{2}$

(SSC CGL Tier-I Exam. 2012)

8. If $x + \frac{1}{x} = 2$, then what is the value of $x^{64} + x^{121}$?

यदि $x + \frac{1}{x} = 2$ है तो $x^{64} + x^{121}$ का मान क्या होगा?

- (1) 0 (2) 1 (3) 2 (4) -2

(SSC CGL - 2017)

9. If $x = 6 + 2\sqrt{6}$, then what is the value of $\sqrt{x-1} + \frac{1}{\sqrt{x-1}}$?

यदि $x = 6 + 2\sqrt{6}$, तब $\sqrt{x-1} + \frac{1}{\sqrt{x-1}}$ का मान क्या है?

- (1) $2\sqrt{3}$ (2) $3\sqrt{2}$ (3) $2\sqrt{2}$ (4) $3\sqrt{3}$

(SSC-CGL-2017)

10. If $(x-a)(x-b) = 1$ and $a-b+5=0$, then the value of $(x-a)^3 - \frac{1}{(x-a)^3}$ is

यदि $(x-a)(x-b) = 1$ तथा $a-b+5=0$ हो, तो $(x-a)^3 - \frac{1}{(x-a)^3}$ का मान क्या होगा?

- (1) -125 (2) 1 (3) 125 (4) 140

(SSC Graduate Level Tier-II Exam. 29.09.2013)

11. If $x = \frac{2\sqrt{15}}{\sqrt{3}+\sqrt{5}}$, then what is the value of

$$\frac{x+\sqrt{5}}{x-\sqrt{5}} + \frac{x+\sqrt{3}}{x-\sqrt{3}} ?$$

यदि $x = \frac{2\sqrt{15}}{\sqrt{3}+\sqrt{5}}$, तो $\frac{x+\sqrt{5}}{x-\sqrt{5}} + \frac{x+\sqrt{3}}{x-\sqrt{3}}$ का मान क्या है?

- (1) $\sqrt{5}$ (2) $\sqrt{3}$ (3) $\sqrt{15}$ (4) 2

(SSC - CGL - 2017)

12. If $\frac{1}{x^4} + x^{-\frac{1}{4}} = 2$, then what is the value of $x^{81} + \frac{1}{x^{81}}$?

यदि $\frac{1}{x^4} + x^{-\frac{1}{4}} = 2$, हो तो $x^{81} + \frac{1}{x^{81}}$ का मान क्या है?

- (1) -2 (2) 0 (3) 1 (4) 2

(SSC CGL-2017)

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

यदि $x + \frac{1}{x} = 2$, तो $\left(x^2 + \frac{1}{x^2}\right) \left(x^3 + \frac{1}{x^3}\right)$ का मान है-

- (1) 20 (2) 4 (3) 8 (4) 16

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting))

14. If $x^2 + \frac{1}{x^2} = 1$ then what is the value of $x^{48} + x^{42} + x^{36} + x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1$?

यदि $x^2 + \frac{1}{x^2} = 1$ है तो $x^{48} + x^{42} + x^{36} + x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1$ का मान क्या होगा?

- (1) -9 (2) 0 (3) 1 (4) 2

(SSC CGL - 2017)

15. If $2x + \frac{9}{x} = 9$ then what is the minimum value of $x^2 + \frac{1}{x^2}$?

यदि $2x + \frac{9}{x} = 9$ है, तो $x^2 + \frac{1}{x^2}$ का न्यूनतम मान क्या होगा?

- (1) $\frac{95}{36}$ (2) $\frac{97}{36}$ (3) $\frac{86}{25}$ (4) $\frac{623}{27}$

(SSC CGL - 2017)

16. If $x + \frac{1}{x} = 1$, then the value of $\frac{x^2+3x+1}{x^2+7x+1}$ is

यदि $x + \frac{1}{x} = 1$ है, तो $\frac{x^2+3x+1}{x^2+7x+1}$ का मान है ?

- (1) 1 (2) $\frac{3}{7}$ (3) $\frac{1}{2}$ (4) 2

(SSC CGL Tier-I Exam. 09.08.2015 (IInd Sitting) TF No. 4239378)

17. If $x + \frac{1}{x} = 2$ then the value of $x^{12} + \frac{1}{x^{12}}$ is

- (1) 2 (2) -4 (3) 0 (4) 4

(SSC CGL Tier-I Exam. 09.08.2015 (IInd Sitting) TF No. 4239378)

18. If $x + \frac{1}{x} = 5$ then what is the value of $x^5 + \frac{1}{x^5}$?

यदि $x + \frac{1}{x} = 5$ है, तो $x^5 + \frac{1}{x^5}$ का मान क्या है?

- (1) 1875 (2) 2525 (3) 2530 (4) 3120

(SSC CGL - 2017)

19. If $4a - \frac{4}{a} + 3 = 0$, then the value of : $a^3 - \frac{1}{a^3} + 3 = ?$

यदि $4a - \frac{4}{a} + 3 = 0$ तो निम्नलिखित का मान है : $a^3 - \frac{1}{a^3} + 3 = ?$

- (1) $\frac{3}{16}$ (2) $\frac{7}{16}$ (3) $\frac{21}{64}$ (4) $\frac{21}{16}$

(SSC CGL Tier-I Exam, 16.08.2015
(IInd Sitting) TF No. 2176783)

20. If $x + \frac{1}{x} = 1$, then the value of $\frac{2}{x^2 - x + 2} = ?$

यदि $x + \frac{1}{x} = 1$ तो निम्नलिखित का मान है : $\frac{2}{x^2 - x + 2}$

- (1) 2 (2) 4 (3) $\frac{2}{3}$ (4) 1

(SSC CGL Tier-I Exam, 16.08.2015
(IInd Sitting) TF No. 2176783)

21. If $a - \frac{1}{a-3} = 5$, then the value of $(a-3)^3 -$

$\frac{1}{(a-3)^3}$ is

यदि $a - \frac{1}{a-3} = 5$, तो $(a-3)^3 - \frac{1}{(a-3)^3}$ का मान क्या

होगा?

- (1) 5 (2) 7 (3) 2 (4) 14

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

22. If $x^4 + \frac{1}{x^4} = 34$, then what is the value of

$x^3 - \frac{1}{x^3}$?

यदि $x^4 + \frac{1}{x^4} = 34$, है, तो $x^3 - \frac{1}{x^3}$ का मान क्या होगा?

- (1) 0 (2) 6 (3) 8 (4) 14

(SSC CGL - 2017)

23. If $x + \frac{1}{(x+7)} = 0$ then what is the value of

$\left[x - \frac{1}{(x+7)} \right] = ?$

यदि $x + \frac{1}{(x+7)} = 0$ है, तो $\left[x - \frac{1}{(x+7)} \right]$ का मान क्या होगा?

- (1) $3\sqrt{5}$ (2) $3\sqrt{5} - 7$ (3) $3\sqrt{5} + 7$ (4) 8

(SSC CGL - 2017)

24. If $4b^2 + \frac{1}{b^2} = 2$, then the value of $8b^3 + \frac{1}{b^3}$ is

यदि $4b^2 + \frac{1}{b^2} = 2$ हो, तो $8b^3 + \frac{1}{b^3}$ का मान होगा-

- (1) 0 (2) 1 (3) 2 (4) 5

(SSC CPO S.I. Exam. 09.11.2008)

25. If $x + \frac{1}{x} = 3$, then the value of $\frac{x^3 + \frac{1}{x}}{x^2 - x + 1}$ is :

यदि $x + \frac{1}{x} = 3$ हो, तो $\frac{x^3 + \frac{1}{x}}{x^2 - x + 1}$ का मान होगा :

- (1) $\frac{3}{2}$ (2) $\frac{5}{2}$ (3) $\frac{7}{2}$ (4) $\frac{11}{2}$

(SSC CHSL DEO & LDC Exam. 27.11.2010)

26. If $3x + \frac{1}{5x} = 7$ then what is the value of

$\frac{5x}{15x^2 + 15x + 1}$?

यदि $3x + \frac{1}{5x} = 7$ है, तो $\frac{5x}{15x^2 + 15x + 1}$ का मान क्या होगा?

- (1) $\frac{1}{5}$ (2) $\frac{1}{10}$ (3) $-\frac{2}{5}$ (4) 10

(SSC CGL - 2017)

27. If $x + \frac{1}{4x} = \frac{3}{2}$, find the value of $8x^3 + \frac{1}{8x^3}$.

यदि $x + \frac{1}{4x} = \frac{3}{2}$ हो, तो $8x^3 + \frac{1}{8x^3}$ का मान कितना होगा ?

- (1) 18 (2) 36 (3) 24 (4) 16

(SSC CHSL DEO & LDC Exam. 04.12.2011
(1st Sitting) (East Zone))

28. If $\frac{x}{2x^2+5x+2} = \frac{1}{6}$, the value of $\left(x + \frac{1}{x}\right)$ is —

यदि $\frac{x}{2x^2+5x+2} = \frac{1}{6}$, $\left(x + \frac{1}{x}\right)$ का मान है :

- (1) 2 (2) $\frac{1}{2}$ (3) $-\frac{1}{2}$ (4) -2

(SSC (10+2) DEO & LDC Exam, 11.12.2011 Delhi : IInd Sitting)

29. If $x^4 + \frac{1}{x^4} = 119$ and $x > 1$, then the value of $x^3 - \frac{1}{x^3}$ is

यदि $x^4 + \frac{1}{x^4} = 119$ हो और $x > 1$, हो, तो $x^3 - \frac{1}{x^3}$ का मान

क्या होगा?

- (1) 54 (2) 18 (3) 72 (4) 36

(SSC CHSL DEO & LDC Exam, 11.12.2011
(1st Sitting (East Zone))

30. If $x^2 + x = 19$ then what is the value of

$$(x+5)^2 + \frac{1}{(x+5)^2} ?$$

यदि $x^2 + x = 19$ है, तो $(x+5)^2 + \frac{1}{(x+5)^2}$ का मान क्या

होगा?

- (1) 77 (2) 79 (3) 81 (4) 83

(SSC CGL - 2017)

31. If $x + \frac{1}{x} = 2$, then $x^{100} + \frac{1}{x^{100}}$ will equal to—

यदि $x + \frac{1}{x} = 2$ हो, तो $x^{100} + \frac{1}{x^{100}}$ का मान होगा :

- (1) 2 (2) 0 (3) 1 (4) -2

(SSC GL Tier-II Exam, 01.08.2010)

32. If $a + \frac{1}{a} + 2 = 0$, then $\left(a^{37} - \frac{1}{a^{100}}\right)$ will equal to—

यदि $a + \frac{1}{a} + 2 = 0$, तो $\left(a^{37} - \frac{1}{a^{100}}\right)$ का मान है—

- (1) 0 (2) -2 (3) 1 (4) 2

(SSC GL Tier-II Exam, 04.09.2011)

33. If $x + \frac{1}{x} = 3$, then what will be the value of $x^5 + \frac{1}{x^5}$?

यदि $x + \frac{1}{x} = 3$ हो, तो $x^5 + \frac{1}{x^5}$ का मान क्या होगा ?

- (1) 123 (2) 126 (3) 113 (4) 129

(SSC CGL Tier-I Exam, 2012 & SSC (10+2) DEO)

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

यदि $x + \frac{1}{2x} = 2$, तो $8x^3 + \frac{1}{x^3}$ का मान है—

- (1) 48 (2) 88 (3) 40 (4) 44

(SSC CHSL DEO & LDC Exam, 04.12.2011
(1st Sitting (North Zone))

35. If $x + \frac{1}{x} = 5$, then what will be the value of

$$\frac{x^4 + \frac{1}{x^2}}{x^2 - 3x + 1} ?$$

यदि $x + \frac{1}{x} = 5$, हो, तो $\frac{x^4 + \frac{1}{x^2}}{x^2 - 3x + 1}$ का मान कितना होगा?

- (1) 70 (2) 50 (3) 110 (4) 55

(SSC CGL Tier-I Exam, 2012)

36. If $x + \frac{1}{x} = 5$, then the value of

$$\frac{x^4 + 3x^3 + 5x^2 + 3x + 1}{x^4 + 1}$$

यदि $x + \frac{1}{x} = 5$ हो, तो $\frac{x^4 + 3x^3 + 5x^2 + 3x + 1}{x^4 + 1}$ का

मान कितना होगा ?

- (1) $\frac{43}{23}$ (2) $\frac{47}{21}$ (3) $\frac{41}{23}$ (4) $\frac{45}{21}$

(SSC CHSL DEO & LDC Exam, 28.10.2012 (1st Sitting))

37. If $x^2 + 1 = 2x$, then the value of $\frac{x^4 + \frac{1}{x^2}}{x^2 - 3x + 1}$ is

यदि $x^2 + 1 = 2x$ हो, तो $\frac{x^4 + \frac{1}{x^2}}{x^2 - 3x + 1}$ का मान क्या होगा ?

- (1) 0 (2) 1 (3) 2 (4) -2

(SSC Delhi Police S.I.(SI) Exam, 19.08.2012)

38. If x is real, $x + \frac{1}{x} \neq 0$ and $x^3 + \frac{1}{x^3} = 0$, then the

value of $\left(x + \frac{1}{x}\right)^4$ is

यदि x वास्तविक एवं $x + \frac{1}{x} \neq 0$ हो और $x^3 + \frac{1}{x^3} = 0$ हो, तो

$\left(x + \frac{1}{x}\right)^4$ का मान कितना होगा ?

- (1) 4 (2) 9 (3) 16 (4) 25

(SSC GL Tier-I Exam. 11.11.2012 (1st Sitting))

39. If $x > 1$ and $x^2 + \frac{1}{x^2} = 83$, then $x^3 - \frac{1}{x^3}$ is

यदि $x > 1$ तथा $x^2 + \frac{1}{x^2} = 83$ हो, तो $x^3 - \frac{1}{x^3}$ का मान

कितना होगा?

- (1) 764 (2) 750 (3) 756 (4) 760

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

40. If $x + \frac{1}{4x} = \frac{5}{2}$ then what is the value of

$\frac{(64x^6 + 1)}{8x^3}$?

यदि $x + \frac{1}{4x} = \frac{5}{2}$ तो $\frac{(64x^6 + 1)}{8x^3}$ का मान क्या होगा?

- (1) 110 (2) 115 (3) 125 (4) 140

(SSC CGL - 2017)

41. If $x = \frac{4\sqrt{ab}}{\sqrt{a} + \sqrt{b}}$, then what is the value of

$\frac{x + 2\sqrt{a}}{x - 2\sqrt{a}} + \frac{x + 2\sqrt{b}}{x - 2\sqrt{b}}$ (when $a \neq b$) ?

यदि $x = \frac{4\sqrt{ab}}{\sqrt{a} + \sqrt{b}}$ हो तो $\frac{x + 2\sqrt{a}}{x - 2\sqrt{a}} + \frac{x + 2\sqrt{b}}{x - 2\sqrt{b}}$ का मान

क्या है, (जहाँ $a \neq b$) हो ?

- (1) 0 (2) 2
(3) 4 (4) $(\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b})$

(SSC CGL - 2017)

42. If $x = \sqrt[3]{2 + \sqrt{3}}$, then the value of $x^3 + \frac{1}{x^3}$ is

यदि $x = \sqrt[3]{2 + \sqrt{3}}$ हो, तो $x^3 + \frac{1}{x^3}$ का मान कितना होगा?

- (1) 8 (2) 9 (3) 2 (4) 4

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

43. If $x = 3 + 2\sqrt{2}$, then what is the value of $\sqrt{x} - \frac{1}{\sqrt{x}}$?

यदि $x = 3 + 2\sqrt{2}$ हो, तो $\sqrt{x} - \frac{1}{\sqrt{x}}$ का मान है-

- (1) $\pm 2\sqrt{2}$ (2) ± 2 (3) $\pm \sqrt{2}$ (4) $\pm \frac{1}{2}$

(SSC CPO SI & Assistant Intelligence Officer Exam. 2012)

44. If $\sqrt{x} = \sqrt{3} - \sqrt{5}$, then the value of $x^2 - 16x + 6$ is

यदि $\sqrt{x} = \sqrt{3} - \sqrt{5}$ हो, तो $x^2 - 16x + 6$ का मान क्या होगा?

- (1) 0 (2) -2 (3) 2 (4) 4

(SSC GL Tier-II Exam. 29.09.2013)

45. If $x + \frac{1}{x} = 2$, then $\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)$ will equal to—

यदि $x + \frac{1}{x} = 2$ हो, तो $\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)$ का मान होगा-

- (1) $\sqrt{2}$ (2) 2 (3) $\sqrt{2} + 1$ (4) 1

(SSC SAS Exam. 27.06.2010)

46. If $2x = \sqrt{a} + \frac{1}{\sqrt{a}}$, $a > 0$, then the value of

$\frac{\sqrt{x^2 - 1}}{x - \sqrt{x^2 - 1}}$ is

यदि $2x = \sqrt{a} + \frac{1}{\sqrt{a}}$, $a > 0$, तो $\frac{\sqrt{x^2 - 1}}{x - \sqrt{x^2 - 1}}$ का मान क्या

होगा ?

