CBSE NCERT Solutions for Class 8 Mathematics Chapter 12

Back of Chapter Questions

Exercise: 12.1

1. Evaluate:

(i) 3^{-2}

(ii) $(-4)^{-2}$

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

Solution:

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

$= \frac{1}{9}$

Hence, $3^{-2} = \frac{1}{9}$

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

$= \frac{1}{16}$

Hence, $(-4)^{-2} = \frac{1}{16}$

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

$= (2)^5 = 32$

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

2. 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) $(3^{-7} \div 3^{-10}) \times 3^{-5}$

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

Solution:

(i) $(-4)^5 \div (-4)^8 = (-4)^{5-8}$ $\left[\because a^m \div a^n = a^{m-n}\right]$

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

Hence, $(-4)^5 \div (-4)^8 = \frac{1}{(-4)^3}$

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

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

Hence, $\left(\frac{1}{2^2}\right)^2 = \frac{1}{2^6}$

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

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

$= 3^{4-4} \times 5^4$ $\left[\because a^m \div a^n = a^{m-n}\right]$

$= 3^0 \times 5^4 = 5^4$ $\left[\because a^0 = 1\right]$

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

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

$= 3^{-7+10} \times 3^{-5} = 3^3 \times 3^{-5} = 3^{3+(-5)}$ $\left[\because a^m \times a^n = a^{m+n}\right]$

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

Hence, $(3^{-7} \div 3^{-10}) \times 3^{-5} = \frac{1}{3^2}$

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

$= \frac{1}{\{2\times(-7)\}^3} = \frac{1}{(-14)^3}$ $\left[\because (ab)^m = a^m b^m\right]$

Hence, $2^{-3} \times (-7)^{-3} = \frac{1}{(-14)^3}$

3. Find the value of:

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

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

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

Solution:

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

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

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

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

Hence, $(3^0 + 4^{-1}) \times 2^2 = 5$

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

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

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

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

Hence, $(2^{-1} \times 4^{-1}) \div 2^{-2} = \frac{1}{2}$

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

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

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

Hence, $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} = 29$

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

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

Hence, $(3^{-1} + 4^{-1} + 5^{-1})^0 = 1$

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

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

$= \frac{81}{16}$

Hence, $\left\{\left(-\frac{2}{3}\right)^{-2}\right\}^{2} = \frac{81}{16}$

4. Evaluate:

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

(ii) $(5^{-1}\times 2^{-1})\times 6^{-1}$

Solution:

(i) $\frac{8^{-1}\times 5^{3}}{2^{-4}} = \frac{(2^{3})^{-1}\times 5^{3}}{2^{-4}} = \frac{2^{-3}\times 5^{3}}{2^{-4}}$ $[\because (a^m)^n = a^{m\times n}]$

$= 2^{-3-(-4)}\times 5^{3} = 2^{-3+4}\times 5^{3}$ $[\because a^m \div a^n = a^{m-n}]$

$= 2\times 125 = 250$

Hence, $\frac{8^{-1}\times 5^{3}}{2^{-4}} = 250$

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

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

Hence, $(5^{-1}\times 2^{-1})\times 6^{-1} = \frac{1}{60}$

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

Solution:

Given $5^m \div 5^{-3} = 5^5$

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

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

Comparing exponents both sides, we get

$\Rightarrow$ $m + 3 = 5$

$\Rightarrow$ $m = 5 - 3$

$\Rightarrow$ $m = 2$

Therefore, the value of m is 2

6. Evaluate:

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

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

Solution:

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

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

Hence, $\left\{\left(\frac{1}{3}\right)^{-1}-\left(\frac{1}{4}\right)^{-1}\right\}^{-1}=-1$

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

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

$=5^{-7+4}\times 8^{-4+7}=5^{-3}\times 8^{3}=\frac{8^3}{5^3}$ $\left[\because a^{-m}=\frac{1}{a^m}\right]$

$=\frac{512}{125}$

Hence, $\left(\frac{5}{8}\right)^{-7}\times\left(\frac{8}{5}\right)^{-4}=\frac{512}{125}$

7. Simplify:

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

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

Solution:

(i) $\frac{25\times t^{-4}}{5^{-3}\times 10\times t^{-8}}=\frac{5^2\times t^{-4}}{5^{-3}\times 5\times 2\times t^{-8}}=\frac{5^{2-(-3)-1}\times t^{-4-(-8)}}{2}$ $[\because a^m\div a^n=a^{m-n}]$

