SpeedLabs

MATHS

CBSE 8th

TEEVRA EDUTECH PVT. LTD.

Q.1 Evaluate

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

Sol: (i) $3^{-2} = \frac{1}{3^2}$ $\left[\because a^{-m} = \frac{1}{a^m}\right]$

$= \frac{1}{9}$

(ii) $(-4)^{-2} = \frac{1}{(-4)^2}$ $\left[\because a^{-m} = \frac{1}{a^m}\right]$

$= \frac{1}{16}$

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

$= (2)^5$ $\left[\because \left(\frac{1}{a}\right)^{-1} = a\right]$

$= 32$

Q.2 Simplify an express the result in power notation with positive exponent.

(i) $(-4)^5 + (-4)^8$ (ii) $\left(\frac{1}{2^3}\right)^2$ (iii) $(-3)^4 \times \left(\frac{5}{3}\right)^4$ (iv) $(3^{-7} + 3^{-10}) \times 3^{-5}$ (v) $2^{-3} \times (-7)^{-3}$.

Sol:

(i) $(-4)^5 \div (-4)^8$

$= (-4)^{5-8}$ $[\because x^m \div x^n = x^{m-n}]$

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

(ii) $\left(\frac{1}{2^3}\right)^2$

$= \frac{1^2}{(2^3)^2}$ $\left[\because \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}\right]$

$= \frac{1^2}{2^{3\times2}} = \frac{1}{2^6}$ $[\because (a^m)^n = a^{mn}]$

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

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

$= (-1)^4 \times 3^4 \times 3^{-4} \times 5^4$ $[\because (-1)^4 = 1]$

$= 1 \times 3^{4+(-4)} \times 5^4$ $[\because a^m \times a^n = a^{m+n}]$

$= 1 \times 3^{4-4} \times 5^4$

$= 1 \times 3^0 \times 5^4$

$= 1 \times 1 \times 5^4$ $(\because a^0 = 1)$

$= 1 \times 5^4 = 5^4$

(iv) $(3^{-7} \div 3^{-10}) \times 3^{-5}$

$= 3^{-7-(-10)} \times 3^{-5}$ $[\because x^m \div x^n = x^{m-n}]$

$= 3^{-7+10} \times 3^{-5} = 3^3 \times 3^{-5}$

$= 3^3 + (-5)$

$= 3^{3-5} = 3^{-2}$ $[\because a^m \times a^n = a^{m+n}]$

$= \frac{1}{3^2}$ $\left[\because a^{-m} = \frac{1}{a^m}\right]$

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

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

$= \frac{1}{[2\times(-7)]^3}$ $[\because (a^3 \times b^3) = (a \times b)^3]$

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

Q.3 Find the value of .

(i) $(3^0 + 4^{-1}) \times 2^2$ (ii) $(2^{-1} \times 4^{-1}) + 2^{-2}$ (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) $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2$

Sol:

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

$= \left(\frac{4+1}{4}\right) \times 2^2 = \frac{5}{4} \times 2^2 = \frac{5\times 2^2}{2^2}$

$= 5 \times 2^2 \times 2^{-2} = 5 \times 2^{2+(-2)}$ $\left[\because \frac{1}{a^m} = a^{-m}\right]$

$= 5 \times 2^{2-2} = 5 \times 2^0 = 5 \times 5 = 5.$ $[\because\ a^m \times a^n = a^{m+n}]$

(ii) $(2^{-1} \times 4^{-1}) \div 2^{-2}$

$= \left(\frac{1}{2^1} \times \frac{1}{4^1}\right) \div 2^{-2}$ $\left[\because a^{-m} = \frac{1}{a^m}\right]$

$= \left(\frac{1}{2} \times \frac{1}{2\times 2}\right) \div 2^{-2} = \left(\frac{1}{2^3}\right) \div 2^{-2}$

$= 2^{-3} \div 2^{-2} = 2^{-3-(-2)} = 2^{-3+2}$ $[\because x^m \div x^n = x^{m-n}]$

$= 2^{-1} = \frac{1}{2^1}$ $\left[\because a^{-m} = \frac{1}{a^m}\right]$

$= \frac{1}{2}$

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

$= (2^{-1})^{-2} + (3^{-1})^{-2} + (4^{-1})^{-2}$ $\left[\because a^{-m} = \frac{1}{a^m}\right]$

$= 2^{-1\times(-2)} + 3^{-1\times(-2)} + 4^{-1\times(-2)}$ $[\because\ (a^m)^n = a^{mn}]$