- (1) $a + 1$ (2) $\frac{1}{2} (a + 1)$

- (3) $\frac{1}{2} (a - 1)$ (4) $a - 1$

(SSC CGL Tier-II Exam. 2014 12.04.2015

(Kolkata Region) TF No. 789 TH 7)

47. If $a^3 + b^3 = 20$ and $a + b = 5$, then find the value of $(a^4 + b^4)$.

- (1) 25 (2) 26 (3) 24 (4) 23

SSC CHSL (10+2) TIER-I CBE EXAM

Held on : 17.03.2020 (Shift-I)

48. If the value of $\frac{3x\sqrt{y} + 2y\sqrt{x}}{3x\sqrt{y} - 2y\sqrt{x}} - \frac{3x\sqrt{y} - 2y\sqrt{x}}{3x\sqrt{y} + 2y\sqrt{x}}$ is

same as that of $\sqrt{x}\sqrt{y}$, then which of the following relations between x and y is correct ?
 (1) $9x - 4y = 36$ (2) $9x + 4y = 24$
 (3) $9x + 4y = 36$ (4) $9x - 4y = 24$

SSC CHSL (10+2) TIER-I CBE EXAM
 Held on : 18.03.2020 (Shift-I)

49. If

$$\frac{4}{1 + \sqrt{2} + \sqrt{3}} = a + b\sqrt{2} + c\sqrt{3} - d\sqrt{6}, \text{ where } a, b, c, d \text{ are}$$

natural numbers, then the value of $a + b + c + d$ is :
 (1) 0 (2) 2 (3) 4 (4) 1

SSC CHSL (10+2) TIER-I CBE EXAM
 Held on : 18.03.2020 (Shift-I)

50. If $a + b + c + d = 2$, then the maximum value of $(1 + a)(1 + b)(1 + c)(1 + d)$ is _____

(1) $\frac{91}{9}$ (2) $\frac{81}{16}$ (3) $\frac{63}{22}$ (4) $\frac{54}{13}$

SSC CHSL (10+2) TIER-I CBE EXAM
 Held on : 18.03.2020 (Shift-2)

51. If $a^2 + b^2 + c^2 + 216 = 12(a + b - 2c)$, then $\sqrt{ab - bc + ca}$ is:

(1) 6 (2) 4 (3) 3 (4) 8

SSC DELHI POLICE SI, CAPFs SI & CISF ASI (CPO) EXAM
 Held on : 23.11.2020 (Shift-I)

52. If $x^4 + x^{-4} = 194$, $x > 0$, then the value of $x + \frac{1}{x}$ is:

(1) 4 (2) 14 (3) 6 (4) 8

SSC DELHI POLICE SI, CAPFs SI & CISF ASI (CPO) EXAM
 Held on : 23.11.2020 (Shift-I)

53. If $x^2 - 3x + 1 = 0$, then the value of

$$\left(x^4 + \frac{1}{x^2}\right) \div (x^2 + 1)$$

(1) 5 (2) 6 (3) 7 (4) 9

SSC DELHI POLICE SI, CAPFs SI & CISF ASI (CPO) EXAM
 Held on : 24.11.2020 (Shift-I)

54. If $x\left(3 - \frac{2}{x}\right) = \frac{3}{x}$, then the value of $x^3 - \frac{1}{x^3}$ is equal to :

यदि $x\left(3 - \frac{2}{x}\right) = \frac{3}{x}$, है, तो $x^3 - \frac{1}{x^3}$ का मान ज्ञात कीजिए।

(1) $\frac{8}{27}$ (2) $\frac{61}{27}$

(3) $\frac{62}{27}$ (4) $\frac{52}{27}$

(SSC CGL Tier-II Exam. 18.11.2020)

55. If $x - \frac{3}{x} = 6$, $x \neq 0$, then the value of $\frac{x^4 - \frac{27}{x^2}}{x^2 - 3x - 3}$ is:

यदि $x - \frac{3}{x} = 6$, $x \neq 0$ है, तो $\frac{x^4 - \frac{27}{x^2}}{x^2 - 3x - 3}$ का मान ज्ञात

कीजिए।

(1) 80 (2) 270
 (3) 54 (4) 90

(SSC CGL Tier-II Exam. 18.11.2020)

Type-III

Factor Theorem and Questions Based on Other Formulae

1. If $x = \sqrt{a} + \frac{1}{\sqrt{a}}$, $y = \sqrt{a} - \frac{1}{\sqrt{a}}$, then the value of $x^4 + y^4 - 2x^2y^2$ is—

यदि $x = \sqrt{a} + \frac{1}{\sqrt{a}}$, $y = \sqrt{a} - \frac{1}{\sqrt{a}}$,

तो $x^4 + y^4 - 2x^2y^2$ का मान है :

(1) 16 (2) 20 (3) 10 (4) 5

(SSC CPO SI & Assistant Intelligence Officer Exam. 2012)

2. If $(x - 2)$ is a factor of $x^2 + 3Qx - 2Q$, then the value of Q is

यदि $x^2 + 3Qx - 2Q$ का गुणनखंड $(x - 2)$ है, तो Q का मान है—

(1) 2 (2) -2 (3) 1 (4) -1

(SSC CHSL DEO Exam. 02.11.2014 (1st Sitting))

3. If $x - \frac{1}{x} = 1$, then what is the value of

$$\frac{1}{x} \left[\frac{1}{x-1} - \frac{1}{x+1} + \frac{1}{x^2+1} - \frac{1}{x^2-1} \right] ?$$

यदि $x - \frac{1}{x} = 1$, तो

$\frac{1}{x} \left[\frac{1}{x-1} - \frac{1}{x+1} + \frac{1}{x^2+1} - \frac{1}{x^2-1} \right]$ का मान क्या है?

(1) $\pm\sqrt{5}x$ (2) $\frac{2}{5x}$

(3) $\pm \frac{2}{\sqrt{5x}}$

(4) $\pm \frac{\sqrt{5}}{2}x$

(SSC CGL - 2017)

4. If $(Px^3 - 8x^2 - qx + 1)$, the expression is completely divisible by the expression $(3x^2 - 4x + 1)$ then what will be the value of p and q respectively?

यदि व्यंजक $(Px^3 - 8x^2 - qx + 1)$, व्यंजक $(3x^2 - 4x + 1)$ से पूर्णतः विभाजित होता है, तो क्रमशः p तथा q का मान क्या होगा?

(1) $\left(\frac{21}{4}, \frac{15}{8}\right)$

(2) (6, 1)

(3) $\left(\frac{33}{4}, \frac{5}{4}\right)$

(4) (1, 6)

(SSC CPO - 2017)

5. If $p = \frac{5}{18}$, then $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$ is equal to

यदि $p = \frac{5}{18}$ तो $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$ का मान है?

(1) $\frac{4}{27}$

(2) $\frac{5}{27}$

(3) $\frac{8}{27}$

(4) $\frac{10}{27}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

6. If $a(2 - \sqrt{3}) = b(2 + \sqrt{3}) = 1$, then $(a^2 - b^2)$ equal to—

यदि $a(2 - \sqrt{3}) = b(2 + \sqrt{3}) = 1$ हो, तो $(a^2 - b^2)$ का मान होगा—

(1) $8\sqrt{3}$

(2) $3\sqrt{8}$

(3) $6\sqrt{3}$

(4) $2\sqrt{6}$

(SSC SAS Exam. 27.06.2010)

7. If $x = 3 + 2\sqrt{2}$ and $xy = 1$, then the value of

$\frac{x^2 + 3xy + y^2}{x^2 - 3xy + y^2}$ is

यदि $x = 3 + 2\sqrt{2}$ तथा $xy = 1$ हो, तो $\frac{x^2 + 3xy + y^2}{x^2 - 3xy + y^2}$ का

मान क्या होगा ?

(1) $\frac{30}{31}$

(2) $\frac{70}{31}$

(3) $\frac{35}{31}$

(4) $\frac{37}{31}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting))

8. If $x = 5 - \sqrt{21}$, then the value of $\frac{\sqrt{x}}{\sqrt{32 - 2x - \sqrt{21}}}$ is

यदि $x = 5 - \sqrt{21}$ हो, तो $\frac{\sqrt{x}}{\sqrt{32 - 2x - \sqrt{21}}}$ का मान क्या होगा?

(1) $\frac{1}{\sqrt{2}}(\sqrt{3} - \sqrt{7})$

(2) $\frac{1}{\sqrt{2}}(\sqrt{7} - \sqrt{3})$

(3) $\frac{1}{\sqrt{2}}(\sqrt{7} + \sqrt{3})$

(4) $\frac{1}{\sqrt{2}}(7 - \sqrt{3})$

(SSC CHSL DEO & LDC Exam. 10.11.2013, 1st Sitting)

9. If $a = 7 - 4\sqrt{3}$, then what is the value of $\frac{1}{a^2} + a^{-\frac{1}{2}}$?

यदि $a = 7 - 4\sqrt{3}$ हो, तो $\frac{1}{a^2} + a^{-\frac{1}{2}}$ का मान कितना होगा?

(1) $3\sqrt{3}$

(2) 4

(3) 7

(4) $2\sqrt{3}$

(SSC FCI Assistant Grade-III (Main) Exam. 07.04.2013)

10. If $x = \frac{\sqrt{5+1}}{\sqrt{5-1}}$, then $x^2 + x - 1$ equal to—

यदि $x = \frac{\sqrt{5+1}}{\sqrt{5-1}}$, तो $x^2 + x - 1$ का मान है—

(1) $\sqrt{5} + 1$

(2) 2

(3) $-\sqrt{5}$

(4) 0

(SSC CGL Tier-II Exam. 2012)

11. If $x = \sqrt[3]{5} + 2$, then the value of $x^3 - 6x^2 + 12x - 13$ is

यदि $x = \sqrt[3]{5} + 2$ हो, तो $x^3 - 6x^2 + 12x - 13$ का मान क्या होगा?

(1) -1

(2) 1

(3) 2

(4) 0

(SSC Graduate Level Tier-II Exam. 29.09.2013)

12. If $a^2 + 1 = a$, then what will be the value of $a^{12} + a^6 + 1$?

यदि $a^2 + 1 = a$, हो, तो $a^{12} + a^6 + 1$ का मान क्या होगा?

(1) -3

(2) 1

(3) 2

(4) 3

(SSC GL Tier-I Exam. 21.04.2013)

13. If $x = 2 - 2^{1/3} + 2^{2/3}$, then the value of $x^3 - 6x^2 + 18x + 18$ is

यदि $x = 2 - 2^{1/3} + 2^{2/3}$, तो $x^3 - 6x^2 + 18x + 18$ का मान है—

(1) 22

(2) 33

(3) 40

(4) 45

(SSC CHSL DEO & LDC Exam. 04.12.2011 (1st Sitting (North Zone))

14. If $x = 1 + \sqrt{2} + \sqrt{3}$, then the value of $(2x^4 - 8x^3 - 5x^2 + 26x - 28)$?

यदि $x = 1 + \sqrt{2} + \sqrt{3}$ हो, तो $(2x^4 - 8x^3 - 5x^2 + 26x - 28)$ का मान क्या होगा ?

- (1) $6\sqrt{6}$ (2) 0 (3) $3\sqrt{6}$ (4) $2\sqrt{6}$

(SSC CGL Tier-I Exam, 2012)

15. If $x = -1$, then the value of

$$\frac{1}{x^{99}} + \frac{1}{x^{98}} + \frac{1}{x^{97}} + \frac{1}{x^{96}} + \frac{1}{x^{95}} + \frac{1}{x^{94}} + \frac{1}{x} - 1$$

यदि $x = -1$ हो, तो

$$\frac{1}{x^{99}} + \frac{1}{x^{98}} + \frac{1}{x^{97}} + \frac{1}{x^{96}} + \frac{1}{x^{95}} + \frac{1}{x^{94}} + \frac{1}{x} - 1$$

किसके बराबर होगा?

- (1) 1 (2) 0 (3) -2 (4) -1

(SSC MTS Exam, 17.03.2013, Kolkata Region)

16. What will be the value of $x^4 - 17x^3 + 17x^2 - 17x + 17$ if $x = 16$?

$x = 16$ की स्थिति में व्यंजक $x^4 - 17x^3 + 17x^2 - 17x + 17$ का मान क्या होगा?

- (1) 0 (2) 1 (3) 2 (4) 3

FCI Assistant Grade-III Exam.05.02.2012, Second Sitting & CHSL DEO and LDC Exam, 2011)

17. If $\frac{x + \sqrt{x^2 - 1}}{x - \sqrt{x^2 - 1}} + \frac{x - \sqrt{x^2 - 1}}{x + \sqrt{x^2 - 1}} = 62$ then what is the value of $x (x < 0)$?

$$\text{यदि } \frac{x + \sqrt{x^2 - 1}}{x - \sqrt{x^2 - 1}} + \frac{x - \sqrt{x^2 - 1}}{x + \sqrt{x^2 - 1}} = 62 \text{ है, तो } x (x < 0)$$

का मान क्या होगा?

- (1) -4 (2) 0 (3) 3 (4) 16

(SSC CPO - 2017)

18. If $x^2 - 3x + 1 = 0$, then the value of

$$\frac{x^6 + x^4 + x^2 + 1}{x^3}$$

यदि $x^2 - 3x + 1 = 0$, तो $\frac{x^6 + x^4 + x^2 + 1}{x^3}$ का मान क्या

होगा?

- (1) 18 (2) 15 (3) 21 (4) 30

(SSC CGL Tier-I Exam, 19.10.2014 (1st Sitting))

19. If the expression $x^2 + x + 1$ is written in the form

$$\left(x + \frac{1}{2}\right)^2 + q^2, \text{ then the possible values of } q \text{ are}$$

यदि व्यंजक $x^2 + x + 1$ को $\left(x + \frac{1}{2}\right)^2 + q^2$, के रूप में लिखा जाए, तो q के संभावित मान हैं-

- (1) $\frac{1}{3}$ (2) $\pm \frac{\sqrt{3}}{2}$ (3) $\pm \frac{2}{\sqrt{3}}$ (4) $\pm \frac{1}{2}$

(SSC Graduate Level Tier-I Exam, 21.04.2013 IIInd Sitting)

20. If $ax + by = 3$, $bx - ay = 4$ and $x^2 + y^2 = 1$, then the value of $a^2 + b^2$ is —

यदि $ax + by = 3$, $bx - ay = 4$ तथा $x^2 + y^2 = 1$, हो तो $a^2 + b^2$ का मान क्या है ?

- (1) 17 (2) 16 (3) 9 (4) 25

(SSC (10+2) CHSL DEO & LDC Exam, 04.11.2012 Second Sitting)

21. If $\frac{x}{a} = \frac{1}{a} - \frac{1}{x}$, then the value of $x - x^2$ is :

यदि $\frac{x}{a} = \frac{1}{a} - \frac{1}{x}$ हो, तो $x - x^2$ का मान कितना होगा?

- (1) -a (2) $\frac{1}{a}$ (3) $-\frac{1}{a}$ (4) a

(SSC GL Tier-I Exam, 21.04.2013, 1st Sitting)

22. If $x^2 + ax + b$ is a perfect square, then which one of the following relations between a and b is true ?

यदि $x^2 + ax + b$ पूर्ण वर्ग है, तो a और b के बीच निम्नलिखित में से कौन-सा सम्बन्ध सही है?

