

Foundation Batch



MATHS

Algebra

(बीजगणित)

Part -6

LIVE

21-12-2024 07:00PM



107. If $\left(x - \frac{1}{x}\right) = \sqrt{6}$ and $x > 1$, what is the value of $\left(x^8 - \frac{1}{x^8}\right)$?

यदि $\left(x - \frac{1}{x}\right) = \sqrt{6}$ और $x > 1$ है, तो $\left(x^8 - \frac{1}{x^8}\right)$ का मान कितना है?

(a) $998\sqrt{15}$

(b) $1024\sqrt{15}$

(c) $992\sqrt{15}$

(d) $1012\sqrt{15}$

(SSC CGL Pre 17/07/2023)

$$x + \frac{1}{x} = \sqrt{6+4} = \sqrt{10}$$

$$x^2 + \frac{1}{x^2} = 10 - 2 = 8$$

$$x^4 + \frac{1}{x^4} = 8^2 - 2 = 62$$

$$\left(x - \frac{1}{x}\right) \left(x + \frac{1}{x}\right) \left(x^2 + \frac{1}{x^2}\right) \left(x^4 + \frac{1}{x^4}\right)$$

$$\sqrt{6} \times \sqrt{10} \times 8 \times 62$$

$$496 \sqrt{60}$$

$$496 \times 2 \sqrt{15}$$

$$992 \sqrt{15}$$



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Mix



108. If $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{6}$, then $\left(x^2 + \frac{1}{x^2}\right)$ is equal to :

यदि $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{6}$ है, तब $\left(x^2 + \frac{1}{x^2}\right)$ बराबर है:

(a) 36

(b) 16

(c) 62

(d) 14

$$\left(\sqrt{x}\right)^2 + \frac{1}{\left(\sqrt{x}\right)^2} = \left(\sqrt{6}\right)^2 - 2$$

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

$$x^2 + \frac{1}{x^2} = 4^2 - 2 = 14$$

(SSC CGL Pre 11/06/2019)



109. If $\sqrt{x} - \frac{1}{\sqrt{x}} = 4$, then $x^2 + \frac{1}{x^2}$ is equal to.

यदि $\sqrt{x} - \frac{1}{\sqrt{x}} = 4$ है, तब $x^2 + \frac{1}{x^2}$ बराबर है।

(SSC CGL Pre 10/06/2019)

(a) 256

(b) 322

(c) 326

(d) 192

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

$$x + \frac{1}{x} = 18$$

$$x^2 + \frac{1}{x^2} = 18^2 - 2 = 322$$



110. If $\sqrt{x} + \frac{1}{\sqrt{x}} = 3$, then the value of $x^3 + \frac{1}{x^3}$

यदि $\sqrt{x} + \frac{1}{\sqrt{x}} = 3$ है, तो $x^3 + \frac{1}{x^3}$ का मान ज्ञात कीजिए।

~~(a) 322~~

(b) 326

(c) 324

(d) 422

$$\begin{aligned} \downarrow \\ x + \frac{1}{x} &= 3 - 2 \\ &= 1 \\ x^3 + \frac{1}{x^3} &= 1^3 - 3 \times 1 \\ &= 1 - 3 \\ &= -2 \end{aligned}$$

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

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

(SSC CGL Pre 18/04/2022)

(a) 527

(b) 623

(c) 531

(d) 7

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

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

$$x^2 + \frac{1}{x^2} = 5^2 - 2 = 23$$

$$x^4 + \frac{1}{x^4} = 23^2 - 2 = 527$$



112. If $x = 7 - 4\sqrt{3}$, then find the value of $\left(x^2 + \frac{1}{x^2}\right)$

यदि $x = 7 - 4\sqrt{3}$ है, तो $\left(x^2 + \frac{1}{x^2}\right)$ का मान ज्ञात कीजिए।

(a) 197 $\frac{1}{x} = 7 + 4\sqrt{3}$

(b) 195 $x + \frac{1}{x} = 7 + 7 = 14$

(c) 196

(d) 194 $x^2 + \frac{1}{x^2} = 14^2 - 2 = 194$

(SSC Selection Post Phase XII 26/06/2024)



112. If $x = 7 - 4\sqrt{3}$, then find the value of $\left(x^2 + \frac{1}{x^2}\right)$

यदि $x = 7 - 4\sqrt{3}$ है, तो $\left(x^2 + \frac{1}{x^2}\right)$ का मान ज्ञात कीजिए।

~~(a) 197~~ 199 195

~~(b) 195~~ 197 193

~~(c) 196~~ 198 194

(d) 194 196 14^2

(SSC Selection Post Phase XII 26/06/2024)

Conjugate

$$x = a + b$$

$$\frac{1}{x} = \frac{1}{a+b} = a-b$$

where.

$$a^2 - b^2 = 1$$

$$a > b$$

$$x = 7 + 4\sqrt{3}$$

$$\frac{1}{x} = \frac{1}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}} = \frac{7-4\sqrt{3}}{\underbrace{49-48}_{(1)}} = (7-4\sqrt{3})$$

$$\begin{cases} x = 2 - \sqrt{3} \\ \frac{1}{x} = 2 + \sqrt{3} \end{cases}$$

113. If $x = (\sqrt{6} - 1)^{\frac{1}{3}}$, the value of $\left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right)$ is.

