

214) $\frac{x^2 - (y-z)^2}{(x+z)^2 - y^2} + \frac{y^2 - (x-z)^2}{(x+y)^2 - z^2} + \frac{z^2 - (x-y)^2}{(y+z)^2 - x^2} = ?$

$$1^{\text{st}} \text{ term} = \frac{1}{1 + \frac{a^x}{a^y} + \frac{a^x}{a^z}} = \frac{a^y a^z}{a^y a^z + a^x a^z + a^x a^y}$$

$$2^{\text{nd}} \text{ term} = \frac{a^x a^z}{a^x a^z + a^y a^z + a^y a^x}$$

$$3^{\text{rd}} \text{ term} = \frac{a^x a^y}{a^x a^y + a^z a^y + a^z a^x}$$

$$\text{Final Answer} = \frac{a^y a^z + a^x a^z + a^x a^y}{a^y a^z + a^x a^z + a^x a^y} = 1$$

215) $\frac{1}{1+a+b^{-1}} + \frac{1}{1+b+c^{-1}} + \frac{1}{1+c+a^{-1}}$

$$\therefore \frac{b}{b+ab+1} + \frac{c}{c+bc+1} + \frac{a}{a+ac+1} = 1$$

216) $a^x = b^y = c^z = 12$

$$a = 12^{1/x}, b = 12^{1/y}, c = 12^{1/z}$$

$$\therefore b^2 = ac$$

$$\therefore (12^{1/y})^2 = 12^{1/x} \cdot 12^{1/z}$$

$$\therefore \frac{2}{y} = \frac{1}{x} + \frac{1}{z} = \frac{x+z}{xz}$$

$$\begin{aligned}\therefore 2xz &= y(x+z) = xy + yz \\ &= xy + yz - 2xz \\ &= 0\end{aligned}$$

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$$\begin{aligned}\frac{2^{n+1} + 2^{n-1}}{2^n + 2^{n+1}} &= \frac{2^{n-1}(2^2 + 1)}{2^n(1+2)} \\ &= \frac{2^{n-1}(5)}{2^n(3)} \\ &= \frac{2^{-1} \cdot 5}{3} \\ &= \frac{5}{2 \times 3} = \frac{5}{6}\end{aligned}$$

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$$\frac{x^{2n+2} - x^2 \cdot x^{2n}}{x^{2n+3} + x^3 \cdot x^{2n}}$$

$\therefore$ Since Base are Same Power will Add

$$\frac{x^{2n+2} - x^{2n+2}}{x^{2n+3} + x^{2n+3}} = \frac{0}{2x^{2n+3}} = 0$$

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$$2 = 12^{1/3}, \quad 3 = 12^{1/4}, \quad 12 = 12^{1/2}$$

$$2 \times 3 \times 12 = 12$$

$$12^{1/3} \times 12^{1/4} \times 12^{1/2} = 12^{1/2}$$

$$\frac{1}{x} \times \frac{1}{x} \times \frac{1}{y} = \frac{1}{2}$$

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

$$220) \left[\frac{x^{a+b}}{x^c} \right]^{a-b} \cdot \left[\frac{x^{b+c}}{x^a} \right]^{b-c} \cdot \left[\frac{x^{c+a}}{x^b} \right]^{c-a}$$

$\therefore$ For this type of sum, there is a short trick that whenever the powers are going in a sequence there is always answer is 1.

method:-

$$\begin{aligned} & [x^{a+b-c}]^{a-b} \cdot [x^{b+c-a}]^{b-c} \cdot [x^{c+a-b}]^{c-a} \\ &= x^{(a^2-b^2)-c(a-b)} \cdot x^{(b^2-c^2)-a(b-c)} \cdot x^{(c^2-a^2)-b(c-a)} \\ &= x^{a^2-b^2-ac+bc+b^2-c^2-ab+ac+c^2-a^2-bc+ab} \\ &= x^0 = 1 \end{aligned}$$

$$221) (\sqrt{9})^{-5} \times (\sqrt{3})^{-7} = (\sqrt{3})^{-9}$$

$$\therefore \sqrt{3}^{-5} \times 3^{-7/2} = 3^{-9/2}$$

$$\therefore 3^{-5} \times 3^{-7/2} = 3^{-9/2}$$

$$\therefore -5 - 3.5 = -8.5 = -9/2$$

$$\therefore -8.5 = -9/2$$

$$\therefore \boxed{a = 17}$$