

Rationalization (परिमेयकरण)

$$\frac{1}{3+2\sqrt{2}} =$$

$$\frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}} = \frac{3-2\sqrt{2}}{3^2-(2\sqrt{2})^2} = \frac{3-2\sqrt{2}}{9-8} = \frac{3-2\sqrt{2}}{1}$$

$$\frac{1}{7+4\sqrt{3}} = \frac{7-4\sqrt{3}}{1}$$

$49-48$

$$\frac{1}{\sqrt{5}+2} = \frac{\sqrt{5}-2}{1}$$

$5-4$

$$\frac{1}{5-2\sqrt{6}} = \frac{5+2\sqrt{6}}{1}$$

$25-24$

$$\frac{1}{7+5\sqrt{2}} = \frac{7-5\sqrt{2}}{-1} = 5\sqrt{2}-7$$

$49-50$



$$\frac{1}{5\sqrt{3} - 2\sqrt{11}} =$$

$$\frac{5\sqrt{3} + 2\sqrt{11}}{31}$$

$$75 - 44$$



If, $x = 9 + 4\sqrt{5}$

$\frac{1}{x} = 9 - 4\sqrt{5}$

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

$$x - \frac{1}{x} = 8\sqrt{5}$$

$$x \pm \frac{1}{x} = k \text{ (given)}$$

$$x^2 \pm \frac{1}{x^2}, x^3 \pm \frac{1}{x^3}, \dots, x^8 \pm \frac{1}{x^8}, \text{ પૂછેગા}$$

$$\frac{1}{x} = \frac{1}{9+4\sqrt{5}} = \frac{9-4\sqrt{5}}{1}$$

$$81 - 80$$

$$a - (-a) = 2a$$



18. If $x = 8 + 3x\sqrt{7}$, $x > 0$, then the value of $\sqrt{x} - \frac{1}{\sqrt{x}}$ is:

यदि $x = 8 + 3x\sqrt{7}$, $x > 0$ है, तो $\sqrt{x} - \frac{1}{\sqrt{x}}$ का मान क्या है?

(SSC CGL PRE 2022)

[A] 4 $x + \frac{1}{x} = 16$

[C] 6

[B] $\sqrt{14}$
[D] $2\sqrt{7}$

$$\begin{aligned} \left(\sqrt{x} - \frac{1}{\sqrt{x}} \right) &= \overline{x + \frac{1}{x}} - 2 \\ &= 16 - 2 \\ &= 14 \end{aligned}$$

19. If $x = 10 + 3\sqrt{11}$, then find $\sqrt{x} + \frac{1}{\sqrt{x}}$?

यदि $x = 10 + 3\sqrt{11}$ है, तो $\sqrt{x} + \frac{1}{\sqrt{x}}$ ज्ञात कीजिये?

[A] 4.84

[C] 4.69

[B] 5.69

[D] 3.92

$\sqrt{11}$

$$4.8^2 = 23.04$$

$$\begin{aligned} \left(\sqrt{x} + \frac{1}{\sqrt{x}} \right)^2 &= \left(x + \frac{1}{x} \right) + 2 \\ &= 10 + 2 \\ &= 12 \end{aligned}$$

If, $x + \frac{1}{x} = k$

तो $x^2 + \frac{1}{x^2} = k^2 - 2$

Proof:

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

$$\left(x^2 + \frac{1}{x^2}\right) + 2 \times \cancel{x} \times \cancel{\frac{1}{x}} = k^2$$

