

Board – CBSE

Class – 7th

Topic – Exponents and Power 13.2

Q.1 Using laws of exponents, simplify and write the answer in exponential form:

(i) $3^2 \times 3^4 \times 3^8$ (ii) $6^{15} \div 6^{10}$ (iii) $a^3 \times a^2$ (iv) $7^x \times 7^2$

(v) $5^{2^3} \div 5^3$ (vi) $2^5 \times 5^5$ (vii) $a^4 \times b^4$ (viii) $(3^4)^3$ (ix)

(x) $8^t \div 8^2$

Sol: (i) $3^2 \times 3^4 \times 3^8 = (3)^{2+4+8}$ ($a^m \times a^n = a^{m+n}$)

$= 3^{14}$

(ii) $6^{15} \div 6^{10} = (6)^{15-10}$ ($a^m \div a^n = a^{m-n}$)

$= 6^5$

(iii) $a^3 \times a^2 = a^{(3+2)}$ ($a^m \times a^n = a^{m+n}$)

$= a^5$

(iv) $7^x + 7^2 = 7^{x+2}$ ($a^m \times a^n = a^{m+n}$)

(v) $(5^2)^3 \div 5^3$

$= 5^{2 \times 3} \div 5^3$ ($(a^m)^n = a^{mn}$)

$= 5^6 \div 5^3$

$= 5^{(6-3)}$ ($a^m \div a^n = a^{m-n}$)

$= 5^3$

(vi) $2^5 \times 5^5$

$= (2 \times 5)^5$ [$a^m \times b^m = (a \times b)^m$]

$= 10^5$

(vii) $a^4 \times b^4$

$= (ab)^4$ [$a^m \times b^m = (a \times b)^m$]

(viii) $(34)^3 = 34 \times 3 = 312$ ($(a^m)^n = a^{mn}$)

(ix) $(2^{20} \div 2^{15}) \times 2^3$

$= (2^{20-15}) \times 2^3$ ($a^m \div a^n = a^{m-n}$)

$= 2^5 \times 2^3$

$$= (2^{5+3}) (a^m \times a^n = a^{m+n})$$

$$= 2^8$$

$$(x) 8^t \div 8^2 = 8^{(t-2)} (a^m \div a^n = a^{m-n})$$

Q.2 Simplify and express each of the following in exponential form:

$$(i) \frac{2^3 \times 3^4 \times 4}{3 \times 32}$$

$$(ii) [5^{2^3} \times 5^4] \div 5^7$$

$$(iii) 25^4 \div 5^3$$

$$(iv) \frac{3 \times 7^2 \times 11^8}{21 \times 11^3}$$

$$(v) \frac{3^7}{3^4 \times 3^3}$$

$$(vi) 2^0 + 3^0 + 4^0$$

$$(vii) 2^0 \times 3^0 \times 4^0$$

$$(viii) (3^0 + 2^0) \times 5^0$$

$$(ix) \frac{2^8 \times a^5}{4^3 \times a^3}$$

$$(x) \left(\frac{a^5}{a^3}\right) \times a^8$$

$$(xi) \frac{4^5 \times a^8 b^3}{4^5 \times a^5 b^2}$$

$$(xii) (2^3 \times 2)^2$$

Sol: (i) $\frac{2^3 \times 3^4 \times 4}{3 \times 32} = \frac{2^3 \times 3^4 \times 2 \times 2}{3 \times 2 \times 2 \times 2 \times 2} = \frac{2^3 \times 3^4 \times 4}{3 \times 2^5}$