$= 2^2 + 3^2 + 4^2$

$= 4 + 9 + 16 = 29.$

(iv) $[3^{-1}+4^{-1}+5^{-1}]^0$

$=\left[\frac{1}{3}+\frac{1}{4}+\frac{1}{5}\right]^0$ $\left[\because a^{-m}=\frac{1}{a^m}\right]$

$=\left[\frac{20+15+12}{60}\right]^0=\left[\frac{47}{60}\right]^0=1.$ $[\because a^0=1]$

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

$=\left(\frac{-2}{3}\right)^{-2\times 2}$ $[\because\ (x^m)^n=x^{m\times n}=x^{mn}]$

$=\left(\frac{-2}{3}\right)^{-4}=\left[\left(\frac{-2}{3}\right)^{-1}\right]^4=\left(\frac{-3}{2}\right)^4$ $\left[\because \left(\frac{a}{b}\right)^{-1}=\left(\frac{b}{a}\right)^1\right]$

$=\frac{-3\times-3\times-3\times-3}{2\times2\times2\times2}=\frac{81}{16}$

Q.4 Evaluate: (i) $\frac{8^{-1}\times5^3}{2^{-4}}$ (ii) $(5^{-1}\times2^{-1})\times6^{-1}$

Sol:

(i) $\frac{8^{-1}\times5^3}{2^{-4}}=(2^3)^{-1}\times5^3\times2^4$ $\left[\because \frac{1}{a^{-m}}=a^m\right]$

$=2^{-3}\times5^3\times2^4$ $[\because (a^m)^n=a^{m+n}]$

$=2^{4-3}\times5^3$ $[\because a^m\times a^n=a^{m+n}]$

$=2^1\times5^3=2\times125$

$=250$

(ii) $(5^{-1}\times2^{-1})\times6^{-1}$

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

$=\left(\frac{1}{5}\times\frac{1}{2}\right)\times\frac{1}{6}$

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

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

Sol: $5^{m} \div 5^{-3} = 5^{5}$

$\Rightarrow 5^{m-(-3)} = 5^{5} \quad [\because a^{m} \div a^{n} = a^{m-n}]$

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

Comparing exponents both sides, we get

$\Rightarrow m + 3 = 5 \Rightarrow m = 5 - 3$ (Transposing 3 to R.H.S.)

$\Rightarrow m = 2.$

Q. 6 Evaluate . (i) $\left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1}$ (ii) $\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4}$

Sol:

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

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

$= \left\{3^{-1\times(-1)} - 4^{-1\times(-1)}\right\}^{-1} [\because (a^{m})^{n} = a^{mn}]$

$= \{3^{1} - 4^{1}\}^{-1} = [-1]^{-1} = -1.$

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

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

$= 5^{-7} \times 8^{7} \times 8^{-4} \times 5^{4} \quad \left[\because \frac{1}{a^{-m}} = a^{m}\right]$

$= 5^{-7} \times 5^{4} \times 8^{-4+7} = 5^{-7+4} \times 8^{7-4} [\because a^{m} \times a^{n} = a^{m+n}]$

$= 5^{-3} \times 8^{3} = \frac{8^{3}}{5^{3}} \left[\because a^{-m} = \frac{1}{a^{m}}\right]$

$= \frac{8\times8\times8}{5\times5\times5} = \frac{512}{125}.$

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

Sol:

(i) $\frac{25\times t^{-4}}{5^{-3}\times 10\times t^{-8}}$ $(t \neq 0)$

$= \frac{5^2\times t^{-4}}{5^{-3}\times 5\times 2\times t^{-8}} = \frac{5^2\times 5^3\times 5^{-1}\times t^{-4}\times t^8}{2} = \left[\because \frac{1}{a^m} = a^{-m} \text{ and } \frac{1}{a^{-m}} = a^m\right]$

$= \frac{5^{2+3+(-1)}\times t^{-4+8}}{2}$

$= \frac{5^{2+3-1}}{2} t^{-4+8} = \frac{5^4}{2} t^4$

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

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

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

$= 3^{-5} \times 2^{-5} \times 5^{-5} \times 5^3 \times 5^7 \times 2^5 \times 3^5$ $\left[\because \frac{1}{a^{-m}} = a^m\right]$

$= 3^{5+(-5)} \times 2^{5+(-5)} \times 5^{7+3+(-5)}$ $[\because a^m \times a^n = a^{mn}]$

$= 3^{5-5} \times 2^{5-5} \times 5^{7+3-5}$

$= 3^0 \times 2^0 \times 5^5$ $[\because a^0 = 1\ ]$

$= 1 \times 1 \times 5^5 = 5^5$