- (1) $a^2 = b$ (2) $a^2 = 4b$ (3) $b^2 = 4a$ (4) $b^2 = a$

(SSC CHSL DEO Exam, 16.11.2014 (1st Sitting))

23. If $a + b = 1$, $c + d = 1$ and $a - b = \frac{d}{c}$, then the value of $c^2 - d^2$ is

यदि $a + b = 1$, $c + d = 1$ और $a - b = \frac{d}{c}$, तो $c^2 - d^2$ का मान है-

- (1) $\frac{a}{b}$ (2) $\frac{b}{a}$ (3) 1 (4) -1

(SSC CGL Tier-I Re-Exam, (2013) 20.07.2014 (1st Sitting))

24. Find the value of x for which the expression $2 - 3x - 4x^2$ has the greatest value.

x का मान ज्ञात कीजिए जिसके लिए व्यंजक $2 - 3x - 4x^2$ का महत्तम मान है-

- (1) $-\frac{41}{16}$ (2) $\frac{3}{8}$ (3) $-\frac{3}{8}$ (4) $\frac{41}{16}$

(SSC CGL Tier-I Re-Exam, (2013) 20.07.2014 (IIInd Sitting))

25. What is the Simplified value of

$$\left(x^{32} + \frac{1}{x^{32}}\right)\left(x^8 + \frac{1}{x^8}\right)\left(x - \frac{1}{x}\right)\left(x^{16} + \frac{1}{x^{16}}\right)$$

$$\left(x + \frac{1}{x}\right)\left(x^4 + \frac{1}{x^4}\right) \text{ का सरलीकृत मान क्या है?}$$

(1) $\left(x^{64} + \frac{1}{x^{64}}\right)$ (2) $\frac{\left(x^{64} - \frac{1}{x^{64}}\right)}{\left(x^2 + \frac{1}{x^2}\right)}$

(3) $\frac{\left(x^{64} - \frac{1}{x^{64}}\right)}{\left(x + \frac{1}{x}\right)}$ (4) $\frac{\left(x^{32} - \frac{1}{x^{32}}\right)}{\left(x^2 + \frac{1}{x^2}\right)}$

(SSC CPO 2017)

26. If $a^2 + b^2 + c^2 = ab + bc + ca$, then the value of $\frac{a+c}{b}$ is

यदि $a^2 + b^2 + c^2 = ab + bc + ca$, तो $\frac{a+c}{b}$ का मान क्या होगा ?

- (1) 3 (2) 2 (3) 0 (4) 1

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

27. If $3(a^2 + b^2 + c^2) = (a + b + c)^2$, then the relation between a, b and c is

यदि $3(a^2 + b^2 + c^2) = (a + b + c)^2$ है, तो a, b और c के बीच क्या संबंध है ?

- (1) $a \neq b \neq c$ (2) $a = b \neq c$
(3) $a \neq b = c$ (4) $a = b = c$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

28. What is the value of का मान क्या है?

$$\sqrt{1 + \frac{1}{2^2} + \frac{1}{3^2}} + \sqrt{1 + \frac{1}{3^2} + \frac{1}{4^2}} + \sqrt{1 + \frac{1}{4^2} + \frac{1}{5^2}} ?$$

- (1) $\frac{18}{5}$ (2) $\frac{4}{3}$ (3) $\frac{7}{3}$ (4) $\frac{33}{10}$

(SSC COP - 2017)

29. If a, b, c are non-zero, $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$, then the value of abc is :

यदि a, b, c शून्य नहीं हैं, $a + \frac{1}{b} = 1$ तथा $b + \frac{1}{c} = 1$ है, तो abc का मान क्या होगा?

- (1) -1 (2) 3 (3) -3 (4) 1

(SSC Graduate Level Tier-I Exam, 21.04.2013)

30. If $a^2 - 4a - 1 = 0, a \neq 0$, then the value of $a^2 + 3a + \frac{1}{a^2} - \frac{3}{a}$ is

यदि $a^2 - 4a - 1 = 0, a \neq 0$, तो $a^2 + 3a + \frac{1}{a^2} - \frac{3}{a}$ का मान क्या है?

- (1) 24 (2) 26 (3) 28 (4) 30

(SSC CGL Tier-I Exam, 19.10.2014 TF No. 022 MH 3)

31. If $x = \frac{a-b}{a+b}, y = \frac{b-c}{b+c}, z = \frac{c-a}{c+a}$, then

$\frac{(1-x)(1-y)(1-z)}{(1+x)(1+y)(1+z)}$ is equal to

यदि $x = \frac{a-b}{a+b}, y = \frac{b-c}{b+c}, z = \frac{c-a}{c+a}$, तो

$\frac{(1-x)(1-y)(1-z)}{(1+x)(1+y)(1+z)}$ का मान क्या होगा?

- (1) 1 (2) 0 (3) 2 (4) $\frac{1}{2}$

(SSC CGL Tier-I Re-Exam, 30.08.2015)

32. If $\frac{a}{b} + \frac{b}{a} = 2$, then the value of $(a - b)$ is :

यदि $\frac{a}{b} + \frac{b}{a} = 2$ है, तो $a - b$ का मान है :

- (1) 1 (2) 2 (3) -1 (4) 0

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

33. If $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$ then $c + \frac{1}{a}$ is equal to :

यदि $a + \frac{1}{b} = 1$ और $b + \frac{1}{c} = 1$ तो $c + \frac{1}{a}$ किसके बराबर होगा ?

- (1) $\frac{1}{2}$ (2) 2 (3) 1 (4) 0

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

34. If a, b, c are real and $a^3 + b^3 + c^3 = 3abc$ and $a + b + c \neq 0$, तो a, b, c then relation among a, b, c are :

यदि a, b, c वास्तविक हैं और $a^3 + b^3 + c^3 = 3abc$ और $a + b + c \neq 0$, तो a, b, c के बीच संबंध होगा :

- (1) $a + b = c$ (2) $a + c = b$
(3) $a = b = c$ (4) $b + c = a$

(SSC CPO SI & Assistant Intelligence Officer Exam, 2012)

35. If $xy(x + y) = 1$, then the value of $\frac{1}{x^3y^3} - x^3 - y^3$ is

यदि $xy(x + y) = 1$ हो, तो $\frac{1}{x^3y^3} - x^3 - y^3$ का मान है :

- (1) 0 (2) 1 (3) 3 (4) -2

(SSC CHSL DEO & LDC Exam, 11.12.2011 (IInd Sitting Delhi Zone) & (SSC GL Tier-I Exam, 21.04.2013))

36. What is the value of

का मान क्या है?

$$\frac{(a^2 + b^2)(a - b) - (a - b)^3}{a^2b - ab^2}$$

- (1) 0 (2) 1 (3) -1 (4) 2

(SSC CPO - 2017)

37. If $N = \frac{(\sqrt{7} - \sqrt{5})}{\sqrt{7} + \sqrt{5}}$, then what is the value of $\frac{1}{N}$?

यदि $N = \frac{(\sqrt{7} - \sqrt{5})}{\sqrt{7} + \sqrt{5}}$ है तो $\frac{1}{N}$ का मान क्या है?

- (1) $6 - \sqrt{35}$ (2) $6 + \sqrt{35}$ (3) $7 + \sqrt{35}$ (4) $7 - \sqrt{35}$

(SSC CPO - 2017)

38. If $(3a + 1)^2 + (b - 1)^2 + (2c - 3)^2 = 0$, then the value of $(3a + b + 2c)$ is—

यदि $(3a + 1)^2 + (b - 1)^2 + (2c - 3)^2 = 0$, तो $(3a + b + 2c)$ का मान है:

- (1) 3 (2) -1 (3) 2 (4) 5

(SSC CHSL DEO and LDC Exam, 11.12.2011)

39. If $(x - 3)^2 + (y - 5)^2 + (z - 4)^2 = 0$, then the value of

$$\frac{x^2}{9} + \frac{y^2}{25} + \frac{z^2}{16}$$

यदि $(x - 3)^2 + (y - 5)^2 + (z - 4)^2 = 0$ हो तो, $\frac{x^2}{9} + \frac{y^2}{25} +$

$\frac{z^2}{16}$ का मान कितना होगा ?

- (1) 12 (2) 9 (3) 3 (4) 1

(SSC Graduate Level Tier-I Exam, 19.05.2013)

40. If $(a - 3)^2 + (b - 4)^2 + (c - 9)^2 = 0$, then the value of $\sqrt{a + b + c}$ is :

यदि $(a - 3)^2 + (b - 4)^2 + (c - 9)^2 = 0$ हो, तो $\sqrt{a + b + c}$ का मान क्या होगा ?

- (1) -4 (2) 4 (3) ± 4 (4) ± 2

(SSC CHSL DEO & LDC Exam, 11.12.2011)

41. If $\frac{x}{xa + yb + zc} = \frac{y}{ya + zb + xc} = \frac{z}{za + xb + yc}$ and

$x + y + z \neq 0$, then each ratio is

यदि $\frac{x}{xa + yb + zc} = \frac{y}{ya + zb + xc} = \frac{z}{za + xb + yc}$ और

$x + y + z \neq 0$, तो प्रत्येक अनुपात होगा—

- (1) $\frac{1}{a - b - c}$ (2) $\frac{1}{a + b - c}$

- (3) $\frac{1}{a - b + c}$ (4) $\frac{1}{a + b + c}$

(SSC CHSL DEO & LDC Exam, 9.11.2014)

42. If $a + b + c + d = 4$, then find the value of

$$\frac{1}{(1-a)(1-b)(1-c)} + \frac{1}{(1-b)(1-c)(1-d)} + \frac{1}{(1-c)(1-d)(1-a)} + \frac{1}{(1-d)(1-a)(1-b)}$$

यदि $a + b + c + d = 4$, तो $\frac{1}{(1-a)(1-b)(1-c)} +$

$$\frac{1}{(1-b)(1-c)(1-d)} + \frac{1}{(1-c)(1-d)(1-a)} +$$

$\frac{1}{(1-d)(1-a)(1-b)}$ का मान क्या होगा?

- (1) 0 (2) 5 (3) 1 (4) 4

(SSC CHSL DEO Exam, 16.11.2014 (1st Sitting))

43. If $a + b + c = 3$ and none of a, b and c is equal to 1, then what is the value of

$$\frac{1}{(1-a)(1-b)} + \frac{1}{(1-b)(1-c)} + \frac{1}{(1-c)(1-a)}$$

यदि $a + b + c = 3$ तथा c में से कोई भी 1 के बराबर नहीं है,

तो $\frac{1}{(1-a)(1-b)} + \frac{1}{(1-b)(1-c)} + \frac{1}{(1-c)(1-a)}$ का

मान क्या होगा?

- (1) 0 (2) 1 (3) 3 (4) 6

(SSC CPO - 2017)

44. The value of expression $\sum \frac{q-r}{(p+q)(q+r)}$ will be

व्यंजक $\sum \frac{q-r}{(p+q)(q+r)}$ का मान होगा :

- (1) 0 (2) 1
(3) 3 (4) -1

(SSC CGL Tier-I Exam. 19.10.2014)

45. If $\frac{b-c}{a} + \frac{a+c}{b} + \frac{a-b}{c} = 1$ and $a-b+c \neq 0$ then which one of the following relations is true ?

यदि $\frac{b-c}{a} + \frac{a+c}{b} + \frac{a-b}{c} = 1$ और $a-b+c \neq 0$ तो

निम्नलिखित में से कौन-सा संबंध सही होगा ?

(1) $\frac{1}{c} = \frac{1}{a} + \frac{1}{b}$ (2) $\frac{1}{a} = \frac{1}{b} + \frac{1}{c}$

(3) $\frac{1}{b} = \frac{1}{a} - \frac{1}{c}$

(4) $\frac{1}{b} = \frac{1}{a} + \frac{1}{c}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

46. If a, b, c are positive and $a+b+c=1$, then the least value of $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$ is

यदि a, b, c धनात्मक हैं और $a+b+c=1$, तो $\frac{1}{a} +$

$\frac{1}{b} + \frac{1}{c}$ का न्यूनतम मान क्या है ?

- (1) 9 (2) 5 (3) 3 (4) 1

(SSC CGL Tier-I Exam. 26.10.2014)

47. If $\frac{p}{a} + \frac{q}{b} + \frac{r}{c} = 1$ and $\frac{a}{p} + \frac{b}{q} + \frac{c}{r} = 0$, where p, q, r and a, b, c are non-zero, then the value of

$\frac{p^2}{a^2} + \frac{q^2}{b^2} + \frac{r^2}{c^2}$ is

यदि $\frac{p}{a} + \frac{q}{b} + \frac{r}{c} = 1$ और $\frac{a}{p} + \frac{b}{q} + \frac{c}{r} = 0$, यहाँ p, q, r और

a, b, c शून्येतर हैं, तो $\frac{p^2}{a^2} + \frac{q^2}{b^2} + \frac{r^2}{c^2}$ का मान क्या है ?

- (1) -1 (2) 0 (3) 1 (4) 2

(SSC CGL Tier-I Exam. 19.10.2014)

48. The value of $\frac{1}{a^2+ax+x^2} - \frac{1}{a^2-ax+x^2} + \frac{2ax}{a^4+a^2x^2+x^4}$ is

$\frac{1}{a^2+ax+x^2} - \frac{1}{a^2-ax+x^2} + \frac{2ax}{a^4+a^2x^2+x^4}$

का मान क्या होगा?

- (1) 2 (2) 1 (3) -1 (4) 0

(SSC CGL Tier-II Exam. 21.09.2014)

49. If $\frac{a+b-c}{a+b} = \frac{b+c-a}{b+c} = \frac{c+a-b}{c+a}$ and $a+b+c \neq 0$, then

यदि $\frac{a+b-c}{a+b} = \frac{b+c-a}{b+c} = \frac{c+a-b}{c+a}$ और $a+b+c$

$\neq 0$, तो

- (1) $a \neq b \neq c$ (2) $a = b = c$
(3) $a = b \neq c$ (4) $a \neq b = c$

(SSC CGL Tier-II Exam, 2014 12.04.2015
(Kolkata Region) TF No. 789 TH 7)

50. If $bc+ab+ca=abc$, then the value of $\frac{b+c}{bc(a-1)} +$

$\frac{a+c}{ac(b-1)} + \frac{a+b}{ab(c-1)}$ is

यदि $bc+ab+ca=abc$, तो $\frac{b+c}{bc(a-1)} + \frac{a+c}{ac(b-1)} +$

$\frac{a+b}{ab(c-1)}$ का मान क्या होगा ?

- (1) 0 (2) $-\frac{1}{2}$ (3) $-\frac{3}{2}$ (4) 1

(SSC CGL Tier-II Exam, 2014 12.04.2015
(Kolkata Region) TF No. 789 TH 7)

51. If $\frac{a^2-bc}{a^2+bc} + \frac{b^2-ca}{b^2+ca} + \frac{c^2-ab}{c^2+ab} = 1$, then the value of

$\frac{a^2}{a^2+bc} + \frac{b^2}{b^2+ca} + \frac{c^2}{c^2+ab}$ is

यदि $\frac{a^2-bc}{a^2+bc} + \frac{b^2-ca}{b^2+ca} + \frac{c^2-ab}{c^2+ab} = 1$ हो, तो

$\frac{a^2}{a^2+bc} + \frac{b^2}{b^2+ca} + \frac{c^2}{c^2+ab}$ का मान क्या होगा ?

- (1) 0 (2) 1 (3) -1 (4) 2
(SSC CGL Tier-II Exam, 2014 12.04.2015
(Kolkata Region) TF No. 789 TH 7)

52. If $\frac{3-5x}{2x} + \frac{3-5y}{2y} + \frac{3-5z}{2z} = 0$, the value of $\frac{2}{x} + \frac{2}{y} + \frac{2}{z}$ is

यदि $\frac{3-5x}{2x} + \frac{3-5y}{2y} + \frac{3-5z}{2z} = 0$ तो $\frac{2}{x} + \frac{2}{y} + \frac{2}{z}$

का मान क्या है ?

- (1) 20 (2) 5 (3) 10 (4) 15

(SSC CGL Tier-II Exam, 12.04.2015 TF No. 567 TL 9)

53. If $a + b - c = 0$ then the value of $2b^2c^2 + 2c^2a^2 + 2a^2b^2 - a^4 - b^4 - c^4$

यदि $a + b - c = 0$ तो निम्नलिखित का मान है- $2b^2c^2 + 2c^2a^2 + 2a^2b^2 - a^4 - b^4 - c^4$

- (1) 7 (2) 0 (3) 14 (4) 28

(SSC CGL Tier-I Exam, 16.08.2015
(IInd Sitting) TF No. 2176783)

54. What is the value of $\frac{(a^2 + b^2)(a - b) - (a^3 - b^3)}{a^2b - ab^2}$?

$\frac{(a^2 + b^2)(a - b) - (a^3 - b^3)}{a^2b - ab^2}$ का मान क्या होगा?

- (1) 0 (2) 1 (3) -1 (4) 3

(SSC CPO - 2017)

55. If a, b, c are non-zero real numbers $a + b + c = 0$

and $b^2 \neq ca$ then the value of $\frac{a^2 + b^2 + c^2}{b^2 - ca}$ is—

यदि a, b, c तीन शून्येतर वास्तविक संख्याएँ हैं तो $a + b + c = 0$, तथा $b^2 \neq ca$, तो $\frac{a^2 + b^2 + c^2}{b^2 - ca}$ का मान है—

- (1) 3 (2) 2 (3) 0 (4) 1

(SSC CGL Tier-II Exam, 04.09.2011)

56. If $a + b + c = 2s$, then

$\frac{(s-a)^2 + (s-b)^2 + (s-c)^2 + s^2}{a^2 + b^2 + c^2}$ is equal to

यदि $a + b + c = 2s$ तो $\frac{(s-a)^2 + (s-b)^2 + (s-c)^2 + s^2}{a^2 + b^2 + c^2}$

क्या होगा ?