$$= \frac{2^{3+2} \times 3^4}{3 \times 2^5} \quad (a^m \times a^n = a^{m+n})$$

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

$$= 2^{5-5} \times 3^{4-1} \quad (a^m \div a^n = a^{m-n})$$

$$= 2^0 3^3 = 1 \times 3^3 = 3^3$$

$$(ii) [(5^2)^3 \times 5^4] \div 5^7$$

$$= [5^{2 \times 3} \times 5^4] \div 5^7 \quad (a^m)^n = a^{mn}$$

$$= [5^6 \times 5^4] \div 5^7$$

$$= [5^{6+4}] \div 5^7 \quad (a^m \times a^n = a^{m+n})$$

$$= 5^{10} \div 5^7$$

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

$$= 5^3$$

$$(iii) 25^4 \div 5^3 = (5 \times 5)^4 \div 5^3$$

$$= (5^2)^4 \div 5^3$$

$$= 5^{2 \times 4} \div 5^3 \quad (a^m)^n = a^{mn}$$

$$= 5^8 \div 5^3$$

$$= 5^{8-3} (a^m \div a^n = a^{m-n})$$

$$= 5^5$$

$$(iv) \frac{3 \times 7^2 \times 11^8}{21 \times 11^3} = \frac{3 \times 7^2 \times 11^8}{3 \times 7^1 \times 11^3}$$

$$= 3^{1-1} \times 7^{2-1} \times 11^{8-3} \quad (a^m \div a^n = a^{m-n})$$

$$= 3^0 \times 7^1 \times 11^5$$

$$= 1 \times 7 \times 11^5 = 7 \times 11^5$$

$$(v) \frac{3^7}{3^4 \times 3^3} = \frac{3^7}{3^{4+3}} \quad (a^m \times a^n = a^{m+n})$$

$$= \frac{3^7}{3^7} = 3^{7-7} \quad (a^m \div a^n = a^{m-n})$$

$$(vi) 2^0 + 3^0 + 4^0 = 1 + 1 + 1 = 3$$

$$(vii) 2^0 \times 3^0 \times 4^0 = 1 \times 1 \times 1 = 1$$

$$(viii) (3^0 + 2^0) \times 5^0 = (1 + 1) \times 1 = 2$$

$$(ix) \frac{2^8 \times a^5}{4^3 \times a^3} = \frac{2^8 \times a^5}{(2 \times 2)^3 \times a^3} = \frac{2^8 \times a^5}{(2^2)^3 \times a^3}$$

$$= \frac{2^8 \times a^5}{2^{2 \times 3} \times a^3} \quad [(a^m)^n = a^{mn}]$$

$$= \frac{2^8 \times a^5}{2^6 \times a^3}$$

$$= 2^{8-6} \times a^{5-3} \quad (a^m \div a^n = a^{m-n})$$

$$= 2^2 \times a^2 = (2 \times a)^2 = (2a)^2 \quad [a^m \times b^m = (a \times b)^m]$$

$$(x) \left(\frac{a^5}{a^3}\right) \times a^8 = a^{5-3} \times a^8 \quad (a^m \div a^n = a^{m-n})$$

$$= a^2 \times a^8$$

$$= a^{2+8} = a^{10} \quad (a^m \times a^n = a^{m+n})$$

$$(xi) \frac{4^5 \times a^8 b^3}{4^5 \times a^5 b^2} = 4^{5-5} \times a^{8-5} \times b^{3-2} \quad (a^m \div a^n = a^{m-n})$$

$$= 4^0 \times a^3 \times b^1 = 1 \times a^3 \times b^1 = 1 \times a^3 \times b = a^3 b$$

$$(xii) (2^3 \times 2)^2 = (2^{3+1})^2 \quad (a^m \times a^n = a^{m+n})$$

$$= (2^4)^2 = 2^{4 \times 2} \quad (a^m)^n = a^{mn}$$

$$= 2^8$$

Q.3 Say true or false and justify your answer:

(i) $10 \times 10^{11} = 100^{11}$ (ii) $2^3 > 5^2$

$$(iii) 2^3 \times 3^2 = 6^5 \qquad (iv) 3^0 = (1000)^0$$

Sol: (i) $10 \times 10^{11} = 100^{11}$

$$\begin{aligned} \text{L.H.S.} &= 10 \times 10^{11} = 10^{11} + 1 \quad (a^m \times a^n = a^{m+n}) \\ &= 10^{12} \end{aligned}$$

$$\begin{aligned} \text{R.H.S.} &= 100^{11} = (10 \times 10)^{11} = (10^2)^{11} \\ &= 10^{2 \times 11} = 10^{22} \quad (a^m)^n = a^{mn} \end{aligned}$$

