CLASS VIII: Maths
Chapter 10: Exponents and Powers

Questions and Solutions | Exercise 10.1 - NCERT Books

Q 1. Evaluate

(i) 3^{-2} (ii) $(-4)^{-2}$ (iii) $\left(\frac{1}{2}\right)^{-5}$

Answer :

(i) $3^{-2} = \frac{1}{3^2} = \frac{1}{9} \qquad \left(a^{-m} = \frac{1}{a^m}\right)$

(ii) $(-4)^{-2} = \frac{1}{(-4)^2} = \frac{1}{16} \qquad \left(a^{-m} = \frac{1}{a^m}\right)$

(iii) $\left(\frac{1}{2}\right)^{-5} = \frac{1}{(2)^{-5}} = (2)^5 = 2\times2\times2\times2\times2 = 32$

Q2 :

Simplify and express the result in power notation with positive exponent.

(i) $(-4)^5 \div (-4)^8$ (ii) $\left(\frac{1}{2^3}\right)^2$

(iii) $(-3)^4 \times \left(\frac{5}{3}\right)^4$ (iv) $\left(3^{-7} \div 3^{-10}\right) \times 3^{-5}$

(v) $2^{-3} \times (-7)^{-3}$

Answer :

(i) $(-4)^5$ ÃƒÂ· $(-4)^8 = (-4)^{5-8}$ (a^m ÃƒÂ· $a^n = a^{m-n}$)

$= (-4)^{-3}$

$= \frac{1}{(-4)^3}$ $\left(a^{-m} = \frac{1}{a^m}\right)$

(ii) $\left(\frac{1}{2^3}\right)^2 = \frac{1}{(2^3)^2} = \frac{1}{2^6}$ $\left((a^m)^n = a^{mn}\right)$

(iii) $(-3)^4 \times \left(\frac{5}{3}\right)^4 = (-1 \times 3)^4 \times \frac{5^4}{3^4}$

$= (-1)^4 \times 3^4 \times \frac{5^4}{3^4}$ $\left[(ab)^m = a^m \times b^m\right]$

$= (-1)^4 \times 5^4$

$= 5^4$ $\left[(-1)^4 = 1\right]$

(iv) $(3^{-7}$ ÃƒÂ· $3^{-10}) \times 3^{-5} = (3^{-7-(-10)}) \times 3^{-5}$ (a^m ÃƒÂ· $a^n = a^{m-n}$)

$= 3^3 \times 3^{-5}$

$= 3^{3+(-5)}$ ($a^m \times a^n = a^{m+n}$)

$= 3^{-2}$

$= \frac{1}{3^2}$ $\left(a^{-m} = \frac{1}{a^m}\right)$

(v) $2^{-3} \times (-7)^{-3} = \frac{1}{2^3} \times \frac{1}{(-7)^3}$ $\left(a^{-m} = \frac{1}{a^m}\right)$

$= \frac{1}{[2 \times (-7)]^3}$ $\left[a^m \times b^m = (ab)^m\right]$

$= \frac{1}{(-14)^3}$

Q 3. Find the value of.

(i) $(3^0 + 4^{-1}) \times 2^2$ (ii) $(2^{-1} \times 4^{-1})$ ÃƒÂ·2^{-2}

(iii) $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$ (iv) $(3^{-1} + 4^{-1} + 5^{-1})^0$

(v) $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2$

Answer :

(i) $(3^0 + 4^{-1}) \times 2^2 = \left(1 + \frac{1}{4}\right) \times 2^2 \qquad \left(a^0 = 1 \text{ and } a^{-m} = \frac{1}{a^m}\right)$

$= \frac{5}{4} \times 4 = 5$

(ii) $(2^{-1} \times 4^{-1})$ ÃƒÂ· $2^{-2} = [2^{-1} \times \{(2)^2\}^{-1}]$ ÃƒÂ· 2^{-2}

$= (2^{-1} \times 2^{-2})$ ÃƒÂ· $2^{-2} \qquad \left((a^m)^n = a^{mn}\right)$

$= 2^{-1+(-2)}$ ÃƒÂ· 2^{-2} ($a^m \times a^n = a^{m+n}$)

$= 2^{-3}$ ÃƒÂ· 2^{-2}

$= 2^{-3-(-2)}$ (a^m ÃƒÂ· $a^n = a^{m-n}$)

$= 2^{-3+2} = 2^{-1}$

$= \frac{1}{2} \qquad \left(a^{-m} = \frac{1}{a^m}\right)$

(iii) $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} = \left(\frac{2}{1}\right)^2 + \left(\frac{3}{1}\right)^2 + \left(\frac{4}{1}\right)^2 \qquad \left(\therefore a^{-m} = \frac{1}{a^m}\right)$

$= 2^2 + 3^2 + 4^2 = 4 + 9 + 16 = 29$

(iv) $(3^{-1} + 4^{-1} + 5^{-1})^0 = \left(\frac{1}{3}+\frac{1}{4}+\frac{1}{5}\right)^0$ $\left(a^{-m} = \frac{1}{a^m}\right)$