- (1) $a^2 + b^2 + c^2$ (2) 0
(3) 1 (4) 2

(SSC Graduate Level Tier-I Exam, 21.04.2013)

57. If $a + b + c = 0$, then the value of

$\left(\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab}\right)$ is—

यदि $a + b + c = 0$ हो, तो $\left(\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab}\right)$ का मान है :

- (1) 2 (2) 3 (3) 4 (4) 5

(SSC CPO SI & Assistant Intelligence Officer Exam, 2012
and SSC CGL Tier-I Exam, 19.05.2013)

58. What is the simplified value of $(x^{128} + 1)(x^{32} + 1)(x^{64} + 1)(x^{16} + 1)(x^8 + 1)(x^4 + 1)(x^2 + 1)(x + 1)$? का सरलीकृत मान क्या है?

(1) $x^{256} - 1$ (2) $\frac{x^{128} - 1}{x - 1}$ (3) $\frac{x^{64} - 1}{x - 1}$ (4) $\frac{x^{156} - 1}{x - 1}$

(SSC CPO - 2017)

59. If $a^2 + b^2 + c^2 + \frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} = 6$ then what is the value of $a^2 + b^2 + c^2$?

यदि $a^2 + b^2 + c^2 + \frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} = 6$ है, तो $a^2 + b^2 + c^2$ का मान क्या है?

- (1) 3 (2) 6 (3) -3 (4) 2

(SSC CPO - 2017)

60. If $a^2 + b^2 + c^2 = 2a - 2b - 2$, then the value of $3a - 2b + c$ is

यदि $a^2 + b^2 + c^2 = 2a - 2b - 2$, तो $3a - 2b + c$ का मान क्या है?

- (1) 0 (2) 3 (3) 5 (4) 2

(SSC CGL Tier-I Exam, 19.10.2014 TF No. 022 MH 3)

61. If $a + b + c = 3$, $a^2 + b^2 + c^2 = 6$ and $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} =$

1, where a, b, c are all non-zero, then 'abc' is equal to

यदि $a + b + c = 3$, $a^2 + b^2 + c^2 = 6$ और $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 1$, यहाँ a, b, c सभी शून्येतर हैं, तो 'abc' किसके बराबर है?

- (1) $\frac{2}{3}$ (2) $\frac{3}{2}$ (3) $\frac{1}{2}$ (4) $\frac{1}{3}$

(SSC CGL Tier-I Exam, 19.10.2014 TF No. 022 MH 3)

62. If $x(x + y + z) = 20$, $y(x + y + z) = 30$, and $z(x + y + z) = 50$, then the value of $2(x + y + z)$ is :

यदि $x(x + y + z) = 20$, $y(x + y + z) = 30$, और $z(x + y + z) = 50$, तो $2(x + y + z)$ का मान क्या होगा ?

- (1) 20 (2) -10 (3) 15 (4) 18

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015
(1st Sitting) TF No. 1375232)

63. If $(2a-1)^2 + (4b-3)^2 + (4c+5)^2 = 0$, then the

value of $\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2}$ is

यदि $(2a-1)^2 + (4b-3)^2 + (4c+5)^2 = 0$ तो

$\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2}$ का मान क्या होगा ?

- (1) $1\frac{3}{8}$ (2) $2\frac{3}{8}$ (3) $3\frac{3}{8}$ (4) 0

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015
(IInd Sitting) TF No. 3441135)

64. The numerical value of $\frac{(a-b)^2}{(a-c)(c-a)} +$

$\frac{(b-c)^2}{(c-a)(a-b)} + \frac{(c-a)^2}{(a-b)(b-c)}$ is (a ≠ b ≠ c)

$\frac{(a-b)^2}{(b-c)(c-a)} + \frac{(b-c)^2}{(c-a)(b-c)} + \frac{(c-a)^2}{(a-b)(b-c)}$ का मान

है (a ≠ b ≠ c)

- (1) 0 (2) 1 (3) $\frac{1}{3}$ (4) 3

(SSC CAPFs SI, CISF ASI & Delhi Police SI
Exam. 22.06.2014 TF No. 999 KP0)

65. If $\frac{m-a^2}{b^2+c^2} + \frac{m-b^2}{c^2+a^2} + \frac{m-c^2}{a^2+b^2} = 3$, then the value of m is

यदि $\frac{m-a^2}{b^2+c^2} + \frac{m-b^2}{c^2+a^2} + \frac{m-c^2}{a^2+b^2} = 3$, है, तो m का मान क्या है ?

- (1) $a^2 + b^2 - c^2$ (2) $a^2 + b^2$
(3) $a^2 + b^2 + c^2$ (4) $a^2 - b^2 - c^2$

(SSC CGL Tier-I Exam, 09.08.2015 (1st Sitting) TF No. 1443088)

66. If $a^2 = b + c$, $b^2 = c + a$ and $c^2 = a + b$, then what will be the value of $\frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c}$?

यदि $a^2 = b + c$, $b^2 = c + a$ तथा $c^2 = a + b$ हो, तो $\frac{1}{1+a}$

$+ \frac{1}{1+b} + \frac{1}{1+c}$ का मान क्या होगा?

- (1) abc (2) $a^2b^2c^2$ (3) 1 (4) 0

(SSC CHSL DEO and LDC Exam, 2011)

67. If $\sqrt{\frac{x-a}{x-b}} + \frac{a}{x} = \sqrt{\frac{x-b}{x-a}} + \frac{b}{x}$, $b \neq a$ then what will be the value of x?

यदि $\sqrt{\frac{x-a}{x-b}} + \frac{a}{x} = \sqrt{\frac{x-b}{x-a}} + \frac{b}{x}$, $b \neq a$ हो, तो x का मान क्या होगा?

- (1) $\frac{b}{a+b}$ (2) $\frac{ab}{a+b}$ (3) 1 (4) $\frac{a}{a+b}$

(SSC CGL Tier-I Exam, 2012)

68. If $x = \sqrt[3]{a + \sqrt{a^2 + b^3}} + \sqrt[3]{a - \sqrt{a^2 + b^3}}$, then $x^3 + 3bx$ is equal to

यदि $x = \sqrt[3]{a + \sqrt{a^2 + b^3}} + \sqrt[3]{a - \sqrt{a^2 + b^3}}$, तो $x^3 + 3bx$ का मान है-

- (1) 0 (2) a (3) 2a (4) 1

(SSC GL Tier-I Exam. 21.04.2013 IInd Sitting)

69. If $ab(a+b) = 1$ then what is the value of $\frac{1}{a^3b^3} - a^3 - b^3$?

यदि $ab(a+b) = 1$ है, तो $\frac{1}{a^3b^3} - a^3 - b^3$ का मान क्या है?

- (1) -1 (2) 1
(3) 3 (4) -3

(SSC CPO - 2017)

70. If $x = (\sqrt{2}-1)^{-\frac{1}{2}}$ then $\left(x^2 - \frac{1}{x^2}\right)$ will equal to—

यदि $x = (\sqrt{2}-1)^{-\frac{1}{2}}$ हो, तो $\left(x^2 - \frac{1}{x^2}\right)$ का मान होगा :

- (1) 2 (2) $-2\sqrt{2}$ (3) $2\sqrt{2}$ (4) $-\sqrt{2}$

(SSC GL Tier-II Exam, 01.08.2010)

71. If $x = \frac{u+v}{1-uv}$, $y = \frac{u-v}{1+uv}$, then $\frac{x+y}{1-xy}$ equals to

यदि $x = \frac{u+v}{1-uv}$, $y = \frac{u-v}{1+uv}$, तो $\frac{x+y}{1-xy} - x^3 - y^3$ बराबर होगा

- (1) $\frac{u}{1+u^2}$ (2) $\frac{2u}{1+u}$ (3) $\frac{2u}{1-u^2}$ (4) $\frac{2u}{1+u^2}$

72. If $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c} = 1$, then what will be the

value of $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c}$?

यदि $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c} = 1$ हो, तो $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c}$ का मान क्या होगा?

- (1) 1 (2) 2 (3) 3 (4) 4

(SSC CHSL DEO & LDC Exam. 2011 & SSC GL Tier-I Exam, 19.05.2013 IInd Sitting)

73. If $x^3 + 6x^2 + 12x = 19$, then what is the value of x^3 ?

यदि $x^3 + 6x^2 + 12x = 19$, हो तो x^3 का मान क्या है?

- (1) 8 (2) 27 (3) -1 (4) 1

(SSC CPO - 2017)

74. If $x = \frac{\sqrt{5}-2}{\sqrt{5}+2}$, then what will be the nature of

$x^4 + x^{-4}$?

यदि $x = \frac{\sqrt{5}-2}{\sqrt{5}+2}$ हो, तो $x^4 + x^{-4}$ कैसा होगा?

- (1) Surd number / करणी संख्या
 (2) Rational number, but not whole number / परिमेय संख्या, किन्तु पूर्णांक नहीं
 (3) Whole number / पूर्णांक संख्या
 (4) Irrational number, but not surd number / अपरिमेय संख्या, किन्तु करणी नहीं

(SSC CGL Tier-I Exam, 2012)

75. If $x = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ and $y = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ then the value

of $\frac{x^2+xy+y^2}{x^2-xy+y^2} = ?$

यदि $x = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ और $y = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ तो निम्नलिखित का

मान है : $\frac{x^2+xy+y^2}{x^2-xy+y^2}$

- (1) $\frac{63}{61}$ (2) $\frac{67}{65}$ (3) $\frac{65}{63}$ (4) $\frac{69}{67}$

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

76. If $x + y = 2z$, then what will be value of

$\frac{x}{x-z} + \frac{z}{y-z}$?

यदि $x + y = 2z$ हो, तो $\frac{x}{x-z} + \frac{z}{y-z}$ का मान क्या होगा ?

- (1) 1 (2) 3 (3) $\frac{1}{2}$ (4) 2

(SSC DP Sub Inspector Exam. 19.08.2012, Paper-I)

77. Let $x = \frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}$ and $y = \frac{1}{x}$, then the value of

$3x^2 - 5xy + 3y^2$ is

मान लें कि $x = \frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}$ और $y = \frac{1}{x}$, तो $3x^2 - 5xy$

$+ 3y^2$ का मान है

- (1) 1717 (2) 1177 (3) 1771 (4) 1171

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

78. If $x \neq 0$, $y \neq 0$ and $z \neq 0$ and

$\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{1}{xy} + \frac{1}{yz} + \frac{1}{zx}$, then the relation

among x , y , z is

यदि $x \neq 0$, $y \neq 0$ तथा $z \neq 0$ तथा $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2}$

$= \frac{1}{xy} + \frac{1}{yz} + \frac{1}{zx}$, हो, तो x , y , z के बीच क्या संबंध होगा?

- (1) $x + y + z = 0$ (2) $x + y = z$

- (3) $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$ (4) $x = y = z$

(SSC Graduate Level Tier-I Exam. 21.04.2013)

79. If $a + b + c = 0$, then the value of

$\left(\frac{a+b}{c} + \frac{b+c}{a} + \frac{c+a}{b}\right) \left(\frac{a}{b+c} + \frac{b}{c+a} + \frac{c}{a+b}\right)$ is :

यदि $a + b + c = 0$ हो, तो

$\left(\frac{a+b}{c} + \frac{b+c}{a} + \frac{c+a}{b}\right) \left(\frac{a}{b+c} + \frac{b}{c+a} + \frac{c}{a+b}\right)$ का

मान क्या होगा?

- (1) 8 (2) -3 (3) 9 (4) 0

(SSC Graduate Level Tier-I Exam. 21.04.2013)

80. If $\left(\frac{p^{-1}q^2}{p^3q^{-2}}\right)^{\frac{1}{3}} \div \left(\frac{p^6q^{-3}}{p^{-2}q^3}\right)^{\frac{1}{3}} = p^a q^b$, then the value

of $a + b$, where p and q are different positive primes, is

यदि $\left(\frac{p^{-1}q^2}{p^3q^{-2}}\right)^{\frac{1}{3}} \div \left(\frac{p^6q^{-3}}{p^{-2}q^3}\right)^{\frac{1}{3}} = p^a q^b$ है, तो $a + b$ का मान

क्या है जिसमें p और q विभिन्न धनात्मक अभाज्य हैं ?

- (1) $-1/3$ (2) $2/3$ (3) $1/3$ (4) $-2/3$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

81. If $x = a^{\frac{1}{2}} + a^{-\frac{1}{2}}$, $y = a^{\frac{1}{2}} - a^{-\frac{1}{2}}$, then value of $(x^4 - x^2y^2 - 1) + (y^4 - x^2y^2 + 1)$ is

यदि $x = a^{\frac{1}{2}} + a^{-\frac{1}{2}}$, $y = a^{\frac{1}{2}} - a^{-\frac{1}{2}}$ है, तो $(x^4 - x^2y^2 - 1) + (y^4 - x^2y^2 + 1)$ का मान है

- (1) 16 (2) 13 (3) 12 (4) 14

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

82. If $x - \sqrt{3} - \sqrt{2} = 0$ and $y - \sqrt{3} + \sqrt{2} = 0$, then the value of $(x^3 - 20\sqrt{2}) - (y^3 + 20\sqrt{2})$ is

यदि $x - \sqrt{3} - \sqrt{2} = 0$ और $y - \sqrt{3} + \sqrt{2} = 0$, तो

$(x^3 - 20\sqrt{2}) - (y^3 + 20\sqrt{2})$ का मान क्या होगा?

- (1) 0 (2) 1 (3) 3 (4) 2

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

83. If $p^{2x}(p^2 + 1) = p(p^{3x} - p^x)$ then, the value of x will be

यदि $p^{2x}(p^2 + 1) = p(p^{3x} - p^x)$ हो, तो x का मान है-

- (1) ± 1 (2) $\pm p$ (3) 0 (4) $\frac{1}{p}$

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I) & (SSC CHSL DEO & LDC Exam. 04.12.2011) (1st Sitting) & (SSC CGL Tier-I Exam. 19.05.2013) (1st Sitting)

84. If $x^2 - 3x + 1 = 0$, then the value of $x^2 + x + \frac{1}{x} + \frac{1}{x^2}$ is

यदि $x^2 - 3x + 1 = 0$, तो $x^2 + x + \frac{1}{x} + \frac{1}{x^2}$ का मान है-

- (1) 10 (2) 2 (3) 6 (4) 8

(SSC GL Tier-I Exam. 19.05.2013 1st Sitting)

85. If $\frac{x}{(2x+y+z)} = \frac{y}{(x+2y+z)} = \frac{z}{(x+y+2z)} = a$ and $x + y + z \neq 0$, then the value of a will be

यदि $\frac{x}{(2x+y+z)} = \frac{y}{(x+2y+z)} = \frac{z}{(x+y+2z)} = a$ तथा

$x + y + z \neq 0$ तो a का मान है-

(1) $\frac{1}{3}$ (2) $\frac{1}{4}$

(3) $\frac{1}{2}$ (4) $\frac{1}{8}$

(SSC GL Tier-I Exam. 19.05.2013 1st Sitting)

86. If $\frac{1}{a} - \frac{1}{b} = \frac{1}{a-b}$, then the value of $a^3 + b^3$ is

यदि $\frac{1}{a} - \frac{1}{b} = \frac{1}{a-b}$ हो, तो $a^3 + b^3$ का मान क्या होगा ?

- (1) 0 (2) -1 (3) 1 (4) 2

(SSC CHSL DEO & LDC Exam. 10.11.2013, 1st Sitting)

87. If $a + b + c = 0$, then $\frac{1}{a^2 + b^2 + c^2} + \frac{1}{b^2 + c^2 + a^2} +$

$\frac{1}{a^2 + c^2 - b^2}$ equal to

यदि $a + b + c = 0$ तो $\frac{1}{a^2 + b^2 + c^2} + \frac{1}{b^2 + c^2 + a^2} +$

$\frac{1}{a^2 + c^2 - b^2}$ बराबर होगा।

- (1) 0 (2) 1 (3) -1 (4) 2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (1st Sitting) (Delhi Zone)

88. If $x = \frac{\sqrt{2}+1}{\sqrt{2}-1}$ and $xy = 1$, then what will be the

value of $\frac{2x^2 + 3xy + 2y^2}{2x^2 - 3xy + 2y^2}$?

