



Exercise 5A

$$\begin{aligned}
 \text{(v)} \quad \left\{ \left(\frac{-3}{4} \right)^3 - \left(\frac{-5}{2} \right)^3 \right\} \times 4^2 &= \left\{ \left(\frac{-3^3}{4^3} \right) - \left(\frac{-5^3}{2^3} \right) \right\} \times 4^2 \\
 &= \left\{ \left(\frac{-27}{64} \right) - \left(\frac{-125}{8} \right) \right\} \times 16 \\
 &= \left\{ \frac{-27}{64} + \frac{125}{8} \right\} \times 16 \\
 &= \left(\frac{-27+1000}{64} \right) \times 16 \\
 &= \left(\frac{973}{64} \times 16 \right) = \frac{973}{4}
 \end{aligned}$$

Q8

Answer :

$$\begin{aligned}
 \text{(i)} \quad \left(\frac{4}{9} \right)^6 \times \left(\frac{4}{9} \right)^{-4} &= \left(\frac{4}{9} \right)^{6+(-4)} && [\text{since } a^n \times a^m = a^{n+m}] \\
 &= \left(\frac{4}{9} \right)^2 = \frac{(4)^2}{(9)^2} = \frac{4 \times 4}{9 \times 9} = \frac{16}{81}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad \left(\frac{-7}{8} \right)^{-3} \times \left(\frac{-7}{8} \right)^2 &= \left(\frac{-7}{8} \right)^{(-3)+2} && [\text{since } a^n \times a^m = a^{n+m}] \\
 &= \left(\frac{-7}{8} \right)^{-1} \\
 &= \left(\frac{8}{-7} \right)^1 && \left[\text{since } \left(\frac{a}{b} \right)^{-1} = \left(\frac{b}{a} \right)^1 \right] \\
 &= \left(\frac{8 \times -1}{-7 \times -1} \right) = \frac{-8}{7}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad \left(\frac{4}{3} \right)^{-3} \times \left(\frac{4}{3} \right)^{-2} &= \left(\frac{4}{3} \right)^{(-3)+(-2)} && [\text{since } a^n \times a^m = a^{n+m}] \\
 &= \left(\frac{4}{3} \right)^{-5} \\
 &= \left(\frac{3}{4} \right)^5 && \left[\text{since } \left(\frac{a}{b} \right)^{-1} = \left(\frac{b}{a} \right)^1 \right] \\
 &= \frac{(3)^5}{(4)^5} = \frac{3 \times 3 \times 3 \times 3 \times 3}{4 \times 4 \times 4 \times 4 \times 4} = \frac{243}{1024}
 \end{aligned}$$

Q9

$$\text{(i)} \quad 5^{-3} = \left(\frac{5}{1} \right)^{-3} = \left(\frac{1}{5} \right)^3 = \frac{(1)^3}{(5)^3} = \frac{1}{125}$$

$$\text{(ii)} \quad (-2)^{-5} = \left(\frac{-2}{1} \right)^{-5} = \left(\frac{1}{-2} \right)^5 = \frac{(1)^5}{(-2)^5} = \frac{1 \times -1}{-32 \times -1} = \frac{-1}{32}$$

$$\text{(iii)} \quad \left(\frac{1}{4} \right)^{-4} = \left(\frac{4}{1} \right)^4 = \frac{(4)^4}{(1)^4} = \frac{256}{1} = 256$$

$$\text{(iv)} \quad \left(\frac{-3}{4} \right)^{-3} = \left(\frac{4}{-3} \right)^3 = \frac{(4)^3}{(-3)^3} = \frac{64}{-27} = \frac{64 \times -1}{-27 \times -1} = \frac{-64}{27}$$

$$\text{(v)} \quad (-3)^{-1} \times \left(\frac{1}{3} \right)^{-1} = \left(\frac{1}{-3} \right)^1 \times \left(\frac{3}{1} \right)^1 = \left(\frac{1 \times 3}{-3 \times 1} \right)^1 = \left(\frac{3}{-3} \right)^1 = \frac{1}{-1} = \frac{1 \times -1}{-1 \times -1} = \frac{-1}{1} = -1$$

$$\text{(vi)} \quad \left(\frac{5}{7} \right)^{-1} \times \left(\frac{7}{4} \right)^{-1} = \left(\frac{7}{5} \right)^1 \times \left(\frac{4}{7} \right)^1 = \left(\frac{7 \times 4}{5 \times 7} \right)^1 = \frac{4}{5}$$