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



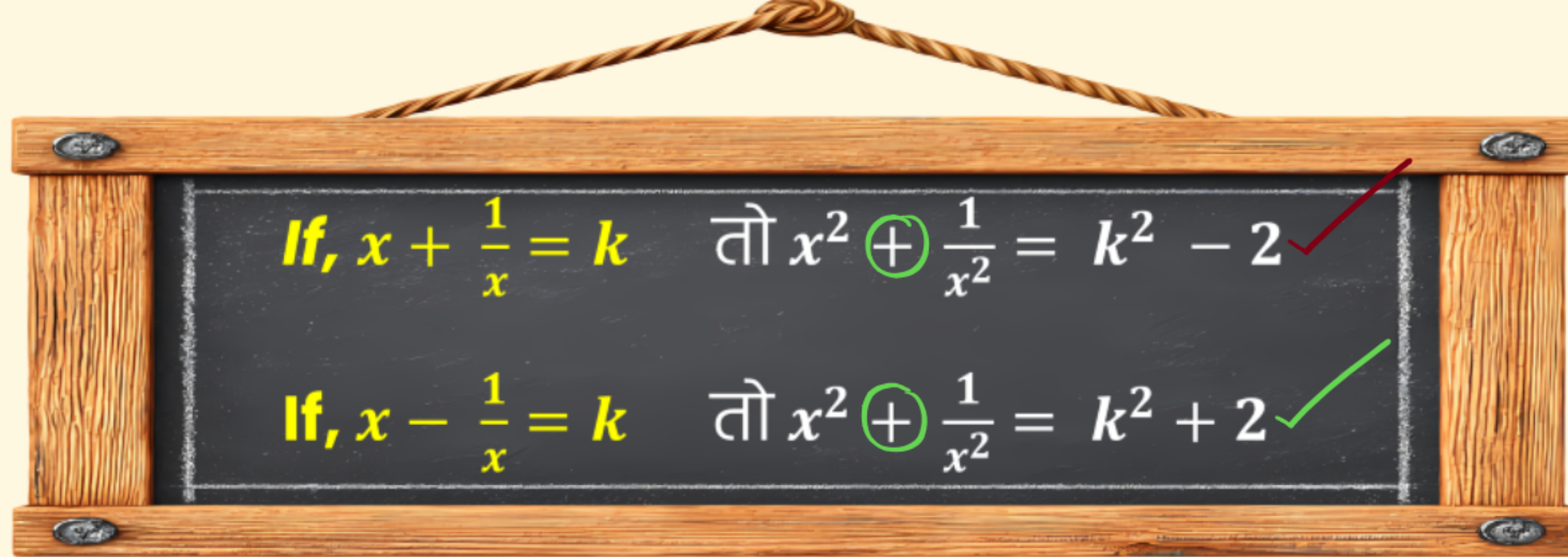
If, $x - \frac{1}{x} = k$ तो $x^2 + \frac{1}{x^2} = k^2 + 2$

Proof:

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

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

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



$$\text{If, } x + \frac{1}{x} = 9$$

$$x^2 + \frac{1}{x^2} = 9^2 - 2 = 79$$

$$\text{If, } y + \frac{1}{y} = 16$$

$$y^2 + \frac{1}{y^2} = 16^2 - 2 = 254$$



If, $x + \frac{1}{x} = k$ तो $x^2 + \frac{1}{x^2} = k^2 - 2$

If, $x - \frac{1}{x} = k$ तो $x^2 + \frac{1}{x^2} = k^2 + 2$

If, $z^7 + \frac{1}{z^7} = 25$

$z^{14} + \frac{1}{z^{14}} = 25^2 - 2 = 623$

If, $\left(\frac{x^3}{5}\right) + \left(\frac{5}{x^3}\right) = 12$

$\frac{x^6}{25} + \frac{25}{x^6} = 12^2 - 2 = 142$

If, $x = 11 + 2\sqrt{30}$

तो $x^2 + \frac{1}{x^2} =$

If, $\frac{m^8}{n} + \frac{n}{m^8} = 8$

$$\frac{m^{16}}{n^2} + \frac{n^2}{m^{16}} =$$



$$\text{If, } x + \frac{1}{x} = k \quad \text{तो } x^2 + \frac{1}{x^2} = k^2 - 2$$

$$\text{If, } x - \frac{1}{x} = k \quad \text{तो } x^2 + \frac{1}{x^2} = k^2 + 2$$

$$\text{If, } 2z + \frac{1}{(2z+5)} = 9+5$$

$$\Rightarrow (2z+5) + \frac{1}{(2z+5)} = 14$$

$$\text{तो } (2z+5)^2 + \frac{1}{(2z+5)^2} = 14^2 - 2 = 194$$

$$\frac{x^5}{\sqrt{3}} + \frac{\sqrt{3}}{x^5} = 7\sqrt{6}$$

$$\text{तो } \frac{y^{10}}{3} + \frac{3}{y^{10}} = (7\sqrt{6})^2 - 2 = 49 \times 6 - 2 = 292$$