यदि $x = (\sqrt{6} - 1)^{\frac{1}{3}}$ है, $\left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right)$ का मान है।

(a) $\frac{2\sqrt{6}-6}{5}$

(b) $\frac{4\sqrt{6}-6}{5}$

(c) $\frac{4\sqrt{3}-6}{5}$

(d) $\frac{4\sqrt{6}-6}{3}$

(SSC CHSL Pre 09/08/2023)

$$x^3 = \sqrt{6} - 1$$

$$\frac{1}{x^3} = \frac{1}{\sqrt{6}-1} \times \frac{\sqrt{6}+1}{\sqrt{6}+1}$$

$$\frac{\sqrt{6}+1}{6-1} = \frac{\sqrt{6}+1}{5}$$

~~$$x^3 - \frac{1}{x^3} - 3 \times 1 \left(x - \frac{1}{x}\right) + 3 \left(x - \frac{1}{x}\right)$$~~

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

$$\frac{\sqrt{6}-1}{5} - \frac{\sqrt{6}+1}{5}$$

$$= \frac{\sqrt{6}-1-\sqrt{6}-1}{5}$$



114. If $x + \frac{1}{x} = 1$, then the value of $\frac{x^2+7x+1}{x^2+11x+1}$?

यदि $x + \frac{1}{x} = 1$ है, तो $\frac{x^2+7x+1}{x^2+11x+1}$ का मान क्या है?

- (a) $\frac{2}{3}$
- (b) $\frac{3}{4}$
- (c) $\frac{1}{3}$
- (d) $\frac{1}{4}$

divide (N) & (D) by x

$$\frac{x + \frac{1}{x} + 7}{x + \frac{1}{x} + 11}$$

$$= \frac{1+7}{1+11} = \frac{8}{12} = \frac{2}{3}$$

(SSC CGL Pre 26/07/2023)

115. If $x - \frac{1}{x} = 5, x \neq 0$, then the value of $\frac{x^6 - 5x^3 - 1}{x^6 + 7x^3 - 1}$?

यदि $x - \frac{1}{x} = 5, x \neq 0$ है, तो $\frac{x^6 - 5x^3 - 1}{x^6 + 7x^3 - 1}$ का मान ज्ञात कीजिए।

(a) $\frac{41}{45}$

(b) $\frac{45}{49}$

(c) $\frac{45}{41}$

(d) $\frac{49}{45}$

$$x^3 - \frac{1}{x^3} = 5^3 + 3 \times 5$$
$$= 140$$

Divide (N) & (D) by x^3

$$\frac{x^3 - \frac{1}{x^3} - 5}{x^3 - \frac{1}{x^3} + 7}$$

(SSC CGL Pre 13/08/2023)

$$\frac{140 - 5}{140 + 7} = \frac{135}{147} = \frac{45}{49}$$

Case-1

$$\text{if } x + \frac{1}{x} = 2 \rightarrow x^2 + 1 = 2x$$
$$x^2 - 2x + 1 = 0$$

then $x = 1$

$(+1)(+1)$

also $x^m + \frac{1}{x^m} = 2$

Case-2

$$\text{if } x + \frac{1}{x} = -2$$

$$x = -1$$

Case 3 if $x + \frac{1}{x} = 1 \rightarrow (x+1)(x^2 - x + 1) = 0 \times (x+1)$

then

$$\boxed{x^3 = -1}$$

$$x^3 + 1^3 = 0$$

$$\boxed{x^3 = -1}$$

Case 4

if $x + \frac{1}{x} = -1 \Rightarrow (x-1)(x^2 + x + 1) = 0 \times (x-1)$

$$\boxed{x^3 = +1}$$

$$x^3 - 1^3 = 0$$

$$\boxed{x^3 = +1}$$

$$x + \frac{1}{x} = \pm \sqrt{3}$$

$$x^6 = -1$$



If $x + \frac{1}{x} = 2$, then $x = 1$ (Always)

✓ If $x + \frac{1}{x} = -2$, then $x = -1$ (Always)

✓ If $x + \frac{1}{x} = -1$, then $x^3 = 1$ (Always)

✓ If $x + \frac{1}{x} = 1$, then $x^3 = -1$ (Always)

✓ If $x + \frac{1}{x} = \pm\sqrt{3}$, then $x^6 = -1$ (Always)



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TYPE-V

116. If $x + \frac{1}{x} = 2$, then find the value of $\left(x^4 + \frac{4}{x^4}\right)\left(x^3 - \frac{4}{x^3}\right)$

यदि $x + \frac{1}{x} = 2$ है, तो $\left(x^4 + \frac{4}{x^4}\right)\left(x^3 - \frac{4}{x^3}\right)$ का मान ज्ञात करें

(a) 10

(b) 15

(c) -15

(d) -10

$x=1$

$$\left(1 + \frac{4}{1}\right)\left(1 - \frac{4}{1}\right)$$

$$5 \times (-3)$$

$$= -15$$

(SSC CPO 27/06/2024)