$$\begin{aligned}
 \text{(vii)} \quad (5^{-1} - 7^{-1})^{-1} &= \left(\frac{1}{5} - \frac{1}{7} \right)^{-1} = \left(\frac{7-5}{35} \right)^{-1} \\
 &= \left(\frac{2}{35} \right)^{-1} = \left(\frac{35}{2} \right)^1 = \frac{35}{2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(viii)} \quad \left\{ \left(\frac{4}{3} \right)^{-1} - \left(\frac{1}{4} \right)^{-1} \right\}^{-1} &= \left\{ \left(\frac{3}{4} \right)^1 - \left(\frac{4}{1} \right)^1 \right\}^{-1} = \left(\frac{3}{4} - \frac{4}{1} \right)^{-1} \\
 &= \left(\frac{3-16}{4} \right)^{-1} = \left(\frac{-13}{4} \right)^{-1} \\
 &= \left(\frac{4}{-13} \right)^1 = \left(\frac{4 \times -1}{-13 \times -1} \right) \\
 &= \frac{-4}{13}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ix)} \quad \left\{ \left(\frac{3}{2} \right)^{-1} \div \left(\frac{-2}{5} \right)^{-1} \right\} &= \left\{ \left(\frac{2}{3} \right)^1 \div \left(\frac{5}{-2} \right)^1 \right\} \\
 &= \left(\frac{2}{3} \times \frac{-2}{5} \right) \\
 &= \frac{-4}{15}
 \end{aligned}$$

$$\text{(x)} \quad \left(\frac{23}{25} \right)^0 = 1 \quad [\text{since } a^0 = 1 \text{ for every integer } a]$$

Q10

Answer :

(i)

$$\begin{aligned}
 \left[\left\{ \left(-\frac{1}{4} \right)^2 \right\}^{-2} \right]^{-1} &= \left[\left(-\frac{1}{4} \right)^{2 \times -2} \right]^{-1} && \left[\text{since } \left\{ \left(\frac{a}{b} \right)^m \right\}^n = \left(\frac{a}{b} \right)^{mn} \right] \\
 &= \left[\left(-\frac{1}{4} \right)^{-4} \right]^{-1} \\
 &= \left(-\frac{1}{4} \right)^{(-4) \times (-1)} \\
 &= \left(-\frac{1}{4} \right)^4 = \frac{(-1)^4}{(4)^4}
 \end{aligned}$$

(ii)

$$\begin{aligned}
 \left\{ \left(\frac{-2}{3} \right)^2 \right\}^3 &= \left(\frac{-2}{3} \right)^{2 \times 3} && \left[\text{since } \left\{ \left(\frac{a}{b} \right)^m \right\}^n = \left(\frac{a}{b} \right)^{mn} \right] \\
 &= \left(\frac{-2}{3} \right)^6 \\
 &= \frac{(-2)^6}{(3)^6} = \frac{64}{729} && [\text{since } (-2)^6 = 64 \text{ and } (3)^6 = 729]
 \end{aligned}$$

(iii)

$$\begin{aligned}
 \left(\frac{-3}{2} \right)^3 \div \left(\frac{-3}{2} \right)^6 &= \left(\frac{-3}{2} \right)^{3-6} && [\text{since } a^m \div a^n = a^{m-n}] \\
 &= \left(\frac{-3}{2} \right)^{-3} \\
 &= \left(\frac{2}{-3} \right)^3 && \left[\text{since } \left(\frac{a}{b} \right)^{-1} = \left(\frac{b}{a} \right)^1 \right] \\
 &= \left(\frac{2 \times -1}{-3 \times -1} \right)^3 = \left(\frac{-2}{3} \right)^3 \\
 &= \frac{(-2)^3}{(3)^3} = \frac{-8}{27}
 \end{aligned}$$

(iv)

$$\begin{aligned}
 \left(\frac{-2}{3} \right)^7 \div \left(\frac{-2}{3} \right)^4 &= \left(\frac{-2}{3} \right)^{7-4} && [\text{since } a^m \div a^n = a^{m-n}] \\
 &= \left(\frac{-2}{3} \right)^3 \\
 &= \frac{(-2)^3}{(3)^3} = \frac{-8}{27}
 \end{aligned}$$

Q11

Answer :

Let the required number be x .

$$(-5)^{-1} \times x = (8)^{-1}$$

$$\Rightarrow \frac{1}{-5} \times x = \frac{1}{8}$$

$$\therefore x = \frac{1}{8} \times (-5) = \frac{-5}{8}$$

Hence, the required number is $\frac{-5}{8}$.

Q12

Answer :

Let the required number be x .

$$(3)^{-3} \times x = 4$$

$$\Rightarrow \frac{1}{3^3} \times x = 4$$

$$\Rightarrow \frac{1}{27} \times x = 4$$

$$\therefore x = 4 \times 27 = 108$$

Hence, the required number is 108.

Q13

Answer :

Let the required number be x .

$$(-30)^{-1} \div x = 6^{-1}$$

$$\Rightarrow \frac{1}{(-30)} \times \frac{1}{x} = \frac{1}{6}$$

$$\Rightarrow \frac{1}{(-30x)} = \frac{1}{6}$$

$$\begin{aligned}\therefore x &= \frac{6}{(-30)} = \frac{1}{-5} \\ &= \frac{-1}{5}\end{aligned}$$

Hence, the required number is $\frac{-1}{5}$.