$$\text{If, } x + \frac{1}{x} = \sqrt{7}$$

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

$$x^4 + \frac{1}{x^4} = 5^2 - 2 = 23$$

$$x^8 + \frac{1}{x^8} = 23^2 - 2 = 527$$

$$\text{If, } x - \frac{1}{x} = 4$$

$$\text{तो } x^2 + \frac{1}{x^2} = 4^2 + 2 = 18$$

$$x^4 + \frac{1}{x^4} = 18^2 - 2 = 322$$

$$\text{if, } m - \frac{1}{m} = 17$$

$$m^2 + \frac{1}{m^2} = 17^2 + 2 \\ = 291$$

$$a - \frac{1}{a} = 24$$

$$\text{तो } 36a^2 + \frac{1}{36a^2} = 24^2 + 2 = 578$$

$$\text{if, } \sqrt{a} - \frac{1}{\sqrt{a}} = 10$$

$$\text{तो } a + \frac{1}{a} = 10^2 + 2 = 102$$



If, $\frac{x^2 - 11x + 1}{x} = 0$

$x - 11 + \frac{1}{x} = 0 \Rightarrow x + \frac{1}{x} = 11$

तो $x^2 + \frac{1}{x^2} = 11^2 - 2$
 $= 119$

यदि $\frac{y^{14} - 19y^7 + 1}{y^7} = 0$

$y^7 - 19 + \frac{1}{y^7} = 0 \Rightarrow y^7 + \frac{1}{y^7} = 19$

तो $\rightarrow y^{14} + \frac{1}{y^{14}} = 19^2 - 2$
 $= 359$

$$\frac{x^2 - \sqrt{15}x - 1 = 0}{x}$$

$$x - \sqrt{15} - \frac{1}{x} = 0 \Rightarrow$$

$$x - \frac{1}{x} = \sqrt{15}$$

तो $x^2 + \frac{1}{x^2} = \sqrt{15}^2 + 2$
 $= 17$


$$\text{If, } x + \frac{1}{x} = k$$

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

$$\Rightarrow x \cdot (x - k) = -1$$

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

$$\text{If, } x - \frac{1}{x} = k$$

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

$$\Rightarrow x \cdot (x - k) = 1$$

$$\Rightarrow x^2 - kx - 1 = 0$$

$$\text{If, } x^n - \frac{1}{x^n} = k$$

$$x^n - k = \frac{-1}{x^n}$$

$$x^n \cdot (x^n - k) = -1$$

$$\text{If, } x^n - \frac{1}{x^n} = k$$

$$\text{तो } x^n \cdot (x^n - k) = +1$$



$$\text{If, } x^n + \frac{1}{x^n} = k$$

$$x^n (x^n - k) = -1$$

If,
तो

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

$$w^4 (w^4 - 527) =$$



20. If $x + \frac{1}{x} = 13$, then what is the value of $x^2 + \frac{1}{x^2}$?

यदि $x + \frac{1}{x} = 13$ है, तो $\left(x^2 + \frac{1}{x^2}\right)$ का मान कितना है?

RRB Group-D 2024

[A] 171

[C] 163

~~[B]~~ 167

[D] 169

21. **If $x + \frac{1}{x} = 15$, find the value of $x^2 + \frac{1}{x^2}$.**

यदि $x + \frac{1}{x} = 15$ है, तो $x^2 + \frac{1}{x^2}$ का मान ज्ञात कीजिए।

[RRB ALP CBT-1 2025]

[A] 125

[C] 225

[B] 143

☒ [D] 223

$\rightarrow 15^2 - 2$

22. If $a + \frac{1}{a} = 12$, then the value of $a^2 + \frac{1}{a^2}$.

यदि $a + \frac{1}{a} = 12$ है, तो $a^2 + \frac{1}{a^2}$ का मान ज्ञात करें।

[A] 138

[B] 144

[C] 140

✓ [D] 142

23. If $\sqrt{x} + \frac{1}{\sqrt{x}} = 5$, find $x + \frac{1}{x}$.

यदि $\sqrt{x} + \frac{1}{\sqrt{x}} = 5$, तो $x + \frac{1}{x}$ ज्ञात कीजिए।

[A] 32

[C] 23

$5^2 - 2$

[B] 15

[D] 25

- 24. If $\left(x + \frac{1}{x}\right) = 8.5$, what is the value of $\left(x^2 + \frac{1}{x^2}\right)$?**
यदि $\left(x + \frac{1}{x}\right) = 8.5$ है, तो $\left(x^2 + \frac{1}{x^2}\right)$ का मान ज्ञात करें।
- [A] 70.25** **[B] 74.25**
[C] 72.25 **[D] 75.25**

$$8.5^2 = 72.25$$

$$8.5^2 - 2 = 72.25 - 2$$

25. If $x^2 + \frac{1}{x^2} = 16$ and $x \neq 0$, then what is the value of $x^4 + \frac{1}{x^4}$.

यदि $x^2 + \frac{1}{x^2} = 16$ और $x \neq 0$ है, तो $x^4 + \frac{1}{x^4}$ का मान ज्ञात कीजिए।