117. If $x + \frac{1}{x} = 2$, then the value of $x^{100} + \frac{1}{x^{100}}$ is.

यदि $x + \frac{1}{x} = 2$ है, तो $x^{100} + \frac{1}{x^{100}}$ का मान है।

(a) 1

(b) 0

(c) -2

(d) 2

2

(SSC CGL Mains 01/08/2010)



118. If $x + \frac{1}{x} = 2$ and x is real, then the value of $x^{17} + \frac{1}{x^{19}}$.

यदि $x + \frac{1}{x} = 2$ और x वास्तविक है, तो $x^{17} + \frac{1}{x^{19}}$ का मान है।

(a) 0

(b) -2

~~(c) 2~~

(d) N.O.T.

$x=1$

2



119. If $x + \frac{1}{x} = 2$, then find the value of $x^{1823} + \frac{1}{x^{1929}}$.

यदि $x + \frac{1}{x} = 2$ है, तब $x^{1823} + \frac{1}{x^{1929}}$ का मान ज्ञात कीजिए।

(a) 0

(b) 2

(c) -1

(d) 1

$x=1$

2

(SSC CHSL Pre 07/08/2023)



120. If $a + \frac{1}{a} + 2 = 0$, then the value of $a^{37} - \frac{1}{a^{100}}$ is.

यदि $a + \frac{1}{a} + 2 = 0$, तो $a^{37} - \frac{1}{a^{100}}$ का मान है।

(a) 2

☒ (b) -2

(c) 0

(d) 1

$$a + \frac{1}{a} = -2$$

$$a = -1$$

$$(-1)^{37} - \frac{1}{(-1)^{100}}$$

$$-1 - \frac{1}{+1}$$

$$-1 - 1$$

$$= -2$$

(SSC CGL Mains 04/09/2011)



121. If $a + \frac{1}{a} = -2$, then the value of $a^{1000} + a^{-1000}$ is.

यदि $a + \frac{1}{a} = -2$, तो $a^{1000} + a^{-1000}$ का मान है।

(a) $\frac{1}{2}$

(b) 0

(c) 1

~~(d) 2~~

$a = -1$

$$a^{1000} + \frac{1}{a^{1000}}$$

$$(-1)^{1000} + \frac{1}{(-1)^{1000}}$$

$$1 + 1$$

$$= 2$$



122. If $x + \frac{1}{x} = -1$, then the value of $x^{15} + \frac{1}{x^{15}}$ will be :

यदि $x + \frac{1}{x} = -1$ है, तो $x^{15} + \frac{1}{x^{15}}$ का मान क्या होगा:

(a) 2

(b) -1

(c) 0

(d) 3

$$\boxed{x^3 = +1}$$

$$\begin{aligned} & \downarrow \\ & (x^3)^5 + \frac{1}{(x^3)^5} \\ & (+1)^5 + \frac{1}{(+1)^5} \\ & 1 + 1 \\ & = 2 \end{aligned}$$

$$\begin{aligned} & x^{17} + \frac{1}{x^{17}} = ? \\ & (x^3)^5 \times x^2 + \frac{1}{(x^3)^5 \times x^2} \end{aligned}$$

(SSC CHSL Pre 07/08/2023)

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

$$\begin{aligned} & x^{16} + \frac{1}{x^{16}} \\ & (x^3)^5 \times x + \frac{1}{(x^3)^5 \times x} \end{aligned}$$

$$1 \times x + \frac{1}{1 \times x}$$

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

$$= \textcircled{-1}$$

123. If $x + \frac{1}{x} = \sqrt{3}$, then the value of $x^{18} + x^{12} + x^6 + 1$ is.

यदि $x + \frac{1}{x} = \sqrt{3}$, तो $x^{18} + x^{12} + x^6 + 1$ का मान क्या होगा?

(a) 1

(b) 2

(c) 0

(d) N.O.T.

$$x^6 = -1$$

$$\downarrow$$
$$(x^6)^3 + (x^6)^2 + x^6 + 1$$

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

$$-1 + 1 - 1 + 1$$

$$= 0$$



124. If $a^3 + \frac{1}{a^3} = 2$, then the value of $\frac{a^2+1}{a}$ is? (where a is a positive number)

यदि $a^3 + \frac{1}{a^3} = 2$ हो, तो $\frac{a^2+1}{a}$ का मान कितना है? (जहाँ a एक धनात्मक संख्या है)

$$a = 1$$

$$a + \frac{1}{a} = ?$$

↓

$$2$$

(a) 4

(b) 3

~~(c) 2~~

(d) 1



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TYPE-VI

125. If $3^a = 27^b = 81^c$ and $abc = 144$, then the value of $12 \left(\frac{1}{a} + \frac{1}{2b} + \frac{1}{5c} \right)$ is.