यदि $x = \frac{\sqrt{2}+1}{\sqrt{2}-1}$ तथा $xy = 1$ हो, तो $\frac{2x^2 + 3xy + 2y^2}{2x^2 - 3xy + 2y^2}$ का

मान होगा-

(1) $\frac{71}{65}$ (2) $3 + 2\sqrt{2}$

(3) $\frac{81}{65}$ (4) $3 - 2\sqrt{2}$

(SSC SAS Exam, 27.06.2010) & GL Tier-I Exam, 2012)

89. If $x = \frac{4ab}{a+b}$ ($a \neq b$), the value of $\frac{x+2a}{x-2a} + \frac{x+2b}{x-2b}$ is

यदि $x = \frac{4ab}{a+b}$ ($a \neq b$), हो, तो $\frac{x+2a}{x-2a} + \frac{x+2b}{x-2b}$ का मान

क्या होगा ?

- (1) a (2) b (3) 2 ab (4) 2

(SSC CHSL DEO & LDC Exam. 04.12.2011
(1st Sitting (East Zone))

90. If $x = \frac{2\sqrt{24}}{\sqrt{3}+\sqrt{2}}$, then what is the value of $\frac{x+\sqrt{8}}{x-\sqrt{8}}$

$+\frac{x+\sqrt{12}}{x-\sqrt{12}}$?

यदि $x = \frac{2\sqrt{24}}{\sqrt{3}+\sqrt{2}}$ हो, तो $\frac{x+\sqrt{8}}{x-\sqrt{8}} + \frac{x+\sqrt{12}}{x-\sqrt{12}}$ का मान क्या

होगा?

- (1) 1 (2) 2 (3) 1 (4) -2

(SSC CGL Tier-I Exam, 2012)

91. If $x = \frac{2\sqrt{6}}{\sqrt{3}+\sqrt{2}}$, then what is the value of

$\frac{x+\sqrt{2}}{x-\sqrt{2}} + \frac{x+\sqrt{3}}{x-\sqrt{3}}$?

यदि $x = \frac{2\sqrt{6}}{\sqrt{3}+\sqrt{2}}$ हो तो, $\frac{x+\sqrt{2}}{x-\sqrt{2}} + \frac{x+\sqrt{3}}{x-\sqrt{3}}$ का मान

कितना होगा?

- (1) $\sqrt{2}$ (2) $\sqrt{3}$ (3) $\sqrt{6}$ (4) 2

(SSC CGL Tier-I Exam, 2012)

92. If $x = \frac{4\sqrt{15}}{\sqrt{5}+\sqrt{3}}$, the value of $\frac{x+\sqrt{20}}{x-\sqrt{20}} + \frac{x+\sqrt{12}}{x-\sqrt{12}}$ is

यदि $x = \frac{4\sqrt{15}}{\sqrt{5}+\sqrt{3}}$ हो, तो $\frac{x+\sqrt{20}}{x-\sqrt{20}} + \frac{x+\sqrt{12}}{x-\sqrt{12}}$ का मान

कितना होगा ?

- (1) 1 (2) 2 (3) $\sqrt{3}$ (4) $\sqrt{5}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

93. If $xy + yz + zx = 0$, then $\left(\frac{1}{x^2-yz} + \frac{1}{y^2-zx} + \frac{1}{z^2-xy}\right)$

($x, y, z \neq 0$) is equal to

यदि $xy + yz + zx = 0$ है, तो $\left(\frac{1}{x^2-yz} + \frac{1}{y^2-zx} + \frac{1}{z^2-xy}\right)$

($x, y, z \neq 0$) किसके बराबर है?

- (1) 3 (2) 1 (3) $x+y+z$ (4) 0

(SSC CHSL DEO & LDC Exam. 20.10.2013)

94. If $(a^2 + b^2)^3 = (a^3 + b^3)^2$, then $\frac{a}{b} + \frac{b}{a}$ is

यदि $(a^2 + b^2)^3 = (a^3 + b^3)^2$ हो, तो $\frac{a}{b} + \frac{b}{a}$ कितना होगा?

- (1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) $-\frac{1}{3}$ (4) $-\frac{2}{3}$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (1st Sitting))

95. The value of the expression

$\frac{(a-b)^2}{(b-c)(c-a)} + \frac{(b-c)^2}{(a-b)(c-a)} + \frac{(c-a)^2}{(a-b)(b-c)}$ is :

$\frac{(a-b)^2}{(b-c)(c-a)} + \frac{(b-c)^2}{(a-b)(c-a)} + \frac{(a-c)^2}{(a-b)(b-c)}$

का मान, जब $a \neq b \neq c$ हो, कितना होगा ?

- (1) 0 (2) 3 (3) $\frac{1}{3}$ (4) 2

(SSC CHSL DEO & LDC Exam. 11.12.2011 & 27.10.2013
(IInd Sitting (Delhi Zone))

96. If $a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}} = 0$, then a relation among a, b, c is

यदि $a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}} = 0$, तो a, b एवं c के बीच क्या संबंध होगा ?

- (1) $a + b + c = 0$ (2) $(a + b + c)^3 = 27abc$
(3) $a + b + c = 3abc$ (4) $a^3 + b^3 + c^3 = 0$

(SSC CHSL DEO Exam. 16.11.2014 (1st Sitting))

97. If $\left(x + \frac{1}{x}\right)^2 = 3$, then the value of $x^{206} + x^{200} + x^{90} + x^{84} + x^{18} + x^{12} + x^6 + 1$ is

यदि $\left(x + \frac{1}{x}\right)^2 = 3$ हो, तो $x^{206} + x^{200} + x^{90} + x^{84} + x^{18} + x^{12} + x^6 + 1$ का मान क्या होगा?

- (1) 0 (2) 1
(3) 84 (4) 206

(SSC Graduate Level Tier-II Exam. 16.09.2012)

98. If $x = p + \frac{1}{p}$ and $y = p - \frac{1}{p}$, then the value of $x^4 - 2x^2y^2 + y^4$ is

यदि $x = p + \frac{1}{p}$ और $y = p - \frac{1}{p}$, हो तो $x^4 - 2x^2y^2 + y^4$

का मान होगा-

- (1) 24 (2) 4
(3) 16 (4) 8

(SSC CHSL DEO & LDC Exam. 9.11.2014)

99. If $x = \frac{1}{2+\sqrt{3}}$, $y = \frac{1}{2-\sqrt{3}}$, then the value of $8xy$ ($x^2 + y^2$) is

यदि $x = \frac{1}{2+\sqrt{3}}$, $y = \frac{1}{2-\sqrt{3}}$ हो, तो $8xy$ ($x^2 + y^2$) का

मान क्या होगा ?

- (1) 196 (2) 290
(3) 112 (4) 194

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

100. If $\frac{x^{24} + 1}{x^{12}} = 7$, then the value of $\frac{x^{72} + 1}{x^{36}}$ is

यदि $\frac{x^{24} + 1}{x^{12}} = 7$, तो निम्नलिखित का मान है: $\frac{x^{72} + 1}{x^{36}}$

- (1) 433 (2) 322
(3) 343 (4) 432

(SSC CGL Tier-I Exam, 16.08.2015 (1st Sitting) TF No. 3196279)

SHORT ANSWERS

Test-I

Based on Square and Cubic Formulae

1. (1)	2. (1)	3. (3)	4. (3)	5. (3)	6. (4)
7. (2)	8. (1)	9. (4)	10. (1)	11. (4)	12. (1)
13. (1)	14. (2)	15. (2)	16. (1)	17. (3)	18. (3)
19. (3)	20. (3)	21. (4)	22. (3)	23. (1)	24. (1)
25. (3)	26. (3)	27. (3)	28. (1)	29. (2)	30. (2)
31. (4)	32. (1)	33. (4)	34. (3)	35. (1)	36. (1)
37. (2)	38. (2)	39. (3)	40. (1)	41. (4)	42. (3)
43. (3)	44. (4)	45. (4)	46. (1)	47. (3)	48. (4)
49. (3)	50. (2)	51. (3)	52. (3)	53. (3)	54. (3)
55. (1)	56. (2)	57. (2)	58. (3)	59. (1)	60. (2)
61. (2)	62. (3)	63. (2)	64. (3)	65. (2)	66. (2)
67. (2)	68. (3)	69. (1)	70. (3)	71. (2)	71. (2)

72. (1)	73. (1)	74. (1)	75. (1)	76. (3)	77. (3)
78. (4)	79. (2)	80. (1)	81. (2)	82. (2)	83. (2)
84. (4)	85. (2)	86. (1)	87. (4)	88. (2)	89. (4)
90. (3)	91. (3)	92. (4)	93. (3)	94. (2)	95. (4)

Test-II

Based on $a + \frac{1}{a}$ or $a - \frac{1}{a}$ Formulae

1. (4)	2. (3)	3. (2)	4. (2)	5. (4)	6. (4)
7. (1)	8. (3)	9. (1)	10. (4)	11. (4)	12. (4)
13. (2)	14. (3)	15. (2)	16. (3)	17. (1)	18. (2)
19. (3)	20. (1)	21. (4)	22. (4)	23. (2)	24. (1)
25. (3)	26. (2)	27. (1)	28. (2)	29. (4)	30. (2)
31. (1)	32. (2)	33. (1)	34. (3)	35. (4)	36. (1)
37. (4)	38. (2)	39. (3)	40. (1)	41. (2)	42. (4)
43. (2)	44. (3)	45. (2)	46. (3)	46. (3)	47. (4)
48. (2)	49. (1)	50. (3)	51. (1)	52. (1)	53. (*)
54. (2)	55. (4)				

Test-III

Factor Theorem and Questions Based on Other Formulae

1. (1)	2. (4)	3. (3)	4. (3)	5. (3)	6. (1)
7. (4)	8. (2)	9. (2)	10. (1)	11. (4)	12. (4)
13. (3)	14. (1)	15. (3)	16. (2)	17. (1)	18. (3)
19. (2)	20. (4)	21. (4)	22. (2)	23. (2)	24. (3)
25. (2)	26. (2)	27. (4)	28. (4)	29. (1)	30. (4)
31. (1)	32. (4)	33. (3)	34. (3)	35. (3)	36. (4)
37. (2)	38. (1)	39. (3)	40. (2)	41. (4)	42. (1)
43. (1)	44. (1)	45. (3)	46. (1)	47. (3)	48. (4)
49. (2)	50. (4)	51. (4)	52. (3)	53. (2)	54. (3)
55. (2)	56. (3)	57. (2)	58. (4)	59. (1)	60. (3)
61. (2)	62. (1)	63. (4)	64. (4)	65. (3)	66. (3)
67. (2)	68. (3)	69. (3)	70. (1)	71. (3)	72. (4)
73. (4)	74. (3)	75. (1)	76. (1)	77. (1)	78. (4)
79. (3)	80. (4)	81. (1)	82. (1)	83. (1)	84. (1)
85. (2)	86. (1)	87. (1)	88. (1)	89. (4)	90. (2)
91. (4)	92. (2)	93. (4)	94. (2)	95. (2)	96. (2)
97. (1)	98. (3)	99. (3)	100. (2)		

EXPLANATIONS

Type-1

Based on Square and Cubic Formulae

1. (1) $25a^2 + 40ab + 16b^2 = (5a + 4b)^2$
 $= (5 \times 23 - 29 \times 4)^2 = (115 - 116)^2 = 1$

2. (1) $(a + b)^2 = a^2 + b^2 + 2ab$
 $\Rightarrow 25 = 13 + 2ab \Rightarrow 2ab = 25 - 13 = 12$
 $\therefore (a - b)^2 = a^2 + b^2 - 2ab = 13 - 12 = 1$
 $\Rightarrow a - b = 1$

2nd Method

Let we put $a = 3$ and $b = 2$
 $a + b = 5 \Rightarrow 3 + 2 = 5$ (Satisfied)
 $a^2 + b^2 = 13 \Rightarrow (3)^2 + (2)^2 = 9 + 4 = 13$
 (Satisfied)

$\therefore a - b = 3 - 2 = 1$

3. (3) $48x^3 - 8x^2 - 93x - 45$
 $= 48x^3 - 80x^2 + 72x^2 - 120x + 27x - 45$
 $= 16x^2(3x - 5) + 24x(3x - 5) + 9(3x - 5)$
 $= (3x - 5)(16x^2 + 24x + 9)$
 $= (3x - 5)(4x + 3)(4x + 3)$

4. (3) Option (c) से,
 $x(x + 2) - 15 = x(x - 5) + 11$
 $\Rightarrow x^2 + 2x - 15 = x^2 - 5x + 11$
 $\Rightarrow 7x = 26$
 $\therefore 7x - 26 = 0$

ये Quadratic eqⁿ नहीं है because ये eqⁿ $ax^2 + bx + c = 0$ के form में नहीं है।

5. (3) $a^2 + b^2 + \frac{1}{a^2} + \frac{1}{b^2} = 4$

$\Rightarrow a^2 + \frac{1}{a^2} + b^2 + \frac{1}{b^2} = 4$

$\Rightarrow \left(a - \frac{1}{a}\right)^2 + 2 + \left(b - \frac{1}{b}\right)^2 + 2 = 4$

$\Rightarrow \left(a - \frac{1}{a}\right)^2 + \left(b - \frac{1}{b}\right)^2 = 0$

$\Rightarrow a - \frac{1}{a} = 0; b - \frac{1}{b} = 0$

$\Rightarrow a = \frac{1}{a} \Rightarrow a^2 = 1$

$\Rightarrow a = \pm 1$

इसी प्रकार

$\Rightarrow a = b = \pm 1$

$\therefore a^2 + b^2 = 1 + 1 = 2$

2nd Method

$a^2 + b^2 + \frac{1}{a^2} + \frac{1}{b^2} = 4$

Putting $a = b = 1$

$\therefore a^2 + b^2 = 1 + 1 = 2.$

6. (4) $a^2 + b^2 = 24$ and $ab = 6$

$\therefore (a + b)^2 = a^2 + b^2 + 2ab$
 $= 24 + 2 \times 6 = 36$

$\therefore a + b = 6$

$\therefore (a^3 + b^3) = (a + b)(a^2 - ab + b^2)$
 $= 6(24 - 6) = 6 \times 18 = 108$

7. (2) $(x + y)^3 = x^3 + y^3 + 3(xy)(x + y)$

$\Rightarrow 125 = 35 + 3(5)xy$

$\Rightarrow 15xy = 125 - 35 = 90$

$\Rightarrow xy = \frac{90}{15} = 6$

$\Rightarrow \frac{x+y}{xy} = \frac{1}{y} + \frac{1}{x} = \frac{5}{6}$

2nd Method

Let we put $x = 3, y = 2$

$x^3 + y^3 = 35 \Rightarrow 3^3 + 2^3 = 27 + 8 = 35$

$x + y = 5 \Rightarrow 3 + 2 = 5$

$\therefore \frac{1}{x} + \frac{1}{y} = \frac{1}{3} + \frac{1}{2} = \frac{2+3}{6} = \frac{5}{6}$

8. (1) $x - y = \frac{x+y}{7} = \frac{xy}{4} = k$

$\Rightarrow x - y = k$

$x + y = 7k$

$\therefore (x + y)^2 - (x - y)^2$

$= 49k^2 - k^2$

$\Rightarrow 4xy = 48k^2$

$\Rightarrow 16k = 48k^2$

$\Rightarrow k = \frac{1}{3}$

$\therefore xy = 4k = 4 \times \frac{1}{3} = \frac{4}{3}$

Aliter :

$x - y = \frac{x+y}{7} = \frac{xy}{4}$

$\Rightarrow 7(x - y) = x + y$

$7x - 7y = x + y$

$\Rightarrow 6x = 8y$

$\Rightarrow 3x = 4y$

Also $4x - 4y = xy$

$\Rightarrow 4x - 3x = xy$

$\Rightarrow x = xy$

$$\Rightarrow \boxed{y=1}$$

$$\Rightarrow 3x=4$$

$$\Rightarrow x = \frac{4}{3}$$

$$\therefore xy = \frac{4}{3}$$

9. (4) $a^2 = 2 \Rightarrow a = \sqrt{2}$

$$\Rightarrow a + 1 = \sqrt{2} + 1$$

4th option से,

$$\frac{a-1}{3-2a} = \frac{\sqrt{2}-1}{3-2\sqrt{2}} = \frac{\sqrt{2}-1}{3-2\sqrt{2}} \times \frac{3+2\sqrt{2}}{3+2\sqrt{2}}$$

$$= \frac{3\sqrt{2}-3+4-2\sqrt{2}}{9-8} = 1+\sqrt{2} = a+1$$

10. (1) $x^2 + y^2 - z^2 + 2xy = x^2 + y^2 + 2xy - z^2$

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

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

Aliter :