As L.H.S. \neq R.H.S.,

Therefore, the given statement is false.

$$(ii) 2^3 > 5^2$$

$$\text{L.H.S.} = 2^3 = 2 \times 2 \times 2 = 8$$

$$\text{R.H.S.} = 5^2 = 5 \times 5 = 25$$

As $25 > 8$,

Therefore, the given statement is false.

$$(iii) 2^3 \times 3^2 = 6^5$$

$$\text{L.H.S.} = 2^3 \times 3^2 = 2 \times 2 \times 2 \times 3 \times 3 = 72$$

$$\text{R.H.S.} = 6^5 = 7776$$

As L.H.S. \neq R.H.S.,

Therefore, the given statement is false.

$$(iv) 30 = (1000)^0$$

$$\text{L.H.S.} = 30 = 1$$

$$\text{R.H.S.} = (1000)^0 = 1 = \text{L.H.S.}$$

Therefore, the given statement is true.

Q.4 Express each of the following as a product of prime factors only in exponential form:

$$(i) 108 \times 192 \qquad (ii) 270 \qquad (iii) 729 \times 64 \qquad (iv) 768$$

Sol: (i) 108×192

$$= (2 \times 2 \times 3 \times 3 \times 3) \times (2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3)$$

$$= (2^2 \times 3^3) \times (2^6 \times 3)$$

$$= 2^{6+2} \times 3^{3+1} \qquad (a^m \times a^n = a^{m+n})$$

$$= 2^8 \times 3^4$$

$$(ii) 270 = 2 \times 3 \times 3 \times 3 \times 5 = 2 \times 3^3 \times 5$$

$$(iii) 729 \times 64 = (3 \times 3 \times 3 \times 3 \times 3 \times 3) \times (2 \times 2 \times 2 \times 2 \times 2 \times 2) \\ = 3^6 \times 2^6$$

$$(iv) 768 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 = 2^8 \times 3$$

Q.5 Simplify:

$$(i) \frac{(2^5)^2 \times 7^3}{8^3 \times 7} \quad (ii) \frac{25 \times 5^2 \times t^8}{10^3 \times t^4} \quad (iii) \frac{3^5 \times 10^5 \times 25}{5^7 \times 6^5}$$

Sol:

$$(i) \frac{(2^5)^2 \times 7^3}{8^3 \times 7} = \frac{2^{5 \times 2} \times 7^3}{(2 \times 2 \times 2)^3 \times 7} \quad [(a^m)^n = a^{mn}]$$

$$= \frac{2^{10} \times 7^3}{(2^3)^3 \times 7} = \frac{2^{10} \times 7^3}{2^{3 \times 3} \times 7} \quad [(a^m)^n = a^{mn}]$$

$$= \frac{2^{10} \times 7^3}{2^9 \times 7} = 2^{10-9} \times 7^{3-1} \quad [(a^m \div a^n = a^{m-n})]$$

$$= 2^1 \times 7^2 = 2 \times 7 \times 7 = 98$$

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

$$= \frac{5^{1+1+2} \times t^8}{5^3 \times 2^3 \times t^4} \quad [(a^m \times a^n = a^{m+n})]$$

$$= \frac{5^4 \times t^8}{5^3 \times 2^3 \times t^4} = \frac{5^{4-3} \times t^{8-4}}{2^3} \quad [(a^m \div a^n = a^{m-n})]$$

$$= \frac{5^1 \times 4}{2 \times 2 \times 2} = \frac{5t^4}{8}$$

$$(iii) \frac{3^5 \times 10^5 \times 25}{5^7 \times 6^5} = \frac{3^5 \times (2 \times 5)^5 \times 5 \times 5}{5^7 \times 2^5 \times 3^5}$$

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

$$= \frac{3^5 \times 2^5 \times 5^{5+2}}{5^7 \times 2^5 \times 3^5} \quad [(a^m \times a^n = a^{m+n})]$$

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

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

$$= 3^0 \times 2^0 \times 5^0$$

$$= 1 \times 1 \times 1 = 1$$