# NCERT Solutions for Class 8 Maths Chapter 12 - Exponents and Powers

Chapter 12 - Exponents and Powers Exercise Ex. 12.1

Solution 1

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

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

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

Solution 2

(i) $(-4)^5 \div (-4)^8 = (-4)^{5-8}$ $(a^m \div a^n = a^{m-n})$

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

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

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

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

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

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

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

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

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

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

$= 3^{-2}$

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

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

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

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

Solution 3

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

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

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

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

$=2^{-3}\div 2^{-2}$

$=2^{-3-(-2)} \quad (a^m\div a^n=a^{m-n})$

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

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

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

$=1 \quad (a^0=1)$

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

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

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

Solution 4

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

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

$= 2\times 125 = 250$

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

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

Solution 5

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

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

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

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

$m + 3 = 5$

$m = 5 - 3$

$m = 2$

Solution 6

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

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

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

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

Solution 7

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

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

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

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

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

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

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

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

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

$=5^{5}$

## Chapter 12 - Exponents and Powers Exercise Ex. 12.2

Solution 1

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

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

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

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

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

Solution 2

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

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

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

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

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

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

Solution 3

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

(ii) $0.000, 000, 000, 000, 000, 000, 16 = 1.6 \times 10^{-19}$

(iii) $0.0000005 = 5 \times 10^{-7}$

(iv) $0.00001275 = 1.275 \times 10^{-5}$

(v) $0.07 = 7 \times 10^{-2}$

Solution 4

Thickness of each book = 20 mm

Hence, thickness of 5 books = (5 × 20) mm = 100 mm

Thickness of each paper sheet = 0.016 mm

Hence, thickness of 5 paper sheets = (5 × 0.016) mm = 0.080 mm

Total thickness of the stack = Thickness of 5 books + Thickness of 5 paper sheets

= (100 + 0.080) mm

= 100.08 mm

= $1.0008 \times 10^2$ mm