यदि $3^a = 27^b = 81^c$ और $abc = 144$ है, तब $12 \left(\frac{1}{a} + \frac{1}{2b} + \frac{1}{5c} \right)$ का

मान है।

(a) $\frac{18}{120}$

(b) $\frac{18}{10}$

(c) $\frac{33}{10}$

(d) $\frac{17}{120}$

(SSC CGL Pre 06/03/2020)

$$3^a = 3^{3b} = 3^{4c}$$

$$a = 3b = 4c$$

$$a : b : c$$

$$12 : 4 : 3$$

$$12R$$

$$4R$$

$$3R$$

$$12$$

$$4$$

$$3$$

$$144R^3 = 144$$

$$R^3 = 1$$

$$R = 1$$

$$12 \left[\frac{1}{12} + \frac{1}{8} + \frac{1}{15} \right]$$

$$12 \left(\frac{10 + 15 + 8}{120} \right)$$

$$= \frac{33}{10}$$



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126. If $x^{2a} = y^{2b} = z^{2c} \neq 0$ and $x^2 = yz$, then the value of $\frac{ab+bc+ca}{bc}$ is.

यदि $x^{2a} = y^{2b} = z^{2c} \neq 0$ और $x^2 = yz$, तब $\frac{ab+bc+ca}{bc}$ है।

(a) 3 bc

(b) 3 ab

(c) 3 ac

(d) 3

$$x^{2a} = y^{2b} = z^{2c} = K$$

$$\left(K^{\frac{1}{2a}}\right)^2 = K^{\frac{1}{2b}} \times K^{\frac{1}{2c}}$$

$$K^{\frac{1}{a}} = K^{\frac{1}{2b} + \frac{1}{2c}}$$

$$\frac{1}{a} = \frac{1}{2} \left[\frac{1}{b} + \frac{1}{c} \right]$$

$$\frac{2}{a} = \frac{b+c}{bc}$$

$$1 + \frac{ab+ac}{bc} = 2 + 1$$

$$\frac{bc+ab+ac}{bc} = 3$$

(SSC CGL Pre 03/03/2020)



127. If $2^{x+2y} = 256$ and $3^{x-2y} = \frac{1}{27}$, then the value of $x + y$ is.

यदि $2^{x+2y} = 256$ और $3^{x-2y} = \frac{1}{27}$, तो $x + y$ का मान है।

(a) $\frac{25}{4}$

(b) $\frac{21}{4}$

(c) $\frac{23}{4}$

(d) $\frac{19}{4}$

(ICAR Technician 2023)

$$2^{x+2y} = 2^8$$

$$3^{x-2y} = 3^{-3}$$

$$x+2y = 8$$

$$x-2y = -3$$

$$x = \frac{8+(-3)}{2} = \frac{5}{2}$$

$$2y = \frac{8-(-3)}{2} = \frac{11}{2}$$

$$y = \frac{11}{4}$$

$$\frac{5}{2} + \frac{11}{4}$$

$$= \frac{20+22}{8}$$

$$\frac{42}{8} = \frac{21}{4}$$



128. 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?

(a) $(A + 2)/(A + 1)$

(b) $A/(A - 1)$

(c) $(A + 1)/(A - 1)$

(d) $(A - 2)/(A + 1)$

$$B = 1 + \frac{1}{2^p}$$

$$2^p = A - 1$$

$$B = 1 + \frac{1}{A-1}$$

$$B = \frac{A - 1 + 1}{A - 1}$$

$$B = \frac{A}{A-1}$$



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TYPE-VII



129. If $\frac{8+2\sqrt{3}}{3\sqrt{3}+5} = a\sqrt{3} - b$, then find the value of $a + b$.

यदि $\frac{8+2\sqrt{3}}{3\sqrt{3}+5} = a\sqrt{3} - b$ है, तो $a + b$ का मान ज्ञात कीजिए।

$$\frac{(8+2\sqrt{3})(3\sqrt{3}-5)}{(3\sqrt{3}+5)(3\sqrt{3}-5)}$$

(a) 24

(b) 15

(c) 18

(d) 16

$$\frac{24\sqrt{3} - 40 + 18 - 10\sqrt{3}}{27 - 25}$$

(SSC CGL Mains 18/11/2020)

$$\frac{14\sqrt{3} - 22}{2} = \frac{2(7\sqrt{3} - 11)}{2}$$

$$7\sqrt{3} - 11 = a\sqrt{3} - b$$

on comparing

$$a = 7$$

$$b = 11$$

$$a + b = 11 + 7 = 18$$

130. If $\frac{\sqrt{38-5\sqrt{3}}}{\sqrt{26+7\sqrt{3}}} = \frac{a+b\sqrt{3}}{23}$, $b > 0$, then the value of $(b - a)$ is?