Let we put $a = 1, b = 1, c = 0$ in x, y, z then

$$\therefore x = -1, y = -1, z = 2$$

$$\therefore x^2 + y^2 - z^2 + 2xy = (-1)^2 + (-1)^2 - (2)^2 + 2 \times (-1) \times (-1)$$

$$= 1 + 1 - 4 + 2 = 0$$

11. (4) $x^2 - 2x + y^2 + 6y + 10 = 0$

$$\Rightarrow x^2 - 2x + 1 + y^2 + 6y + 9 = 0$$

$$\Rightarrow (x-1)^2 + (y+3)^2 = 0 \Rightarrow x-1 = 0$$

$$\Rightarrow x = 1$$

$$y + 3 = 0$$

$$\Rightarrow y = -3$$

$$\therefore x^2 + y^2 = 1 + 9 = 10$$

12. (1) Given,

$$(a-7) + (b-9) + (c-11) = (a+b+c) - 27$$

$$= 27 - 27 = 0$$

13. (1) Given

$$\frac{x^2}{yz} + \frac{y^2}{zx} + \frac{z^2}{xy} = 3$$

$$\Rightarrow \frac{x^3 + y^3 + z^3}{xyz} = 3$$

$$\Rightarrow x^3 + y^3 + z^3 - 3xyz = 0$$

that means

$$x + y + z = 0$$

$$\therefore (x+y+z)^3 = 0$$

14. (2) $x + y + z = a - b + b - c + c - a = 0$

$$\therefore x^3 + y^3 + z^3 - 3xyz = 0$$

15. (2)

$$a(a+b+c) = 45$$

$$b(a+b+c) = 75$$

$$+ c(a+b+c) = 105$$

$$(a+b+c)(a+b+c) = 225$$

$$\Rightarrow a+b+c = 15$$

So,

$$a(a+b+c) = 45$$

$$\Rightarrow a \times 15 = 45 \therefore a = 3$$

Similarly

$$b(a+b+c) = 75$$

$$b \times 15 = 75 \therefore b = 5$$

and

$$c(a+b+c) = 105$$

$$\Rightarrow c \times 15 = 105 \therefore c = 7$$

hence,

$$a^2 + b^2 + c^2 = 3^2 + 5^2 + 7^2 = 83$$

2nd Method

putting the value

$$a = 3, b = 5, c = 7$$

$$a(a+b+c) = 3 \times 15 = 45$$

$$b(a+b+c) = 5 \times 15 = 75$$

$$c(a+b+c) = 7 \times 15 = 105$$

$$\text{So, } a^2 + b^2 + c^2 = 3^2 + 5^2 + 7^2 = 83$$

16. (1) यहाँ, $a + b + c = 0$

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

17. (3) दिया गया है, $x + y = 7$

$$\text{अब, } x^3 + y^3 + 21xy$$

$$= (x+y)^3 - 3xy(x+y) + 21xy$$

$$= (7)^3 - 3xy(7) + 21xy = 343 - 21xy + 21xy$$

$$= 343$$

Aliter :

Let we put $x = 4, y = 3$

$$x + y = 7 \Rightarrow 4 + 3 = 7$$

$$\therefore x^3 - y^3 + 21xy = (4)^3 + (3)^3 + 21 \times 4 \times 3$$

$$= 64 + 27 + 252$$

$$= 343$$

18. (3) यदि $a + b + c = 0$,

$$\text{तो, } a^3 + b^3 + c^3 = 3abc$$

$$\text{यहाँ, } y - z + z - x + x - y = 0$$

$$\therefore (y-z)^3 + (z-x)^3 + (x-y)^3$$

$$= 3(y-z)(z-x)(x-y)$$

19. (3) $\frac{x}{a} = b - c; \frac{y}{b} = c - a; \frac{z}{c} = a - b$

$$\text{पुनः, } b - c + c - a + a - b = 0$$

$$\therefore \left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3$$

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

$$= 3(b-c)(c-a)(a-b) = \frac{3xyz}{abc}$$

$$\begin{aligned} 20. (3) \quad & x^3 - x^2y - xy^2 + y^3 = x^3 + y^3 - x^2y - xy^2 \\ & = (x + y)^3 - 3xy(x + y) - xy(x + y) \\ & = (x + y)^3 - 4xy(x + y) = a^3 - 4b^2a \end{aligned}$$

Aliter :

Let we put $x = 1, y = 1$

$$\therefore a = 2, b = 1$$

$$x + y = a \Rightarrow 1 + 1 = 2$$

$$xy = b^2 \Rightarrow 1 \times 1 = (1)^2 = 1$$

$$\begin{aligned} \therefore x^3 - x^2y - xy^2 + y^3 & \\ & = (1)^3 - 1^2 \times 1 - 1 \times 1^2 + 1 \\ & = 1 - 1 - 1 + 1 = 0 \end{aligned}$$

From option (3)

$$\begin{aligned} a^3 - 4b^2a & = (2)^3 - 4 \times (1)^2 \times 2 \\ & = 8 - 8 = 0 \end{aligned}$$

21. (4) Given

$$\frac{11-13x}{x} + \frac{11-13y}{y} + \frac{11-13z}{z} = 5$$

$$\Rightarrow \left(\frac{11}{x} - 13\right) + \left(\frac{11}{y} - 13\right) + \left(\frac{11}{z} - 13\right) = 5$$

$$\Rightarrow 11\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right) - 39 = 5$$

$$\therefore \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = \frac{5+39}{11} = \frac{44}{11} = 4$$

22. (3) $x^3 + 3x^2 + 3x = 7$

$$\Rightarrow x^3 + 3x^2 + 3x + 1 = 7 + 1 = 8$$

$$\Rightarrow (x + 1)^3 = 2^3$$

$$\Rightarrow x + 1 = 2 \Rightarrow x = 1$$

Aliter :

In these type of questions we directly go through the option (3)

$$x^3 + 3x^2 + 3x = 7$$

$$\Rightarrow 1^3 + 3 \times 1^2 + 3 \times 1 = 7$$

$$7 = 7$$

23. (1) Put the value

$$x = 1, y = 2$$

$$\therefore \frac{5x - y}{5x + y} = \frac{5 \times 1 - 2}{5 \times 1 + 2} = \frac{3}{7}$$

Now, According to the Question

$$\frac{4x^2 + y^2 - 4xy}{9x^2 + 16y^2 + 24xy}$$

$$= \frac{(4 \times 1) + (2)^2 - (4 \times 1 \times 2)}{(9 \times 1) + 16 \times (2)^2 + (24 \times 1 \times 2)} = 0$$

24. (1) Given,

$$(x + y)^2 = xy + 1$$

$$\Rightarrow x^2 + y^2 + 2xy = xy + 1$$

$$\Rightarrow x^2 + y^2 + xy = 1$$

Multiplying Both sides by $(x - y)$

$$(x - y)(x^2 + y^2 + xy) = 1 \times (x - y)$$

$$\Rightarrow x^3 - y^3 = x - y$$

$$\Rightarrow 1 = x - y$$

$$\therefore \boxed{x - y = 1}$$

2nd Method

putting $x = 1, y = 0$

$$(x + y)^2 = xy + 1$$

$$(1 + 0)^2 = (1 \times 0) + 1$$

$$1 = 1$$

$$\therefore x - y = 1 - 0 = 1$$

$$25. (3) \quad x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z)$$

$$\left[(x - y)^2 + (y - z)^2 + (z - x)^2\right]$$

$$= \frac{1}{2}(333 + 333 + 334)(0 + 1 + 1) = 1000$$

26. (3) $x + y + z = 6$

दोनों तरफ square करने पर,

$$x^2 + y^2 + z^2 + 2xy + 2yz + 2zx = 36$$

$$\Rightarrow 20 + 2(xy + yz + zx) = 36$$

$$\Rightarrow xy + yz + zx = 8$$

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

$$= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$$

$$= 6(20 - 8) = 72$$

Aliter :

Let we put $x = 4, y = 2, z = 0$

$$x + y + z = 6 \Rightarrow 4 + 2 + 0 = 6 \text{ (Satisfied)}$$

$$x^2 + y^2 + z^2 = 20 \Rightarrow (4)^2 + (2)^2 + 0^2 = 20 \text{ (Satisfied)}$$

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

$$= (4)^3 + (2)^3 + 0 - 0$$

$$= 64 + 8 = 72$$

27. (3) $a - b = 3$

$$a^3 - b^3 = 117$$

$$a^3 - b^3 = (a - b)^3 + 3ab(a - b)$$

$$\Rightarrow 117 = 27 + 3ab(3)$$

$$\Rightarrow 9ab = 117 - 27 = 90$$

$$\Rightarrow ab = 10$$

$$\therefore (a + b)^2 = (a - b)^2 + 4ab = 9 + 40 = 49$$

$$\therefore |a + b| = 7$$

Aliter :

Let we put $a = 5, b = 2$

$$a - b = 3 \Rightarrow 5 - 2 = 3 \text{ (Satisfied)}$$

$$a^3 + b^3 = 117 \Rightarrow (5)^3 - (2)^3 = 125 - 8 = 117$$

$$\therefore (a + b) = 5 + 2 = 7$$

28. (1) By Factor theorem

$$x - 2 = 0$$

$$\begin{aligned}
 x &= 2 \\
 \therefore x^2 + k_1x + k_2 &= 0 \\
 (2)^2 + k_1 \times 2 + k_2 &= 0 \\
 \therefore 2k_1 + k_2 &= -4 \dots (1) \\
 \text{Again, } x + 3 &= 0 \\
 x &= -3 \\
 \therefore (-3)^2 + k_1 \times (-3) + k_2 &= 0 \\
 \Rightarrow -3k_1 + k_2 &= -9 \dots (2) \\
 \text{from eq}^n (1) \& (2) \\
 k_1 &= 1, k_2 = -6
 \end{aligned}$$

29. (2) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
 $\Rightarrow 36 = 14 + 2(ab + bc + ca)$
 $\Rightarrow ab + bc + ca = (36 - 14) \div 2$
 $\Rightarrow ab + bc + ca = 11$ (i)
 $\therefore a^3 + b^3 + c^3 - 3abc = (a + b + c)$
 $(a^2 + b^2 + c^2 - ab - bc - ca)$
 $\Rightarrow 36 - 3abc = 6(14 - 11)$ [By (i)]
 $\Rightarrow 36 - 3abc = 84 - 66 = 18$
 $\Rightarrow 3abc = 36 - 18 = 18$
 $\Rightarrow abc = 6$

Aliter :

Let we put $a = 3, b = 2, c = 1$
 $a + b + c = 6 \Rightarrow 3 + 2 + 1 = 6$ (Satisfied)
 $a^2 + b^2 + c^2 = 14 \Rightarrow 3^2 + 2^2 + 1^2 = 9 + 4 + 1 = 14$
 (Satisfied)
 $a^3 + b^3 + c^3 = 36 \Rightarrow (3)^3 + (2)^3 + 1^3 = 27 + 8 + 1 = 36$
 (Satisfied)
 $\therefore abc = 3 \times 2 \times 1 = 6$

30. (2) $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
 $\Rightarrow 9 = 3(a^2 + b^2 - ab)$

$$\begin{aligned}
 \Rightarrow a^2 + b^2 - ab &= \frac{9}{3} = 3 \\
 \Rightarrow (a + b)^2 - 2ab - ab &= 3 \\
 \Rightarrow 9 - 3ab &= 3 \\
 \Rightarrow 3ab &= 9 - 3 = 6 \Rightarrow ab = 2
 \end{aligned}$$

$$\therefore \frac{1}{a} + \frac{1}{b} = \frac{a+b}{ab} = \frac{3}{2}$$

Aliter :

Let we put $a = 2, b = 1$
 $a^3 - b^3 = 9 \Rightarrow (2)^3 + (1)^3 = 8 + 1 = 9$
 $a + b = 3 \Rightarrow 2 + 1 = 3$

$$\therefore \frac{1}{a} + \frac{1}{b} = \frac{1}{2} + 1 = \frac{3}{2}$$

31. (4) $x = 997$

$y = 998$

$z = 999$

$\therefore x - y = 997 - 998 = -1$

$y - z = 998 - 999 = -1$

$z - x = 999 - 997 = 2$

$\therefore x^2 + y^2 + z^2 - xy - yz - zx$

$$\begin{aligned}
 &= \frac{1}{2} (2x^2 + 2y^2 + 2z^2 - 2xy - 2yz - 2zx) \\
 &= \frac{1}{2} (x^2 + y^2 - 2xy + y^2 + z^2 - 2yz + x^2 + z^2 - 2zx) \\
 &= \frac{1}{2} [(x - y)^2 + (y - z)^2 + (z - x)^2] \\
 &= \frac{1}{2} [(-1)^2 + (-1)^2 + (2)^2] \\
 &= \frac{1}{2} (1 + 1 + 4) = \frac{1}{2} \times 6 = 3
 \end{aligned}$$

2nd Method

Note : If a, b & c are in Continuous form then
 $a^2 + b^2 + c^2 - ab - bc - ca = 3$ (always)

32. (1) Given,

$x - y = 7$

$(x - 15) - (y - 8) = (x - y) - 7$
 $= 7 - 7 = 0$

A/q

$(x - 15)^3 - (y - 8)^3$

$= (x - 15 - y + 8) \{(x - 15)^2 + (y - 8)^2 + (x - 15)(y - 8)\}$
 $= 0 \{(x - 15)^2 + (y - 8)^2 + (x - 15)(y - 8)\} = 0$

33. (4) $x - y - \sqrt{18} = -1 \Rightarrow x - y = \sqrt{18} - 1 \dots (1)$

$x + y - 3\sqrt{2} = 1 \Rightarrow x + y = 3\sqrt{2} + 1 \dots (2)$

from eqⁿ (1) & (2)

$x = 3\sqrt{2}, y = 1$

$\therefore 12xy(x^2 - y^2) = 12 \times 3\sqrt{2} \times 1 \left\{ (3\sqrt{2})^2 - (1)^2 \right\}$

$= 612\sqrt{2}$.

34. (3) $p = 99$ दिया है

$\therefore p(p^2 + 3p + 3)$

$= p^3 + 3p^2 + 3p$

$= p^3 + 3p^2 + 3p + 1 - 1$

$= (p + 1)^3 - 1$

$= (99 + 1)^3 - 1$

$= (100)^3 - 1$

$= 999999$

35. (1) $a^2 + b^2 + c^2 = 2a - 2b - 2c - 3$

$\Rightarrow a^2 - 2a + 1 + b^2 + 2b + 1 + c^2 + 2c + 1 = 0$

$\Rightarrow (a - 1)^2 + (b + 1)^2 + (c + 1)^2 = 0$

$\Rightarrow a - 1 = 0, b + 1 = 0, c + 1 = 0$

$\Rightarrow a = 1, b = -1, c = -1$

$\therefore a + b + c = 1 - 1 - 1 = -1$

36. (1) $x^2 + y^2 + z^2 = 2(x + z - 1)$

$\Rightarrow x^2 + y^2 + z^2 = 2x + 2z - 2$

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

$$\begin{aligned} &\Rightarrow x^2 - 2x + 1 + y^2 + z^2 - 2z + 1 = 0 \\ &\Rightarrow (x-1)^2 + y^2 + (z-1)^2 = 0 \\ &\quad [\because a^2 + b^2 + c^2 = 0 \Rightarrow a=0, b=0, c=0] \end{aligned}$$

