



NCERT solutions for class-8 maths chapter-12 Exponents and Powers

**Q1. Evaluate:**

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

**Ans. (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)**  $\left(\frac{1}{2}\right)^{-5} = \left(\frac{2}{1}\right)^5$

$$\left[ \because a^{-m} = \frac{1}{a^m} \right]$$
$$= (2)^5 = 32$$

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

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

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

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

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

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

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

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

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

$$\begin{aligned}
& \left[ \because (ab)^m = a^m b^m \right] \\
& = 3^{4-4} \times 5^4 \left[ \because a^m \div a^n = a^{m-n} \right] \\
& = 3^0 \times 5^4 = 5^4 \left[ \because a^0 = 1 \right] \\
& \textbf{(iv)} \left( 3^{-7} \div 3^{-10} \right) \times 3^{-5} = 3^{-7-(-10)} \times 3^{-5} \\
& \left[ \because a^m \div a^n = a^{m-n} \right] \\
& = 3^{-7+10} \times 3^{-5} = 3^3 \times 3^{-5} = 3^{3+(-5)} \left[ \because a^m \times a^n = a^{m+n} \right] \\
& = 3^{-2} = \frac{1}{3^2} \left[ \because a^{-m} = \frac{1}{a^m} \right] \\
& \textbf{(v)} 2^{-3} \times (-7)^{-3} = \frac{1}{2^3} \times \frac{1}{(-7)^3} \left[ \because a^{-m} = \frac{1}{a^m} \right] \\
& = \frac{1}{\{2 \times (-7)\}^3} = \frac{1}{(-14)^3} \left[ \because (ab)^m = a^m b^m \right]
\end{aligned}$$

**Q3.** 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)**  $\left\{ \left(\frac{-2}{3}\right)^{-2} \right\}^2$

**Ans.**

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

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

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

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

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

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

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

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

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

$$= (2^{-1})^{-2} + (3^{-1})^{-2} + (4^{-1})^{-2}$$

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

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

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

$$\begin{aligned}
 \text{(iv)} \quad (3^{-1} + 4^{-1} + 5^{-1})^0 &= \left( \frac{1}{3} + \frac{1}{4} + \frac{1}{5} \right)^0 \left[ \because a^{-m} = \frac{1}{a^m} \right] \\
 &= \left( \frac{20+15+12}{60} \right)^0 = \left( \frac{47}{60} \right)^0 = 1 \\
 &\left[ \because a^0 = 1 \right]
 \end{aligned}$$

$$\begin{aligned}
 \text{(v)} \quad \left\{ \left( \frac{-2}{3} \right)^{-2} \right\}^2 &= \left( \frac{-2}{3} \right)^{-2 \times 2} \left[ \because (a^m)^n = a^{m \times n} \right] \\
 &= \left( \frac{-2}{3} \right)^{-4} = \left( \frac{-3}{2} \right)^4 \left[ \because a^{-m} = \frac{1}{a^m} \right] \\
 &= \frac{81}{16}
 \end{aligned}$$

**Q4. Evaluate:**

$$\text{(i)} \frac{8^{-1} \times 5^3}{2^{-4}} \quad \text{(ii)} (5^{-1} \times 2^{-1}) \times 6^{-1}$$

$$\begin{aligned}
 \text{Ans. (i)} \quad \frac{8^{-1} \times 5^3}{2^{-4}} &= \frac{(2^3)^{-1} \times 5^3}{2^{-4}} = \frac{2^{-3} \times 5^3}{2^{-4}} \\
 &\left[ \because (a^m)^n = a^{m \times n} \right] \\
 &= 2^{-3-(-4)} \times 5^3 = 2^{-3+4} \times 5^3 \left[ \because a^m \div a^n = a^{m-n} \right] \\
 &= 2 \times 125 = 250
 \end{aligned}$$

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

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

**Q5.** Find the value of  $m$  for which  $5^m \div 5^{-3} = 5^5$ .

**Ans.**  $5^m \div 5^{-3} = 5^5$

$$\Rightarrow 5^{m-(-3)} = 5^5$$

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

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

Comparing exponents both sides, we get

$$\Rightarrow m+3=5$$

$$\Rightarrow m=5-3$$

$$\Rightarrow m=2$$

**Q6.** Evaluate:

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

**Ans.**

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

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

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

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

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

$$= \frac{512}{125}$$

**Q7. Simplify:**

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

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

**Ans. (i)**  $\frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}}$

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

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

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

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

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

$$= \frac{3^{-5} \times (2 \times 5)^{-5} \times 5^3}{5^{-7} \times (2 \times 3)^{-5}}$$

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

$$\left[ \because (ab)^m = a^m b^m \right]$$

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

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

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

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

$$= 3125$$

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