$=\frac{5^{2+3-1}\times t^{-4+8}}{2}=\frac{5^4\times t^4}{2}=\frac{625}{2}t^4$

(ii) $\frac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}=\frac{3^{-5}\times(2\times 5)^{-5}\times 5^3}{5^{-7}\times(2\times 3)^{-5}}=\frac{3^{-5}\times 2^{-5}\times 5^{-5}\times 5^3}{5^{-7}\times 2^{-5}\times 3^{-5}}$ $[\because (ab)^m=a^mb^m]$

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

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

$=3^{-5+5}\times 2^{-5+5}\times 5^{-2+7}=3^0\times 2^0\times 5^5$

$=1\times 1\times 3125$ $[\because a^0=1]$

$=3125$

Exercise 12.2

1. Express the following numbers in standard from:

(i) 0.0000000000085

(ii) 0.00000000000942

(iii) 6020000000000000

(iv) 0.00000000837

(v) 31860000000

Solution:

(i) $0.0000000000085 = 0.0000000000085 \times \frac{10^{12}}{10^{12}} = 8.5 \times 10^{-12}$

(ii) $0.00000000000942 = 0.00000000000942 \times \frac{10^{12}}{10^{12}} = 9.42 \times 10^{-12}$

(iii) $6020000000000000 = 6020000000000000 \times \frac{10^{15}}{10^{15}} = 6.02 \times 10^{15}$

(iv) $0.00000000837 = 0.00000000837 \times \frac{10^{9}}{10^{9}} = 8.37 \times 10^{-9}$

(v) $31860000000 = 31860000000 \times \frac{10^{10}}{10^{10}} = 3.186 \times 10^{10}$

2. Express the following numbers in usual form:

(i) 3.02×10^{-6}

(ii) 4.5×10^{4}

(iii) 3×10^{-8}

(iv) 1.0001×10^{9}

(v) 5.8×10^{12}

(vi) 3.61492×10^{6}

Solution:

(i) $3.02 \times 10^{-6} = \frac{3.02}{10^{6}} = 0.00000302$

(ii) $4.5 \times 10^{4} = 4.5 \times 10000 = 45000$

(iii) $3 \times 10^{-8} = \frac{3}{10^{8}} = 0.00000003$

(iv) $1.0001 \times 10^{9} = 1000100000$

(v) $5.8 \times 10^{12} = 5.8 \times 1000000000000 = 5800000000000$

(vi) $3.61492 \times 10^{6} = 3.61492 \times 1000000 = 3614920$

3. Express the number appearing in the following statements in standard form:

(i) 1 micron is equal to $\frac{1}{1000000}$ m.

(ii) Charge of an electron is 0.000,000,000,000,000,000,16 coulomb

(iii) Size of a bacteria is 0.0000005 m.

(iv) Size of a plant cell is 0.00001275 m.

(v) Thickness if a thick paper is 0.07 mm.

Solution:

(i) 1 micron $= \frac{1}{1000000} = \frac{1}{10^6} = 1 \times 10^{-6}$ m.

(ii) Charge of an electron is 0.000,000,000,000,000,000,16 coulomb $=$ $0.000,000,000,000,000,000,16 \times \frac{10^{19}}{10^{19}} = 1.6 \times 10^{-19}$ coulomb

(iii) Size of a bacteria $= 0.0000005 = \frac{5}{10000000} = \frac{5}{10^7} = 5 \times 10^{-7}$m.

(iv) Size of a plant cell is 0.00001275 m $= 0.00001275 \times \frac{10^5}{10^5} =$ 1.275×10^{-5} m

(v) Thickness if a thick paper $= 0.07$ mm $= \frac{7}{100}$ mm $= \frac{7}{10^2} = 7 \times 10^{-2}$ mm.

4. In a stack there are 5 books each of thickness 20 mm and 5 paper sheets each of thickness 0.016 mm. What is the total thickness of the stack?

Solution:

Thickness of one book $= 20$ mm

Thickness of 5 books $= 20 \times 5 = 100$ mm

Thickness of one paper $= 0.016$ mm

Thickness of 5 papers $= 0.016 \times 5 = 0.08$ mm

Total thickness of stack $= 100 + 0.08$

$= 100.08$mm

$= 100.08 \times \frac{10^2}{10^2} = 1.0008 \times 10^2$ mm

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