यदि $\frac{\sqrt{38-5\sqrt{3}}}{\sqrt{26+7\sqrt{3}}} = \frac{a+b\sqrt{3}}{23}$, $b > 0$ हो, तो $(b - a)$ का मान कितना होगा?

$$\frac{5\sqrt{3}-1}{23} = \frac{a+b\sqrt{3}}{23}$$

(a) 11

(b) 29

(c) 7

(d) 18

(SSC CGL Mains 03/02/2022)

$$a = -11$$

$$b = 18$$

$$b - a$$

$$18 - (-11) = 18 + 11 = 29$$

$$\begin{aligned} \frac{\sqrt{(38-5\sqrt{3}) \times 2}}{\sqrt{(26+7\sqrt{3}) \times 2}} &= \frac{\sqrt{76-2 \times 5\sqrt{3}}}{\sqrt{52+2 \times 7\sqrt{3}}} \\ &= \frac{\sqrt{76-2 \times 5\sqrt{3}}}{\sqrt{52+2 \times 7\sqrt{3}}} = \frac{\sqrt{76-2 \times 5\sqrt{3}}}{\sqrt{52+2 \times 7\sqrt{3}}} \\ &= \frac{5\sqrt{3}-1}{7+\sqrt{3}} \\ &\quad \downarrow \\ &\quad \frac{(5\sqrt{3}-1)(7-\sqrt{3})}{(7+\sqrt{3})(7-\sqrt{3})} = \frac{36\sqrt{3}-22}{46} \\ &= \frac{35\sqrt{3}-15-7+\sqrt{3}}{49-3} = \frac{36\sqrt{3}-22}{46} \\ &= \frac{18\sqrt{3}-11}{23} \end{aligned}$$

131. If $x = 97 + 56\sqrt{3}$, then what is the value of $\sqrt[4]{x} + \frac{1}{\sqrt[4]{x}}$?

यदि $x = 97 + 56\sqrt{3}$ है, तो $\sqrt[4]{x} + \frac{1}{\sqrt[4]{x}}$ का मान क्या है?

(a) 5

(b) 6

(c) 7

(d) 4

(CDS 03/09/2023)

$$\sqrt{x} = \sqrt{97 + 2 \times 28\sqrt{3}}$$

7 4√3

$$\sqrt{x} = 7 + 4\sqrt{3}$$

$$\sqrt[4]{x} = \sqrt{7 + 4\sqrt{3}}$$

2 2√3

2 √3

$$\sqrt[4]{x} = 2 + \sqrt{3}$$

$$\begin{aligned} & \downarrow \\ & 2 + \cancel{\sqrt{3}} + 2 - \cancel{\sqrt{3}} \\ & = 4 \end{aligned}$$

$$\frac{1}{\sqrt[4]{x}} = 2 - \sqrt{3}$$

132. 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 $z = 1$ है, तो $\left(\frac{x}{yz}\right) + \left(\frac{y}{xz}\right) + \left(\frac{z}{xy}\right) + 2\left[\left(\frac{1}{x}\right) + \left(\frac{1}{y}\right) + \left(\frac{1}{z}\right)\right]$ का मान क्या है?

(a) 43

(b) 17

(c) 22

(d) 25

$$\frac{x^2}{xyz} + \frac{y^2}{xyz} + \frac{z^2}{xyz} + 2 \left[\frac{yz + xz + xy}{xyz} \right]$$

$$\frac{1}{xyz} [x^2 + y^2 + z^2 + 2(xy + yz + zx)]$$

(SSC CGL Mains 18/02/2018)

$$\frac{(x+y+z)^2}{xyz} = \frac{(2+\sqrt{3}+2-\sqrt{3}+1)^2}{(2+\sqrt{3})(2-\sqrt{3}) \times 1} = \frac{5^2}{1 \times 1} = 25$$

133. If $x = \frac{\sqrt{3}+1}{\sqrt{3}-1}$ and $y = \frac{\sqrt{3}-1}{\sqrt{3}+1}$, then what is the value of $x^3 - y^3$?

यदि $x = \frac{\sqrt{3}+1}{\sqrt{3}-1}$ और $y = \frac{\sqrt{3}-1}{\sqrt{3}+1}$, तो $x^3 - y^3$ का मान क्या है?

(a) $45\sqrt{3}$

(b) $30\sqrt{3}$

(c) 90

(d) 60

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

$$24\sqrt{3} + 6\sqrt{3}$$

(CDS 16/04/2023)

$30\sqrt{3}$

$$xy = \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{\sqrt{3}-1}{\sqrt{3}+1}$$

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

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

$$x = \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

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

$$\frac{4+2\sqrt{3}}{2} = 2+\sqrt{3}$$

$$x = 2+\sqrt{3}$$

$$\frac{1}{x} = 2-\sqrt{3}$$

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

134. If $(2 + \sqrt{3})a = (2 - \sqrt{3})b = 1$, then the value of $\frac{1}{a} + \frac{1}{b}$ is?

यदि $(2 + \sqrt{3})a = (2 - \sqrt{3})b = 1$, तो $\frac{1}{a} + \frac{1}{b}$ का मान क्या है?