Q14

Answer :

$$\begin{aligned}\left(\frac{3}{5}\right)^3 \times \left(\frac{3}{5}\right)^{-6} &= \left(\frac{3}{5}\right)^{2x-1} \\ \Rightarrow \left(\frac{3}{5}\right)^{3+(-6)} &= \left(\frac{3}{5}\right)^{2x-1} \quad [\text{since } a^m \times a^n = a^{m+n}] \\ \Rightarrow \left(\frac{3}{5}\right)^{-3} &= \left(\frac{3}{5}\right)^{2x-1}\end{aligned}$$

On equating the exponents:

$$-3 = 2x - 1$$

$$\Rightarrow 2x = -3 + 1$$

$$\Rightarrow 2x = -2$$

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

Q15

Answer :

$$\begin{aligned}\frac{3^5 \times 10^5 \times 25}{5^7 \times 6^5} &= \frac{3^5 \times (2 \times 5)^5 \times 5^2}{5^7 \times (2 \times 3)^5} \\ &= \frac{3^5 \times 2^5 \times 5^5 \times 5^2}{5^7 \times 2^5 \times 3^5} \\ &= \frac{3^5 \times 2^5 \times 5^7}{3^5 \times 2^5 \times 5^7} \\ &= 3^{5-5} \times 2^{5-5} \times 5^{7-7} \\ &= 3^0 \times 2^0 \times 5^0 \\ &= 1 \times 1 \times 1 = 1\end{aligned}$$

Q16

Answer :

$$\begin{aligned}& \frac{16 \times 2^{n+1} - 4 \times 2^n}{16 \times 2^{n+2} - 2 \times 2^{n+2}} \\& \Rightarrow \frac{2^4 \times 2^{n+1} - 2^2 \times 2^n}{2^4 \times 2^{n+2} - 2^{n+1} \times 2^2} \\& \Rightarrow \frac{2^2 \times (2^{n+3} - 2^n)}{2^2 \times (2^{n+4} - 2^{n+1})} \\& \Rightarrow \frac{2^n \times 2^3 - 2^n}{2^n \times 2^4 - 2^n \times 2} \\& \Rightarrow \frac{2^n(2^3 - 1)}{2^n(2^4 - 2)} = \frac{8-1}{16-2} = \frac{7}{14} = \frac{1}{2}\end{aligned}$$

Q17

Answer :

$$\begin{aligned}\text{(i)} \quad & 5^{2n} \times 5^3 = 5^9 \\& 5^{2n+3} = 5^9 \quad [\text{since } a^n \times a^m = a^{m+n}]\end{aligned}$$

On equating the coefficients:

$$\begin{aligned}2n + 3 &= 9 \\&\Rightarrow 2n = 9 - 3 \\&\Rightarrow 2n = 6 \\&\therefore n = \frac{6}{2} = 3\end{aligned}$$

$$\begin{aligned}\text{(ii)} \quad & 8 \times 2^{n+2} = 32 \\& \Rightarrow (2)^3 \times 2^{n+2} = (2)^5 \quad [\text{since } 2^3 = 8 \text{ and } 2^5 = 32] \\& \Rightarrow (2)^{3+(n+2)} = (2)^5\end{aligned}$$

On equating the coefficients:

$$\begin{aligned}3 + n + 2 &= 5 \\&\Rightarrow n + 5 = 5 \\&\Rightarrow n = 5 - 5 \\&\therefore n = 0\end{aligned}$$

$$\begin{aligned}
\text{(iii) } 6^{2n+1} \div 36 &= 6^3 \\
\Rightarrow 6^{2n+1} \div 6^2 &= 6^3 && [\text{since } 36 = 6^2] \\
\Rightarrow \frac{6^{2n+1}}{6^2} &= 6^3 \\
\Rightarrow 6^{2n+1-2} &= 6^3 && [\text{since } \frac{a^m}{a^n} = a^{m-n}] \\
\Rightarrow 6^{2n-1} &= 6^3 \\
\text{On equating the coefficients:} \\
2n - 1 &= 3 \\
\Rightarrow 2n &= 3 + 1 \\
\Rightarrow 2n &= 4 \\
\therefore n &= \frac{4}{2} = 2
\end{aligned}$$

Q18

Answer :

$$\begin{aligned}
2^{n-7} \times 5^{n-4} &= 1250 \\
\Rightarrow \frac{2^n}{2^7} \times \frac{5^n}{5^4} &= 2 \times 5^4 && [\text{since } 1250 = 2 \times 5^4] \\
\Rightarrow \frac{2^n \times 5^n}{2^7 \times 5^4} &= 2 \times 5^4 \\
\Rightarrow 2^n \times 5^n &= 2 \times 5^4 \times 2^7 \times 5^4 && [\text{using cross multiplication}] \\
\Rightarrow 2^n \times 5^n &= 2^{1+7} \times 5^{4+4} && [\text{since } a^m \times a^n = a^{m+n}] \\
\Rightarrow 2^n \times 5^n &= 2^8 \times 5^8 \\
\Rightarrow (2 \times 5)^n &= (2 \times 5)^8 && [\text{since } a^n \times b^n = (a \times b)^n] \\
\Rightarrow 10^n &= 10^8 \\
\Rightarrow n &= 8
\end{aligned}$$

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