= 1 ($a^0 = 1$)

(v) $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2 = \left\{\left(\frac{3}{-2}\right)^2\right\}^2$ $\left(a^{-m} = \frac{1}{a^m}\right)$

$= \left\{\frac{3^2}{(-2)^2}\right\}^2$ $\left[\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}\right]$

$= \left(\frac{9}{4}\right)^2 = \frac{81}{16}$

Q4 :

Evaluate (i) $\frac{8^{-1}\times 5^3}{2^{-4}}$ (ii) $\left(5^{-1}\times 2^{-1}\right)\times 6^{-1}$

Answer :

(i) $\frac{8^{-1}\times 5^3}{2^{-4}} = \frac{2^4\times 5^3}{8^1}$ $\left(a^{-m} = \frac{1}{a^m}\right)$

$= \frac{2^4\times 5^3}{2^3} = 2^{4-3}\times 5^3$ $\left(a^m \div a^n = a^{m-n}\right)$

$= 2\times 125 = 250$

(ii) $(5^{-1} \times 2^{-1}) \times 6^{-1} = \left(\frac{1}{5}\times\frac{1}{2}\right)\times\frac{1}{6}$ $\left(a^{-m} = \frac{1}{a^m}\right)$

$= \frac{1}{10}\times\frac{1}{6} = \frac{1}{60}$

Q 5. Find the value of m for which 5^m ÃƒÂ·$5^{-3} = 5^5$.

Answer :

5^m ÃƒÂ· $5^{-3} = 5^5$

$5^{m-(-3)} = 5^5$ (a^m ÃƒÂ· $a^n = a^{m-n}$)

$5^{m+3} = 5^5$

Since the powers have same bases on both sides, their respective exponents must be equal.

$m + 3 = 5$

$m = 5 - 3$

$m = 2$

Q6 :

Evaluate (i) $\left\{\left(\frac{1}{3}\right)^{-1}-\left(\frac{1}{4}\right)^{-1}\right\}^{-1}$ (ii) $\left(\frac{5}{8}\right)^{-7}\times\left(\frac{8}{5}\right)^{-4}$

Answer :

(i) $\left\{\left(\frac{1}{3}\right)^{-1}-\left(\frac{1}{4}\right)^{-1}\right\}^{-1}=\left\{\left(\frac{3}{1}\right)^{1}-\left(\frac{4}{1}\right)^{1}\right\}^{-1}$ $\left(a^{-m}=\frac{1}{a^m}\right)$

$=\{3-4\}^{-1}=(-1)^{-1}=\frac{1}{-1}=-1$

(ii) $\left(\frac{5}{8}\right)^{-7}\times\left(\frac{8}{5}\right)^{-4}=\frac{5^{-7}}{8^{-7}}\times\frac{8^{-4}}{5^{-4}}$ $\left[\left(\frac{a}{b}\right)^{m}=\frac{a^m}{b^m}\right]$

$$= \frac{8^7}{5^7} \times \frac{5^4}{8^4} \qquad \left(a^{-m} = \frac{1}{a^m}\right)$$

$$= \frac{8^{7-4}}{5^{7-4}} \qquad \left(a^m \div a^n = a^{m-n}\right)$$

$$= \frac{8^3}{5^3} = \frac{512}{125}$$

Q7 :

Simplify. (i) $\frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}} (t \neq 0)$ (ii) $\frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}}$

Answer :

(i) $\frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}} = \frac{5^2 \times t^{-4}}{5^{-3} \times 5 \times 2 \times t^{-8}}$

$$= \frac{5^2 \times t^{-4}}{5^{-3+1} \times 2 \times t^{-8}} \qquad \left(a^m \times a^n = a^{m+n}\right)$$

$$= \frac{5^2 \times t^{-4}}{5^{-2} \times 2 \times t^{-8}}$$

$$= \frac{5^{2-(-2)} t^{-4-(-8)}}{2} \qquad \left(a^m \div a^n = a^{m-n}\right)$$

$$= \frac{5^4 t^4}{2} = \frac{625\, t^4}{2}$$

(ii) $\frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}} = \frac{3^{-5} \times (2 \times 5)^{-5} \times 5^3}{5^{-7} \times (2 \times 3)^{-5}}$

$$= \frac{3^{-5} \times 2^{-5} \times 5^{-5} \times 5^3}{5^{-7} \times 2^{-5} \times 3^{-5}} \qquad \left[(a \times b)^m = a^m \times b^m\right]$$

$$= 3^{-5-(-5)} \times 2^{-5-(-5)} \times 5^{-5+3-(-7)} \qquad \left(a^m \div a^n = a^{m-n}\right)$$

$$= 3^0 \times 2^0 \times 5^5 \qquad \left(a^0 = 1\right)$$

$$= 5^5$$