(a) 4

(b) $2\sqrt{3}$

(c) 2

(d) 1

$$2 + \sqrt{3} = \frac{1}{a} \quad | \quad 2 - \sqrt{3} = \frac{1}{b}$$

$$\frac{1}{a} + \frac{1}{b} = 2 + \cancel{\sqrt{3}} + 2 - \cancel{\sqrt{3}}$$

$$= 4$$



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TYPE-VIII

$$\underline{16 - x^2}$$

for max. value put $x^2 = 0$

$$\Rightarrow 16 - 0 \\ = \underline{\underline{16}}$$

$$16 + x^2$$

for minimum value
 $x^2 = 0$

$$16 + 0 \\ = \underline{\underline{16}}$$

$$2x^2 + 4x + 1$$

↓
min. value =

differentiation

$$\downarrow x^5 \Rightarrow 5x^{5-1} = 5x^4$$

$$\downarrow x^4 = 4x^{4-1} = 4x^3$$

$$\downarrow x^3 \Rightarrow 3x^{3-1} = 3x^2$$

$$\downarrow x^2 = 2x^{2-1} = 2x$$

$$x^n$$

differentiation
 $= \underline{\underline{n x^{n-1}}}$

$$5x$$

$$5x^1$$

$$5 \times x^{1-1} \Rightarrow 5 \times 1 = \textcircled{5}$$

6

$$\text{diff} = 0$$

$$2x^2 + 4x + 1$$

min. value =

$$4x' + 4 + 0 = 0$$

$$4x + 4 = 0$$

$$4x = -4$$

$$\boxed{x = -1}$$

min value

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

$$2 - 4 + 1$$

$$3 - 4$$

$$= -1 \checkmark$$

$$8x^2 + \underline{24x} + 19$$

min value = ?

$$16x + 24 + 0 = 0$$

$$16x + 24 = 0$$

$$16x = -24$$

$$x = \frac{-24}{16} = \frac{-3}{2}$$

$$8x\left(\frac{-3}{2}\right) + 24\left(\frac{-3}{2}\right) + 19$$

$$8x \frac{9}{4} - 24 \times \frac{3}{2} + 19$$

$$18 - 36 + 19$$

$$37 - 36$$

$$= \textcircled{+1}$$

135. What will be the minimum value of $(4x^2 + 2x + 1)$?

$(4x^2 + 2x + 1)$ का न्यूनतम मान क्या होगा?

$$8x + 2 + 0 = 0$$

$$8x = -2$$

$$x = -\frac{2}{8} = -\frac{1}{4}$$

$$\text{min. value} = 4x\left(-\frac{1}{4}\right)^2 + 2\left(-\frac{1}{4}\right) + 1$$

$$4x \frac{1}{16} - 2x \frac{1}{4} + 1$$

$$= \frac{1}{4} - \frac{2}{4} + 1$$
$$= \frac{1-2}{4} + 1$$
$$= 1 - \frac{1}{4}$$
$$= \frac{3}{4}$$

- (a) $\frac{2}{3}$
(b) $\frac{4}{3}$
(c) $\frac{3}{4}$
(d) $\frac{1}{2}$

136. If x is real, then what will be maximum value of $(7 + 10x - 5x^2)$?

यदि x वास्तविक हो, तो $7 + 10x - 5x^2$ का अधिकतम मान क्या होगा?

(a) 12

(b) 13

(c) 2

(d) 10

$$0 + 10 - 10x = 0$$

$$10x = 10$$

$$\boxed{x = 1}$$

Max. Value

$$= 7 + 10 \times 1 - 5 \times (1)^2$$

$$17 - 5 = 12$$

$a \times b \rightarrow \text{max. Value}$



$\text{max. Value} \Rightarrow \boxed{a=b}$

where

$(a+b) = \text{Constant}$

137. If $x + y + z = 13$, then find the maximum value of $(x - 2)(y + 1)(z - 3)$.

यदि $x + y + z = 13$ हो, तो $(x - 2)(y + 1)(z - 3)$ का अधिकतम मान बतायें।

(a) 27

(b) 30

(c) 54

(d) 25

$$\begin{array}{ccccccc} x & + & y & + & z & = & 13 \\ -2 & & +1 & & -3 & & \\ \hline & & & & & & 9 \end{array}$$

$$\underbrace{(x-2)}_3 + \underbrace{(y+1)}_3 + \underbrace{(z-3)}_3 = 9$$

$$3 \times 3 \times 3 = 27$$

ex. xy की max. value

$$\downarrow$$
$$3 \times 3$$
$$= \textcircled{9}$$

जहाँ $x + y = 6$

$$\begin{array}{cc} \downarrow & \downarrow \\ 3 & 3 \end{array}$$

max. Value at $x=y$

ex xyz की max. value

$$\downarrow$$
$$6 \times 6 \times 6$$
$$= \textcircled{216}$$

where

$$x + y + z = 18$$
$$\begin{array}{ccc} \downarrow & \downarrow & \downarrow \\ 6 & 6 & 6 \end{array}$$

max. value at
 $x=y=z$

$a+b \rightarrow \text{min. value}$



minimum value at

$$\underline{\underline{a=b}}$$

where

$$a \times b = \text{Constant}$$

$$a \times b = 7$$

$$a + b \Rightarrow \text{min. value} = ?$$

$$\text{min. at } \Rightarrow \underline{\underline{a = b}}$$

$$a \times b = 7$$

$$a^2 = 7$$

$$\underline{\underline{a = \sqrt{7} = b}}$$

$$\begin{aligned} & \sqrt{7} + \sqrt{7} \\ &= \textcircled{2\sqrt{7}} \end{aligned}$$

$$a \times b = 49$$

$a + b \Rightarrow \text{min. value} = ?$

$$\begin{array}{cc} a & \times & b & = & 49 \\ \downarrow & & | & & \\ 7 & & 7 & & \end{array}$$

$$a + b \rightarrow \text{min value} \rightarrow 7 + 7 = 14$$

138. If $(a - 7)(b - 10)(c - 12) = 1000$, then what will be the minimum value of $(a + b + c)$?

यदि $(a - 7)(b - 10)(c - 12) = 1000$ हो, तो $(a + b + c)$ का न्यूनतम मान क्या होगा?