$$\therefore x-1=0 \Rightarrow x=1$$

$$y=0$$

$$z-1=0$$

$$\Rightarrow z=1$$

$$\therefore x^3 + y^3 + z^3 = 1 + 0 + 1 = 2$$

$$37. (2) x = z = 225, y = 226$$

$$\therefore x + y + z = 225 + 226 + 225 = 676$$

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

$$= \frac{1}{2} (x + y + z) [(x - y)^2 + (y - z)^2 + (z - x)^2]$$

$$= \frac{1}{2} \times 676 [(225 - 226)^2 + (226 - 225)^2 + (225 - 225)^2]$$

$$= \frac{1}{2} \times 676 \times (1 + 1) = 676$$

$$38. (2) a^2 + b^2 + c^2 + 3 = 2a + 2b + 2c$$

$$\Rightarrow a^2 - 2a + 1 + b^2 - 2b + 1 + c^2 - 2c + 1 = 0$$

$$\Rightarrow (a-1)^2 + (b-1)^2 + (c-1)^2 = 0$$

$$\Rightarrow a-1=0$$

$$\Rightarrow a=1; b-1=0$$

$$\Rightarrow b=1$$

$$\text{तथा, } c-1=0$$

$$\Rightarrow c=1$$

$$\therefore a + b + c = 3$$

$$39. (3) a^2 + b^2 + c^2 = 2a - 2b - 2c - 3$$

$$\Rightarrow a^2 + b^2 + c^2 - 2a + 2b + 2c + 1 + 1 + 1 = 0$$

$$\Rightarrow (a^2 - 2a + 1) + (b^2 + 2b + 1) + (c^2 + 2c + 1) = 0$$

$$\Rightarrow (a-1)^2 + (b+1)^2 + (c+1)^2 = 0$$

$$\Rightarrow a-1=0$$

$$\Rightarrow a=1$$

$$\Rightarrow b+1=0$$

$$\Rightarrow b=-1$$

$$\Rightarrow c+1=0$$

$$\Rightarrow c=-1$$

$$\therefore a - b + c = 1 + 1 - 1 = 1$$

$$40. (1) \because x^2 - 9 = 0$$

$$x = \sqrt{9} = 3 \text{ or } -3$$

Put the value of $x = 3$ or -3

$$x = 3$$

$$\therefore px^3 - 2x^2 - qx + 18 = 0$$

$$\Rightarrow 27p - 18 - 3q + 18 = 0$$

$$\Rightarrow 27p = 3q$$

$$\therefore \frac{p}{q} = \frac{1}{9}$$

$$41. (4) (x + y - z)^2 + (y + z - x)^2 + (z + x - y)^2 = 0$$

$$\Rightarrow (x + y - z) = 0 \quad \dots (i)$$

$$y + z - x = 0 \quad \dots (ii)$$

$$\text{व } z + x - y = 0 \quad \dots (iii)$$

\Rightarrow (i), (ii) एवं (iii) को जोड़ने पर,

$$2(x + y + z) - (x + y + z) = 0$$

$$\Rightarrow x + y + z = 0$$

$$42. (3) \because \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$$

$$\frac{xy + yz + zx}{xyz} = 0$$

$$\therefore xy + yz + zx = 0$$

Given

$$x + y + z = 9$$

squaring Both Sides

$$x^2 + y^2 + z^2 + 2(xy + yz + zx) = 81$$

$$\Rightarrow x^2 + y^2 + z^2 + (2 \times 0) = 81$$

$$\therefore x^2 + y^2 + z^2 = 81$$

Now,

$$x^3 + y^3 + z^3 - 3xyz$$

$$= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$$

$$= 9(81 - 0)$$

$$= 729$$

$$43. (3) a + b + c = 9$$

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

$[ab + bc + ca]$ अधिकतम होगा यदि

$$a = b = c$$

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

$$\Rightarrow (a^2 + b^2 + c^2) = \frac{9^2}{3} = 27$$

$$44. (4) x^2 + y^2 + 1 = 2x \Rightarrow x^2 + y^2 + 1 - 2x = 0$$

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

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

$$\Rightarrow x-1=0$$

$$\Rightarrow x=1 \text{ एवं } y=0$$

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

$$45. (4) x + y + z = 0$$

$$\Rightarrow -x = y + z$$

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

$$\Rightarrow x^2 = y^2 + z^2 + 2yz \quad \dots (i)$$

$$\therefore \text{Expression} = \frac{x^2 + y^2 + z^2}{x^2 - yz}$$

$$= \frac{y^2 + z^2 + 2yz + y^2 + z^2}{y^2 + z^2 + 2yz - yz}$$

$$= \frac{2y^2 + 2z^2 + 2yz}{y^2 + z^2 + yz} = \frac{2(y^2 + z^2 + yz)}{y^2 + z^2 + yz} = 2$$

Aliter :

Let we put $x = 1, y = -1$ and $z = 0$

$$x + y + z = 0 \Rightarrow 1 - 1 + 0 = 0 \text{ (Satisfied)}$$

$$\begin{aligned} \therefore \frac{x^2 + y^2 + z^2}{x^2 - y^2} &= \frac{(1)^2 + (-1)^2 + 0}{(1)^2 - 0} \\ &= \frac{1+1}{1} = 2 \end{aligned}$$

46. (1) $x + y + z = 0$

$$\Rightarrow x + z = -y$$

Squaring करने पर,

$$x^2 + z^2 + 2xz = y^2$$

$$\Rightarrow x^2 + z^2 = y^2 - 2xz$$

$$\begin{aligned} \therefore \frac{3y^2 + x^2 + z^2}{2y^2 - xz} \\ &= \frac{3y^2 + y^2 - 2xz}{2y^2 - xz} = \frac{4y^2 - 2xz}{2y^2 - xz} \\ &= \frac{2(2y^2 - xz)}{2y^2 - xz} = 2 \end{aligned}$$

OR

यहाँ, $x + y + z = 0$

Let $x = 1, y = -1, z = 0$

$$\begin{aligned} &= \frac{3y^2 + x^2 + z^2}{(2y^2 - xz)} \\ &= \frac{3(-1)^2 + (1)^2 + 0^2}{[2(-1)^2 - 1 \times 0]} \end{aligned}$$

$$= \frac{3+1}{2} = \frac{4}{2} = 2$$

47. (3) $a^3 + 3a^2 + 9a = 81$

जब $a = 3$

L.H.S = $27 + 27 + 27 = 81$

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

$$= 27 + 1 = 28$$

48. (4) $\frac{a+b}{c} = \frac{6}{5}$

$$\Rightarrow \frac{a+b+c}{c} = \frac{6+5}{5} = \frac{11}{5}$$

$$\Rightarrow a + b + c = 11k$$

$$c = 5k$$

Again,

$$\frac{b+c+a}{a} = \frac{11}{2}$$

$$\Rightarrow a = 2k$$

$$\therefore a + b + c = 11k$$

$$\Rightarrow 2k + b + 5k = 11k$$

$$\Rightarrow b = 11k - 5k = 6k$$

$$\therefore \frac{a+c}{b} = \frac{2k+5k}{6k} = \frac{7}{4}$$

Aliter :

Let we take $a = 2, b = 4, c = 5$ then our condition satisfied

$$\therefore \frac{a+c}{b} = \frac{2+5}{4} = \frac{7}{4}$$

49. (3) $P + Q + R$

$$\begin{aligned} &= y + z - x + z + x - y + x + y - z \\ &= x + y + z \end{aligned}$$

$$P - Q = y + z - x - z - x + y = 2(y - x)$$

$$Q - R = z + x - y - x - y + z$$

$$= 2(z - y)$$

$$R - P = x + y - z - y - z + x$$

$$= 2(x - z)$$

$$\therefore P^3 + Q^3 + R^3 - 3PQR$$

$$= \frac{1}{2} (P + Q + R) [(P - Q)^2 + (Q - R)^2 + (R - P)^2]$$

$$= \frac{1}{2} (x + y + z) [4(y - x)^2 + 4(z - y)^2 + 4(x - z)^2]$$

$$= 4 \times \frac{1}{2} (x + y + z) [(x - y)^2 + (y - z)^2 + (z - x)^2]$$

$$= 4 \times (x^3 + y^3 + z^3 - 3xyz)$$

$$= 4 \times 3 = 12$$

50. (2) Expression

$$= \frac{1}{2+x_1} + \frac{1}{2+x_2} + \frac{1}{2+x_3}$$

$$\begin{aligned} &= \frac{(2+x_2)(2+x_3) + (2+x_1)(2+x_3) + (2+x_1)(2+x_2)}{(2+x_1)(2+x_2)(2+x_3)} \end{aligned}$$

$$= \frac{4 + 2x_2 + 2x_3 + x_2x_3 + 4 + 2x_1 + 2x_3 + x_1x_3 + 4 + 2x_1 + 2x_2 + x_1x_2}{(4 + 2x_1 + 2x_2 + x_1x_2)(2 + x_3)}$$

$$\begin{aligned} &= \frac{12 + 4x_1 + 4x_2 + 4x_3 + x_1x_2 + x_2x_3 + x_3x_1}{8 + 4x_1 + 4x_2 + 2x_1x_2 + 4x_3 + 2x_1x_3 + 2x_2x_3 + x_1x_2x_3} \end{aligned}$$

$$\begin{aligned} &= \frac{x_1x_2x_3 - 16 + 12 + x_1x_2 + x_2x_3 + x_3x_1}{x_1x_2x_3 - 16 + 8 + 2x_1x_2 + 2x_1x_3 + 2x_2x_3 + x_1x_2x_3} \end{aligned}$$

$$= \frac{x_1x_2 + x_2x_3 + x_3x_1 + x_1x_2x_3 - 4}{2(x_1x_2 + x_1x_3 + x_2x_3 + x_1x_2x_3 - 4)} = \frac{1}{2}$$

51. (3) $3x + 5y + 7z = 49$... (i)

$9x + 8y + 21z = 126$... (ii)

By equation (i) $\times 3$ - (ii),

$9x + 15y + 21z = 147$

$\underline{9x + 8y + 21z = 126}$

$\hline 7y = 21$

$\Rightarrow y = \frac{21}{7} = 3$

52. (3) $\therefore x + y + z = 0$

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

A/q

$\frac{x^2}{3z} + \frac{y^3}{3xz} + \frac{z^2}{3x}$

$= \frac{x^3 + y^3 + z^3}{3xz}$

$= \frac{3xyz}{3xz} = y$

2nd Method

putting $x = 2, y = z = -1$

$\therefore \frac{x^2}{3z} + \frac{y^3}{3xz} + \frac{z^2}{3x}$

$= \frac{4}{-3} + \frac{-1}{-6} + \frac{1}{6}$

$= \frac{4}{-3} + \frac{1}{3} = \frac{-3}{3} = -1 = y$

53. (3) $x + y + z = 22;$

$xy + yz + zx = 35$

$\therefore (x + y + z)^2$

$= x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

$\Rightarrow (22)^2 = x^2 + y^2 + z^2 + 2 \times 35$

$\Rightarrow 484 = x^2 + y^2 + z^2 + 70$

$\Rightarrow x^2 + y^2 + z^2 = 484 - 70 = 414$

$\therefore (x - y)^2 + (y - z)^2 + (z - x)^2$

$= 2(x^2 + y^2 + z^2 - xy - yz - zx)$

$= 2(414 - 35) = 2 \times 379 = 758$

54. (3) $\frac{x+y}{z} = 2$

$\Rightarrow x + y = 2z$

$\Rightarrow y = 2z - x$

$\therefore \frac{y}{y-z} + \frac{x}{x-z}$

$= \frac{2z-x}{2z-x-z} - \frac{x}{x-z}$

$= \frac{2z-x}{z-x} - \frac{x}{z-x}$

$= \frac{2z-x-x}{z-x} = \frac{2z-2x}{z-x}$

$= \frac{2(z-x)}{z-x} = 2$

Aliter :

Let we put $x = 3, y = 1, z = 2$ then

$\frac{x+y}{z} = 2 \Rightarrow \frac{3+1}{2} = 2$ (Satisfied)

$\therefore \left[\frac{y}{y-z} \right] + \left[\frac{x}{x-z} \right]$

$= \frac{1}{1-2} + \frac{3}{3-2}$

$= -1 + 3 = 2$

55. (1) $a^4 + 1 = \frac{a^2}{b^2} (4b^2 - b^4 - 1)$

$\Rightarrow a^4 b^2 + b^2 = 4a^2 b^2 - a^2 b^4 - a^2$

$\Rightarrow a^4 b^2 + b^2 - 4a^2 b^2 + a^2 b^4 + a^2 = 0$

$\Rightarrow a^4 b^2 + b^2 - 2a^2 b^2 - 2a^2 b^4 + a^2 b^4 + a^2 = 0$

$\Rightarrow b^2 (a^4 + 1 - 2a^2) + (a^2 b^4 + a^2 - 2b^2 a^2) = 0$

$\Rightarrow b^2 (a^2 - 1)^2 + a^2 (b^4 + 1 - 2b^2) = 0$

$\Rightarrow b^2 (a^2 - 1)^2 + a^2 (b^2 - 1)^2 = 0$

[If $x^2 + y^2 = 0 \Rightarrow x = 0$ and $y = 0$]

$\therefore b^2 (a^2 - 1)^2 = 0$

$\Rightarrow a^2 - 1 = 0 \Rightarrow a^2 = 1$

and $a^2 (b^2 - 1)^2 = 0$

$\Rightarrow b^2 - 1 = 0 \Rightarrow b^2 = 1$

$\therefore a^4 + b^4 = (1)^2 + (1)^2$

$= 1 + 1 = 2$

Aliter :

Let we put $a = b = 1$

$a^4 + 1 = \frac{a^2}{b^2} (4b^2 - b^4 - 1)$

$1 + 1 = \frac{1}{1} (4 \times 1^2 - 1^4 - 1)$

$2 = 2$ (Satisfied)

$\therefore a^4 + b^4 = (1)^4 + (1)^4 = 2$

56. (2) Let, $\sqrt{\frac{1-a}{a}} = x$

$\therefore \sqrt{\frac{a}{1-a}} = \frac{1}{x}$

$$\therefore 3x + 9 = 19 - \frac{3}{x}$$

$$\Rightarrow 3x + 9 = \frac{19x - 3}{x}$$

$$\Rightarrow 3x^2 + 9x = 19x - 3$$

$$\Rightarrow 3x^2 + 9x - 19x + 3 = 0$$

$$\Rightarrow 3x^2 - 10x + 3 = 0$$

$$\Rightarrow 3x^2 - 9x - x + 3 = 0$$

$$\Rightarrow 3x(x - 3) - 1(x - 3) = 0$$

$$\Rightarrow (x - 3)(3x - 1) = 0$$

$$\Rightarrow x = 3 \text{ or } \frac{1}{3}$$

When $x = 3$

$$\sqrt{\frac{1-a}{a}} = 3 \Rightarrow \frac{1-a}{a} = 9$$

$$\Rightarrow \frac{1}{a} - 1 = 9$$

$$\Rightarrow \frac{1}{a} = 9 + 1 = 10$$

$$\Rightarrow a = \frac{1}{10}$$

Again, when $x = \frac{1}{3}$

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

$$\Rightarrow \frac{1-a}{a} = \frac{1}{9}$$

$$\Rightarrow \frac{1}{a} - 1 = \frac{1}{9}$$

$$\Rightarrow \frac{1}{a} = \frac{1}{9} + 1$$

$$= \frac{10}{9}$$

$$\Rightarrow a = \frac{9}{10}$$

57. (2) Let, $\sqrt{\frac{a}{b}} = x$

$$\therefore \sqrt{\frac{b}{a}} = \frac{1}{x}$$

A/q

$$\therefore x - 13 = -\frac{1}{x} - 11$$

$$\Rightarrow x + \frac{1}{x} = 13 - 11$$

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

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

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

$$\therefore \frac{a}{b} = 1 \Rightarrow a = b$$

$$\therefore a + b = 10$$

$$\Rightarrow a = 5 \text{ and } b = 5$$

$$\therefore 3ab + 4a^2 + 5b^2$$

$$= 3 \times 5 \times 5 + 4 \times (5)^2 + 5 \times (5)^2$$

$$= 75 + 100 + 125 = 300$$

58. (3)

$$3x + 4y - 2z + 9 = 17 \quad \dots(i)$$

$$7x + 2y + 11z + 8 = 23 \quad \dots(ii)$$

$$5x + 9y + 6z - 4 = 18 \quad \dots(iii)$$

$$\begin{array}{r} + \\ \hline 15x + 15y + 15z + 13 = 58 \end{array}$$

$$\Rightarrow 15x + 15y + 15z$$

$$= 58 - 13 = 45$$

$$\Rightarrow x + y + z = 3$$

$$\Rightarrow x + y + z - 34 = -34 + 3$$

$$\Rightarrow x + y + z - 34 = -31$$

59. (1) $x + 3y - \frac{2z}{4} = 6$

$$\Rightarrow 4x + 12y - 2z = 24 \quad \dots(i)$$

$$x + \frac{2}{3}(2y + 3z) = 33$$

$$\Rightarrow 3x + 4y + 6z = 99 \quad \dots(ii)$$

$$\frac{1}{7}(x + y + z) + 2z = 9$$

$$\Rightarrow x + y + 15z = 63 \quad \dots(iii)$$

By equation (i) $\times 3 +$ (ii),

$$12x + 36y - 6z = 72$$

$$\frac{3x + 4y + 6z = 99}{15x + 40y = 171 \dots (iv)}$$

Again, equation (i) $\times \frac{15}{2} +$ (iii),

$$30x + 90y - 15z = 180$$

$$\frac{x + y + 15z = 63}{31x + 91y = 243 \dots (v)}$$

equation (iv) तथा (v), को जोड़ने पर

$$\begin{array}{r} 15x + 40y = 171 \\ 31x + 91y = 232 \\ \hline 46x + 131y = 414 \end{array}$$

60. (2) यहाँ,

$$\Rightarrow f(x) = \frac{1}{x} - \frac{1}{x+1}$$

$$f(1) = \frac{1}{1} - \frac{1}{2}$$

$$f(2) = \frac{1}{2} - \frac{1}{3}$$

$$f(3) = \frac{1}{3} - \frac{1}{4}$$

.....
.....