(IB ACIO Grade-2 2023) RRB Technician Grade-3 2025

[A] 254

[C] 258

[B] 260

[D] 252

16-2

26. If $x^{12.5} + \frac{1}{x^{12.5}} = 16$, then $x^{25} + \frac{1}{x^{25}} = ?$

यदि $x^{12.5} + \frac{1}{x^{12.5}} = 16$ हो तो, $x^{25} + \frac{1}{x^{25}} = 16^2$

☒ [A] 254

[B] 258

[C] 260

[D] 256

27. If $\frac{x^{42}+1}{x^{21}} = 7$, then $\frac{x^{84}+1}{x^{42}} = ?$

यदि $\frac{x^{42}+1}{x^{21}} = 7$ हो तो, $\frac{x^{84}+1}{x^{42}} = ?$

[A] 51

[B] 49

[C] 53

[D] 47

$$x^{42} + \frac{1}{x^{42}} = 7$$

$$x^{84} + \frac{1}{x^{84}} = 7^2 - 2$$

28. If $\frac{x^{200}}{y^{200}} + \frac{y^{200}}{x^{200}} = 8$, then find $\frac{x^{400}}{y^{400}} + \frac{y^{400}}{x^{400}}$?

यदि $\frac{x^{200}}{y^{200}} + \frac{y^{200}}{x^{200}} = 8$ है, तो $\frac{x^{400}}{y^{400}} + \frac{y^{400}}{x^{400}}$ ज्ञात कीजिये?

[A] 60

[C] 64

[B] 62

[D] 66

$8^2 - 2$

- 29. If $\left(x - \frac{1}{x}\right) = 7.5$, what is the value of $\left(x^2 + \frac{1}{x^2}\right)$?**
यदि $\left(x - \frac{1}{x}\right) = 7.5$ तो $\left(x^2 + \frac{1}{x^2}\right)$ का मान ज्ञात कीजिए।
- [A] 54.25** **[B] 58.25**
[C] 60.25 **[D] 56.25**

$$\begin{aligned} & \downarrow \\ & 7.5^2 + 2 \\ & = 56.25 + 2 \end{aligned}$$

30. If $x - \frac{1}{x} = 0.4$ & $x > 0$, then find $x^2 + \frac{1}{x^2}$?

यदि $x - \frac{1}{x} = 0.4$ & $x > 0$, तो $x^2 + \frac{1}{x^2}$ ज्ञात करें?

[A] 4.16

[B] 3.32

[C] 1.84

[D] 2.16

$\swarrow$
 $0.4^2 + 2$

31. If $x \left(5 - \frac{2}{x} \right) = \frac{5}{x}$, then the value of $x^2 + \frac{1}{x^2}$ is equal to:

यदि $x \cdot \left(5 - \frac{2}{x} \right) = \frac{5}{x}$, है तो $x^2 + \frac{1}{x^2}$ का मान है?

[A] $2\frac{4}{25}$

[B] $2\frac{1}{25}$

[C] $3\frac{4}{25}$

[D] $2\frac{3}{25}$

$\frac{4}{25} + 2$

$$5x - 2 = \frac{5}{x}$$

$$5x - \frac{5}{x} = 2$$

$$\left(x - \frac{1}{x} \right) = \frac{2}{5}$$

32. If $a^2 - 13a - 1 = 0$, then find the value of $a^2 + \frac{1}{a^2} - 6 = ?$

यदि $a^2 - 13a - 1 = 0$ हो, तो $(a^2 + \frac{1}{a^2}) - 6$ का मान ज्ञात कीजिए।

[RRB Group D-2022] $= 13^2 + 2 - 6$

[A] 165

[B] 169

[C] 167

[D] 171

~~$$a - 13 - \frac{1}{a} = 0$$~~

$$a - \frac{1}{a} = 13$$

33. If $x - 5\sqrt{x} - 1 = 0$, then $x^2 + \frac{1}{x^2}$ is equal to:

यदि $\underline{x^2 - 5\sqrt{x} - 1 = 0}$ हो तो $x^2 + \frac{1}{x^2}$ का मान होगा?

[A] 625

[C] 729

[B] 731

[D] 727

$\rightarrow 27^2 - 2$

$$\sqrt{x} - 5 - \frac{1}{\sqrt{x}} = 0$$

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

$$\Rightarrow x + \frac{1}{x} = 5^2 + 2 = 27$$