(a) 14

(b) 29

(c) 59

(d) 20

$$(a-7)(b-10)(c-12) = 1000$$

10 10 10

$$a-7=10$$

$$\underline{a=17}$$

$$b-10=10$$

$$\underline{b=20}$$

$$c-12=10$$

$$\underline{c=22}$$

↓
 $17+20+22$
 $= 59$

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

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

(a) 5

(b) 3

(c) 2

(d) 4

$$3x + 5y + 7z = 49 \quad \text{--- (1)}$$

$$y = ?$$

$$9x + 8y + 21z = 126 \quad \text{--- (2)}$$

$$\text{Eq (1)} \times 3 \Rightarrow 9x + 15y + 21z = 49 \times 3 = 147 \quad \text{--- (3)}$$

$$\text{(SSC CGL Mains 17/02/2018)} \quad \text{(3) - (2)}$$

$$15y - 8y = 147 - 126$$

$$7y = 21 \quad \text{(4)}$$

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

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

(a) 46

(b) 64

(c) 52

(d) 32

$$2x + 3y - 5z = 18 \quad \text{--- (1)}$$

$$3x + 2y + z = 29 \quad \text{--- (2)}$$

$$x + y + 3z = 17 \quad \text{--- (3)}$$

(SSC CGL Mains 21/02/2018)

$$6x + 6y - z = 64 \quad \text{--- (4)}$$

$$\text{ए (3) } \times \text{ (6) } \Rightarrow 6x + 6y + 18z = 102 \quad \text{--- (5)}$$

$$\text{(5)} - \text{(4)}$$

$$19z = 38$$

$$z = \frac{38}{19} = 2$$

$$5 \times 6 + 6 \times 2 + 2 \times 5$$

$$30 + 12 + 10$$

$$= 52$$

$$2y = 84$$

$$4y = 54$$

$$5y = 30$$

$$y = 6$$

$$+ 6 = 17$$

$$17 - 12 = 5$$



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Miscellaneous

142. If $8(x+y)^3 - 27(x-y)^3 = (5y-x)(Ax^2 + By^2 + Cxy)$, then what is the value of $(A+B-C)$?

यदि $8(x+y)^3 - 27(x-y)^3 = (5y-x)(Ax^2 + By^2 + Cxy)$, तब $(A+B-C)$ का मान क्या है?

(a) -16 $\left[2(x+y)\right]^3 - \left[3(x-y)\right]^3$

(b) -26 $(2x+2y-3x+3y) \left[4(x+y)^2 + 9(x-y)^2 + 2(x+y) \times 3(x-y)\right]$

(c) 16

(d) 36 $(5y-x) \left[4(x^2+y^2+2xy) + 9(x^2+y^2-2xy) + 6(x^2-y^2)\right]$

(SSC CGL Pre 13/08/2020)

$(5y-x) (19x^2 + 7y^2 - 10xy)$

$A=19$
 $B=7$
 $C=-10$

$+B-C$

$1+7-(-10)$

$9+7+10$

$\Rightarrow 36$



Y.W.

143. If $(2x + y)^3 - (x - 2y)^3 = (x + 3y)(Ax^2 + By^2 + Cxy)$, then find the value of $(A + 2B + C)$.

यदि $(2x + y)^3 - (x - 2y)^3 = (x + 3y)(Ax^2 + By^2 + Cxy)$ है, तो $(A + 2B + C)$ का मान ज्ञात करें।

(a) 10

(b) 13

(c) 14

(d) 7

(SSC CGL Mains 23/08/2021)

145. निम्नलिखित व्यंजक को सरल कीजिए।

Simplify the following expression.

$$(1+x)(1+x^2)(1+x^4)(1+x^8)(1-x)$$

(a) $1 - x^{42}$

(b) $1 - x^{32}$

(c) $1 - x^{16}$

(d) $1 - x^{40}$

$$(1-x^2)(1+x^2)(1+x^4)(1+x^8)$$

$$(1-x^4)(1+x^4)(1+x^8)$$

$$(1-x^8)(1+x^8)$$

$$(1-x^{16})$$

(SSC CGL Mains, 03/03/2023)

145. निम्नलिखित व्यंजक को सरल कीजिए।

Simplify the following expression.

$$(1+x)(1+x^2)(1+x^4)(1+x^8)(1-x)$$

(a) $1 - x^{42}$

(b) $1 - x^{32}$

(c) $1 - x^{16}$

(d) $1 - x^{40}$

$$(1-x^{16})$$

(SSC CGL Mains, 03/03/2023)