$$f(10) = \frac{1}{10} - \frac{1}{11}$$

$$\Rightarrow f(1) + f(2) + f(3) \dots + f(10)$$

$$= 1 - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \dots + \frac{1}{10} - \frac{1}{11}$$

first term तथा last term को छोड़कर बाँकी सब terms cancel हो जाएंगी।

$$\Rightarrow f(1) + f(2) + \dots + f(10) = 1 - \frac{1}{11} = \frac{10}{11}$$

61. (2) Given

$$(2 + 1)(2^2 + 1)(2^4 + 1)(2^8 + 1)$$

$$= \frac{(2-1)}{(2-1)} \times (2+1)(2^2+1)(2^4+1)(2^8+1)$$

$$= (2^2 - 1)(2^2 + 1)(2^4 + 1)(2^8 + 1)$$

$$= (2^4 - 1)(2^4 + 1)(2^8 + 1)$$

$$= (2^8 - 1)(2^8 + 1)$$

$$= 2^{16} - 1$$

62. (3) $a^2 + b^2 = 4b + 6a - 13$

$$\Rightarrow a^2 + b^2 - 4b - 6a + 13 = 0$$

$$a^2 - 6a + b^2 - 4b + 13 = 0$$

$$(a^2 - 6a + 9) + (b^2 - 4b + 4) = 0$$

$$(a - 3)^2 + (b - 2)^2 = 0$$

$$\Rightarrow a = 3 \text{ तथा } b = 2$$

$$\therefore a + b = 3 + 2 = 5$$

63. (2) यहाँ, $x^4 + y^4 + x^2y^2 = 481$

$$\Rightarrow (x^2 + y^2)^2 - x^2y^2 = 481$$

$$(x^2 + y^2)^2 - 12^2 = 481$$

$$(x^2 + y^2)^2 = 481 + 144$$

$$(x^2 + y^2)^2 = 625$$

$$x^2 + y^2 = \sqrt{625}$$

$$x^2 + y^2 = 25$$

$$\Rightarrow x^2 + y^2 - xy = 25 - 12 = 13$$

Aliter :

Let we put $x = 3, y = 4$ then

$$x^4 + y^4 + x^2y^2 = 481 \Rightarrow (3)^4 + (4)^4 + (3)^2(4)^2$$

$$= 81 + 256 + 9 \times 16 = 481 \text{ (Satisfied)}$$

$$\therefore x^2 - xy + y^2 = (3)^2 - 3 \times 4 + (4)^2$$

$$= 9 - 12 + 16$$

$$= 13$$

64. (3) यहाँ $A = 1 + 2^p$ तथा $B = 1 + 2^{-p}$

$$\Rightarrow B = 1 + \frac{1}{2^p}$$

$$\text{तथा } 2^p = A - 1$$

$$\Rightarrow B = 1 + \frac{1}{A-1}$$

$$B = \frac{A-1+1}{A-1}$$

$$B = \frac{A}{A-1}$$

Aliter :

Let we take $P = 0$

$$A = 1 + 2^P \Rightarrow 1 + 2^0 = 1 + 1 = 2$$

$$B = 1 + 2^{-P} \Rightarrow 1 + \frac{1}{2^0} = 1 + \frac{1}{2^0} = 1 + 1 = 2$$

\therefore Go through the option (3)

$$B = \frac{A}{A-1} = \frac{2}{2-1} = 2 \text{ (satisfied)}$$

65. (2) $\sqrt{(1-p^2)(1-q^2)} = \frac{\sqrt{3}}{2}$

दोनों तरफ square करने पर

$$(1-p^2)(1-q^2) = \frac{3}{4}$$

$$\Rightarrow 1 - p^2 = 1 \text{ तथा } 1 - q^2 = \frac{3}{4}$$

$$\Rightarrow p = 0 \text{ तथा } q^2 = 1 - \frac{3}{4} = \frac{1}{4}$$

$$q = \frac{1}{2}$$

A/q,

$$\begin{aligned} & \sqrt{2p^2 + 2q^2 + 2pq} + \sqrt{2p^2 + 2q^2 - 2pq} \\ &= \sqrt{2 \times 0^2 + 2 \times \frac{1}{4} + 2 \times 0} + \sqrt{2 \times 0^2 + 2 \times \frac{1}{4} - 2 \times 0} \end{aligned}$$

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

$$= \frac{2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \sqrt{2}$$

66. (2) $(a + b)^2 - 2(a + b) = 80$

माना $a + b = x$

$x^2 - 2x = 80$

$x^2 - 2x - 80 = 0$

$x^2 - 10x + 8x - 80 = 0$

$(x - 10)(x + 8) = 0$

$\Rightarrow x = 10 \mid x = -8$

$\therefore a + b = 10$ or $a + b = -8$

$a = 10 - b$

$(10 - b)b = 16$

$-b^2 + 10b = 16$

$b^2 - 10b + 16 = 0$

$(b - 8)(b - 2) = 0$

$b = 2, 8$

$\therefore a = 8, 2$

$\Rightarrow 3a - 19b = 3 \times 8 - 19 \times 2$
 $= 24 - 38$
 $= -14$

$3a - 19b = 3 \times 2 - 19 \times 8$
 $= 6 - 152$
 $= -146$

$\therefore 3a - 19b = -14$

Aliter :

Let we take $a = 8, b = 2$

$ab = 16 \Rightarrow 8 \times 2 = 16$ (Satisfied)

$(a + b)^2 - 2(a + b) = 80 \Rightarrow (8 + 2)^2 - 2(8 + 2)$
 $= 100 - 20 = 80$ (Satisfied)

$\therefore 3a - 19b = 3 \times 8 - 19 \times 2 = 24 - 38 = -14$

67. (2) यहाँ, $x^{y+z} = 1$... (i)

$y^{x+z} = 1024$... (ii)

$z^{x+y} = 729$ (iii)

$x^{y+z} = 1$

$\Rightarrow x = 1$

$y^{x+z} = 2^{10}$

$\Rightarrow x + z = 10 \Rightarrow z = 9$ तथा $y = 2$

$\therefore (z + 1)^{x+y+1} = (9 + 1)^{1+2+1}$

$= 10^4$

$= 10000$

68. (3) यहाँ, $P = 7 + 4\sqrt{3}$

$PQ = 1$

$\Rightarrow Q = \frac{1}{P}$

$\Rightarrow Q = \frac{1}{7 + 4\sqrt{3}} \times \frac{7 - 4\sqrt{3}}{7 - 4\sqrt{3}}$

$= \frac{7 - 4\sqrt{3}}{7^2 - (4\sqrt{3})^2} = \frac{7 - 4\sqrt{3}}{49 - 48}$

$= \boxed{Q = 7 - 4\sqrt{3}}$

अब, $\frac{1}{P^2} + \frac{1}{Q^2} = \frac{P^2 + Q^2}{(PQ)^2}$

$= \frac{(P+Q)^2 - 2PQ}{(PQ)^2}$

$= \frac{(7 + 4\sqrt{3} + 7 - 4\sqrt{3})^2 - 2 \times 1}{1^2}$

$= 14^2 - 2$

$= 196 - 2$

$= 194$

69. (1) यहाँ,

$x = 2 + \sqrt{3}$

$y = 2 - \sqrt{3}$

$z = 1$

$\Rightarrow yz = (2 - \sqrt{3}) \times 1 = 2 - \sqrt{3}$

$xz = (2 + \sqrt{3}) \times 1 = 2 + \sqrt{3}$

$xy = (2 + \sqrt{3}) \times (2 - \sqrt{3}) = 1$

इन values को equation 1 में रखने पर

$\left(\frac{x}{yz}\right) + \left(\frac{y}{xz}\right) + \left(\frac{z}{xy}\right) + 2\left[\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right]$,

$= \frac{2 + \sqrt{3}}{2 - \sqrt{3}} + \frac{2 - \sqrt{3}}{2 + \sqrt{3}} + \frac{1}{1} + 2\left[\frac{1}{2 + \sqrt{3}} + \frac{1}{2 - \sqrt{3}} + 1\right]$

$= \frac{(2 + \sqrt{3})^2 + (2 - \sqrt{3})^2}{4 - 3} + 1 + 2\left[\frac{2 - \sqrt{3} + 2 + \sqrt{3}}{4 - 3} + 1\right]$

$= \frac{4 + 3 + 4\sqrt{3} + 4 + 3 - 4\sqrt{3}}{1} + 1 + 2(4 + 1)$

$= 14 + 1 + 10 = 25$

70. (3) यहाँ $x + y = 3$

$\Rightarrow x^3 + y^3 + 9xy = (x + y)^3 - 3xy(x + y) + 9xy$

$= 27 - 3xy \times 3 + 9xy$

$= 27 - 9xy + 9xy$

$= 27$

Aliter :

Let we take $x = 2$ and $y = 1$

$x + y = 3 \Rightarrow 2 + 1 = 3$

$\therefore x^3 + y^3 + 9xy = (2)^3 + (1)^3 + 9 \times 2 \times 1$
 $= 8 + 1 + 18 = 27$

71. (2) $A = \frac{x^8 - 1}{x^4 + 1}$

$A = \frac{(x^4)^2 - 1}{x^4 + 1}$

$$= \frac{(x^4 + 1)(x^4 - 1)}{(x^4 + 1)}$$

$$= x^4 - 1$$

इसी प्रकार,

$$B = \frac{y^4 - 1}{y^2 + 1} \text{ equal to } y^2 - 1$$

$$\text{At } x = 2, A = 2^4 - 1 = 15$$

$$\text{At } y = 9, B = 9^2 - 1 = 80$$

$$\begin{aligned} A^2 + 2AB + AB^2 &= 15^2 + 2 \times 15 \times 80 + 15 \times 80^2 \\ &= 225 + 2400 + 96000 \\ &= 98625 \end{aligned}$$

72. (2) $x - 4y = 0$ (i) तथा

$$x + 2y = 24 \text{ ... (ii)}$$

दोनों equations को subtract करने पर

$$\begin{array}{r} x - 4y = 0 \\ x + 2y = 24 \\ \hline -6y = -24 \end{array}$$

$y = 4$ (इस value को equation (i) में रखने पर)

$$x - 4 \times 4 = 0$$

$$x = 16$$

अब,

$$\begin{aligned} \frac{2x + 3y}{2x - 3y} &= \frac{2 \times 16 + 3 \times 4}{2 \times 16 - 3 \times 4} \\ &= \frac{32 + 12}{32 - 12} = \frac{44}{20} = \frac{11}{5} \end{aligned}$$

73. (1) $\frac{x}{a} + \frac{y}{b} = 3$

$$\boxed{bx + ay = 3ab} \text{ ... (i)}$$

$$\frac{x}{b} - \frac{y}{a} = 9$$

$$\boxed{ax - by = 9ab} \text{ ... (2)}$$

$$\frac{x}{a} \cdot \frac{3ab}{3ab} = \frac{y}{3ab} \cdot \frac{b}{b} = \frac{-1}{b} \cdot \frac{a}{a} \cdot \frac{-1}{-b}$$

$$\frac{x}{9a^2b + 3ab^2} = \frac{y}{3a^2b - 9ab^2} = \frac{-1}{-b^2 - a^2}$$

$$\Rightarrow x = \frac{9a^2b + 3ab^2}{a^2 + b^2}$$

$$y = \frac{3a^2b - 9ab^2}{a^2 + b^2}$$

$$\therefore \frac{x}{y} = \frac{9a^2b + 3ab^2}{3a^2b - 9ab^2}$$

$$= \frac{3ab(3a + b)}{3ab(a - 3b)}$$

$$\boxed{\frac{x}{y} = \frac{b + 3a}{a - 3b}}$$

74. (1) As, x, y तथा z prime numbers है

इसलिए equation को satisfy करेंगे

$$x + y + z = 38$$

Possible होगा सिर्फ $x = 19, y = 17$ तथा $z = 2$ के लिए

$\therefore x$ की maximum value 19 होगी।

75. (3) यहाँ,

$$x + y = 2017$$

हम ले सकते हैं, $x = 1, y = 2016$

i.e., यहाँ एक value odd तथा दूसरी value even हैं।

$$\Rightarrow (-1)^x + (-1)^y = (-1)^1 + (-1)^{2016}$$

$$= -1 + 1 = 0$$

76. (3) $x + \frac{1}{x} = \frac{\sqrt{3} + 1}{2}$

दोनों तरफ square करने पर

$$x^2 + \frac{1}{x^2} + 2 = \left(\frac{\sqrt{3} + 1}{2} \right)^2$$

$$x^2 + \frac{1}{x^2} + 2 = \frac{3 + 1 + 2\sqrt{3}}{4}$$

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

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

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

दोबारा square करने पर

$$x^4 + \frac{1}{x^4} + 2 = \left(\frac{\sqrt{3} - 2}{2} \right)^2$$

$$x^4 + \frac{1}{x^4} + 2 = \frac{3 + 4 - 4\sqrt{3}}{4}$$

$$x^4 + \frac{1}{x^4} + 2 = \frac{7 - 4\sqrt{3}}{4}$$

$$\Rightarrow x^4 + \frac{1}{x^4} = \frac{7 - 4\sqrt{3}}{4} - 2$$

$$x^4 + \frac{1}{x^4} = \frac{-1 - 4\sqrt{3}}{4}$$

2nd Method

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

$$x^4 + \frac{1}{x^4} = \left[\left(\frac{\sqrt{3}+1}{2} \right)^2 - 2 \right]^2 - 2$$

$$= \left[\frac{4+2\sqrt{3}}{4} - 2 \right]^2 - 2$$

$$= \left[\frac{2\sqrt{3}-4}{4} \right]^2 - 2$$

$$= \frac{12+16-16\sqrt{3}}{16} - 2$$

$$= \frac{-4-16\sqrt{3}}{16} = \frac{-1-4\sqrt{3}}{4}$$

[We know that

$$\text{If } x + \frac{1}{x} = a \text{ then } x^4 + \frac{1}{x^4} = (a^2 - 2)^2 - 2]$$

77. (3) $a + a^2 + a^3 - 1 = 0$

$$a + a^2 + a^3 = 1$$

$$\Rightarrow 1 + a + a^2 = \frac{1}{a} \quad (\text{दोनों तरफ } a \text{ से divide करने पर})$$

दोनों तरफ $(a-1)$ से multiply करने पर,

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

$$a^3 - 1 = 1 - \frac{1}{a}$$

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

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

78. (4) यहाँ दिया हुआ है

$$\sqrt{a^2+b^2+ab} + \sqrt{a^2+b^2-ab} = 1$$

माना,

$$\sqrt{a^2+b^2+ab} = 0 \text{ तथा}$$

$$\sqrt{a^2+b^2-ab} = 1$$

$$\Rightarrow a^2 + b^2 + ab = 0$$

$$\Rightarrow a^2 + b^2 - ab = 1$$

(i)

(ii)

दोनों equations को add करने पर

$$2(a^2 + b^2) = 1$$

$$a^2 + b^2 = \frac{1}{2}$$

$$\Rightarrow a^2 = \frac{1}{4}, b^2 = \frac{1}{4}$$

$$\sqrt{(1-a^2)(1-b^2)} = \sqrt{\left(1-\frac{1}{4}\right)\left(1-\frac{1}{4}\right)}$$

$$= \sqrt{\frac{3}{4} \times \frac{3}{4}} = \frac{3}{4}$$

79. (2) $\frac{P^2+q^2}{r^2+S^2} = \frac{Pq}{rs} \therefore P^2+q^2 = \frac{(r^2+S^2)Pq}{rs}$

$$\therefore \left(\frac{p-q}{p+q} \right)^2 = \frac{(P-q)^2}{(P+q)^2} = \frac{P^2+q^2-2Pq}{P^2+q^2+2Pq}$$

$$\frac{(r^2+S^2)p^2 - 2Pq}{rs} = \frac{(r^2+S^2)Pq}{rs} + 2Pq$$

$$\frac{Pq \left[\frac{r^2+S^2-2rs}{rs} \right]}{Pq \left(\frac{r^2+S^2+2rs}{rs} \right)}$$

$$= \frac{(r-S)^2}{(r+S)^2} = \left(\frac{r-S}{r+S} \right)^2$$

$$\therefore \frac{p-q}{p+q} = \frac{r-S}{r+S}$$

2nd Method

put the value

$$P = r = 2$$

$$q = S = 1$$

$$\therefore \frac{p+q}{p-q} = \frac{1}{3} = \frac{r-s}{r+s}$$

80. (1) Given the equation,

$$x^2 - x + 3 = 0$$

$$\therefore \alpha + \beta + = \frac{-1}{1} = -1$$