

NCERT SOLUTIONS OF Exponents

Exercise 1

Question 1

Evaluate

i) 3^{-2}

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

iii) $(1/2)^{-5}$

Answer

As we know that

$$b^{-n} = 1/b^n$$

(i) $3^{-2} = 1/3^2 = 1/9$

(ii) $(-4)^{-2} = 1/(-4)^2 = 1/16$

(iii) $(1/2)^{-5} = 1/2^{-5}$
 $= 2^5 = 32$

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

Answer

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

$$= (-4)^5 / (-4)^8$$

$$= (-4)^{5-8}$$

$$= 1/(-4)^3$$

$$\begin{aligned} \text{(ii)} \quad & \left(\frac{1}{2^3}\right)^2 \\ &= 1/2^{3 \times 2} \\ &= 1/2^6 \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad & (-3)^4 \times \left(\frac{5}{3}\right)^4 = (-1 \times 3)^4 \times \frac{5^4}{3^4} \\ &= (-1)^4 \times 3^4 \times \frac{5^4}{3^4} \quad [(ab)^m = a^m \times b^m] \\ &= (-1)^4 \times 5^4 \\ &= 5^4 \quad [(-1)^4 = 1] \end{aligned}$$

$$\begin{aligned} \text{iv)} \quad & (3^{-7} \div 3^{-10}) \times 3^{-5} \\ &= (3^{-7} / 3^{-10}) \times 3^{-5} \\ &= 3^{-7+10} \times 3^{-5} \\ &= 3^3 \times 3^{-5} \\ &= 3^{-2} \\ &= 1/3^2 \end{aligned}$$

$$\begin{aligned} \text{v)} \quad & 2^{-3} \times (-7)^{-3} \\ &= (2 \times -7)^{-3} \\ &= (-14)^{-3} \\ &= 1/(-14)^3 \end{aligned}$$

Question 3

Find the value of

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

Answer

$$\begin{aligned} 1) \quad & (3^0 + 4^{-1}) \times 2^2 \\ &= (1 + 1/4) \times 4 \end{aligned}$$

$$= 4+1=5$$

$$\begin{aligned} & 2) (2^{-1} \times 4^{-1}) \div 2^{-2} \\ & = [(1/2) \times (1/4)] \div (1/4) \\ & = (1/8) \times (4) = 1/2 \end{aligned}$$

$$\begin{aligned} & 3) \left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} \\ & = 2^2 + 3^2 + 4^2 \\ & = 4+9+16=29 \end{aligned}$$

$$\begin{aligned} & 4) (3^{-1} + 4^{-1} + 5^{-1})^0 \\ & = 1 \text{ as } a^0=1 \end{aligned}$$

$$\begin{aligned} & 5) \left\{ \left(\frac{-2}{3}\right)^{-2} \right\}^2 \\ & = \left(\frac{-2}{3}\right)^{-4} \\ & = \left(\frac{3}{-2}\right)^4 \\ & = 81/16 \end{aligned}$$

Question 4

Evaluate

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

Answer

$$\begin{aligned} & \text{i)} \quad \frac{8^{-1} \times 5^3}{2^{-4}} \\ & = \frac{2^4 \times 5^3}{8} \\ & = (16 \times 125)/8 = 250 \end{aligned}$$

ii)

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

$$= \left(\frac{1}{5} \times \frac{1}{2}\right) \times \frac{1}{6} = \frac{1}{60}$$

Question 5

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

Answer

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

$$5^m \times (1/5^{-3}) = 5^5$$

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

So $m+3=5$
 $m=2$

Question 6

Evaluate

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

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

Answer

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

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

$$= (-1)^{-1}$$

$$= -1$$

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

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

$$= \frac{8^7 \times 5^4}{5^7 \times 8^4}$$

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

Question 7

Simplify.

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

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

Answer

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

$$= \frac{25 \times t^8 \times 5^3}{10 \times t^4}$$

$$= \frac{5 \times 125 \times t^4}{10 \times t^4}$$

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

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

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

$$= \frac{3^{-5} \times 2^{-5} \times 5^{-5} \times 125}{5^{-7} \times 2^{-5} \times 3^{-5}}$$

$$= 25 \times 125 = 5^5$$