146. निम्नलिखित व्यंजक को सरल कीजिए।

Simplify the following expression.

$$(x + y)(x - y)(x^2 + y^2)(x^4 + y^4)(x^8 + y^8)(x^{16} + y^{16})$$

(a) $x^{128} - y^{128}$

(b) $x^{64} - y^{64}$

(c) $x^{32} - y^{32}$

(d) $x^{256} - y^{28}$

Ans $(x^{32} - y^{32})$

(SSC Selection Post Phase XII 26/06/2024)

147. दिए गए व्यंजक को सरल कीजिए।

Simplify the given expression.

$$\frac{\left(k + \frac{1}{k}\right) \left(k - \frac{1}{k}\right) \left(k^2 + \frac{1}{k^2}\right) \left(k^4 + \frac{1}{k^4}\right) \left(k^8 + \frac{1}{k^8}\right) \left(k^{16} + \frac{1}{k^{16}}\right) \left(k^{32} + \frac{1}{k^{32}}\right)}{k + \frac{1}{k}}$$

(a) $\frac{k^{32} - \frac{1}{k^{32}}}{k - \frac{1}{k}}$

(b) $\frac{k^{32} - \frac{1}{k^{32}}}{k + \frac{1}{k}}$

(c) $\frac{k^{64} - \frac{1}{k^{64}}}{k + \frac{1}{k}}$

(d) $\frac{k^{32} + \frac{1}{k^{32}}}{k + \frac{1}{k}}$

Ans

$$\frac{k^{64} - \frac{1}{k^{64}}}{k + \frac{1}{k}}$$

(SSC CGL Pre 06/12/2022)



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148. $p^3 + q^3 + r^3 - 3pqr = 4$, if $a = q + r$, $b = r + p$ and $c = p + q$, then what is the value of $a^3 + b^3 + c^3 - 3abc$?

Put $q=r=0$

$p^3 + q^3 + r^3 - 3pqr = 4$ है, यदि $a = q + r$, $b = r + p$ तथा $c = p + q$ है, तो $a^3 + b^3 + c^3 - 3abc$ का मान क्या है?

(a) 2

(b) 8

(c) 12

(d) 4

$$p^3 = 4$$

$$p^3 + p^3 = 0$$

$$= 2p^3$$

$$2 \times 4 = 8$$

$$a = 0$$

$$b = p$$

$$c = p$$

(SSC CGL Mains 19/02/2018)

150. If $a + b + c = 0$, then the value of $\frac{1}{(a+b)(b+c)} +$

$$\frac{1}{(b+c)(c+a)} + \frac{1}{(c+a)(a+b)}.$$

यदि $a + b + c = 0$ हो, तो $\frac{1}{(a+b)(b+c)} + \frac{1}{(b+c)(c+a)} + \frac{1}{(c+a)(a+b)}$

मान निकालें।

(a) 2

(b) 1

(c) 0

(d) 3

$$\frac{(c+a)}{(a+b)(b+c)(c+a)} + \frac{a+b}{(a+b)(b+c)(c+a)} + \frac{b+c}{(a+b)(b+c)(c+a)}$$

$$\frac{c+a+a+b+b+c}{(a+b)(b+c)(c+a)}$$

$$= \frac{2(a+b+c)}{(a+b)(b+c)(c+a)} \text{ Ans} = 0$$



151. का मान ज्ञात कीजिए/The value of?

$$\frac{p^2 - (q-r)^2}{(p+r)^2 - q^2} + \frac{q^2 - (p-r)^2}{(p+q)^2 - r^2} + \frac{r^2 - (p-q)^2}{(q+r)^2 - p^2}$$

(a) 3

(b) 0

(c) 2

(d) 1

$$\frac{(p+q-r)(p-q+r)}{(p+q+r)(p+q-r)} + \frac{(q+r-p)(q-p+r)}{(p+q-r)(p+q+r)} + \frac{(r+p-q)(r-p+q)}{(q+r-p)(q+r+p)}$$

$$\frac{p+q-r}{p+q+r} + \frac{q-r+p}{p+q-r} + \frac{r+p-q}{q+r-p} = \frac{p+q-r}{p+q+r}$$

(SSC CGL Pre 24/07/2023)

①

Let
 $q-r=x$

152. If $x^2 + 4y^2 + 2x + 1 = 0$, then find the value of $x^{39} + y^{36}$.

यदि $x^2 + 4y^2 + 2x + 1 = 0$ है, तो $x^{39} + y^{36}$ का मान ज्ञात कीजिए।

(a) -2

(b) 2

(c) -1

(d) 1

(SSC CPO Pre 29/06/2024)

$$x^2 + 4y^2 + 1 = -2x + 0y$$
$$2[-x + 0y]$$

$$x = -\frac{1}{1} = -1$$

$$y = 0$$

$$(-1)^{39} + 0$$
$$= -1$$

$$2x + 1 + 4y^2 = 0$$

$$x^2 + 4y^2 = 0$$

$$y = 0$$