NCERT Solutions For Class 7 Maths Exponents and Powers Exercise 13.2

Q1. Using laws of exponents, simplify and write the answer in exponential form:

(i) $3^2 \times 3^4 \times 3^8$ (ii) 6^{15} ÃƒÂ· 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) $\left(2^{20} \div 2^{15}\right) \times 2^3$ (x) 8^t ÃƒÂ· 8^2

Ans:

(i) $3^2 \text{ x } 3^4 \text{ x } 3^8 = (3)^{2+4+8}$ $(a^m \text{ x } a^n = a^{m+n})$

$= 3^{14}$

(ii) 6^{15} ÃƒÂ· $6^{10} = (6)^{15-10}$ $(a^m$ ÃƒÂ· $a^n = a^{m-n})$

$= 6^5$

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

$= a^5$

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

(v) $(5^2)^3$ ÃƒÂ· 5^3

$= 5^{2 \text{ x } 3}$ ÃƒÂ· 5^3 $(a^m)^n = a^{mn}$

$= 5^6$ ÃƒÂ· 5^3

$= 5^{(6-3)}$ $(a^m$ ÃƒÂ· $a^n = a^{m-n})$

$= 5^3$

(vi) $2^5 \text{ x } 5^5$

$= (2 \text{ x } 5)^5$ $[a^m \text{ x } b^m = (a \text{ x } b)^m]$

$= 10^5$

(vii) $a^4 \text{ x } b^4$

$= (ab)^4$ $[a^m \text{ x } b^m = (a \text{ x } b)^m]$

(viii) $(3^4)^3 = 3^{4 \text{ x } 3} = 3^{12}$ $(a^m)^n = a^{mn}$

(ix) $(2^{20}$ ÃƒÂ· $2^{15}) \text{ x } 2^3$

$= (2^{20-15}) \text{ x } 2^3$ $(a^m$ ÃƒÂ· $a^n = a^{m-n})$

$= 2^5 \text{ x } 2^3$

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

$= 2^8$

(x) 8^t ÃƒÂ· $8^2 = 8^{(t-2)}$ $(a^m$ ÃƒÂ· $a^n = a^{m-n})$

Q2. Simplify and express each of the following in exponential form:

(i) $\frac{2^3 \times 3^4 \times 4}{3 \times 32}$ (ii) $\left[5^{2^3} \times 5^4\right] \div 5^7$ (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) 20 + 30 + 40

(vii) 20 × 30 × 40 (viii) (30 + 20) × 50 (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) $\left(2^3 \times 2\right)^2$

Ans:

(i)

$$\frac{2^3 \times 3^4 \times 4}{3 \times 32} = \frac{2^3 \times 3^4 \times 2 \times 2}{3 \times 2 \times 2 \times 2 \times 2 \times 2} = \frac{2^3 \times 3^4 \times 2^2}{3 \times 2^5}$$

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

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

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

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

(ii) [(52)3 × 54] ÃƒÂ· 57

= [52 × 3 × 54] ÃƒÂ· 57 (am)n = amn

= [56 × 54] ÃƒÂ· 57

= [56 + 4] ÃƒÂ· 57 (am × an = am+n)

= 510 ÃƒÂ· 57

= 510 - 7 (am ÃƒÂ· an = am - n)

= 53

(iii) 254 ÃƒÂ· 53 = (5 ×5)4 ÃƒÂ· 53

= (52)4 ÃƒÂ· 53

= 52 × 4 ÃƒÂ· 53 (am)n = amn

= 58 ÃƒÂ· 53

= 58 - 3 (am ÃƒÂ· an = am - n)

= 55

(iv)

$$\frac{3\times 7^2\times 11^8}{21\times 11^3}=\frac{3\times 7^2\times 11^8}{3\times 7\times 11^3}$$

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

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

$= 1 \times 7 \times 115 = 7 \times 115$

(v)

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

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

$$=3^0=1$$

(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)

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

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

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

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

$$= 2^2\times a^2=(2\times a)^2 \qquad \left[a^m\times b^m = (a\times b)^m\right]$$

$$=(2a)^2$$

(x)

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

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

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

(xi)

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

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

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

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

$= 2^8$

Q3. Say true or false and justify your answer:

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

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

Ans:

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

L.H.S. $= 10 \times 10^{11} = 10^{11+1}$ $(a^m \times a^n = a^{m+n})$

$= 10^{12}$

R.H.S. $= 100^{11} = (10 \times 10)^{11} = (10^2)^{11}$

$= 10^{2 \times 11} = 10^{22}$ $(a^m)^n = a^{mn}$

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

Therefore, the given statement is false.

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

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

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

As $25 > 8$,

Therefore, the given statement is false.

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

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

R.H.S. $= 6^5 = 7776$

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

Therefore, the given statement is false.

(iv) $3^0 = (1000)^0$

L.H.S. $= 3^0 = 1$

R.H.S. $= (1000)^0 = 1 =$ L.H.S.

Therefore, the given statement is true.

Q4. Express each of the following as a product of prime factors only in exponential form:

(i) 108 x 192 (ii) 270

(iii) 729 x 64 (iv) 768

Ans:

(i) 108 x 192

= (2 x 2 x 3 x 3 x 3) x (2 x 2 x 2 x 2 x 2 x 2 x 3)

= (2^2 x 3^3) x (26 x 3)

= $26+2$ x 3^{3+1} (a^m x a^n = a^{m+n})

= 2^8 x 3^4

(ii) 270 = 2 x 3 x 3 x 3 x 5 = 2 x 3^3 x 5

(iii) 729 x 64 = (3 x 3 x 3 x 3 x 3 x 3) x (2 x 2 x 2 x 2 x 2 x 2)

= 3^6 x 2^6

(iv) 768 = 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 3 = 2^8 x 3

Q5. Simplify:

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

Ans:

(i)

$$\frac{(2^5)^2 \times 7^3}{8^3 \times 7} = \frac{2^{5\times2} \times 7^3}{(2\times2\times2)^3 \times 7} \qquad \left[(a^m)^n = a^{mn}\right]$$

$$= \frac{2^{10} \times 7^3}{(2^3)^3 \times 7} = \frac{2^{10} \times 7^3}{2^{3\times3} \times 7} \qquad \left[(a^m)^n = a^{mn}\right]$$

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

$$= 2^1 \times 7^2 = 2\times7\times7 = 98$$

(ii)

$$\frac{25\times5^2\times t^8}{10^3\times t^4}=\frac{5\times5\times5^2\times t^8}{(5\times2)^3\times t^4} \qquad (a\times b)^m=(a^m\times b^m)$$

$$=\frac{5^{1+1+2}\times t^8}{5^3\times2^3\times t^4} \qquad (a^m\times a^n = a^{m+n})$$

$$=\frac{5^4\times t^8}{5^3\times2^3\times t^4}=\frac{5^{4-3}\times t^{8-4}}{2^3} \qquad (a^m\div a^n = a^{m-n})$$

$$=\frac{5^1\times t^4}{2\times2\times2}=\frac{5t^4}{8}$$

(iii)

$$\frac{3^5\times10^5\times25}{5^7\times6^5}=\frac{3^5\times(2\times5)^5\times5\times5}{5^7\times2^5\times3^5}$$

$$=\frac{3^5\times2^5\times5^5\times5^2}{5^7\times2^5\times3^5} \qquad (a\times b)^m=(a^m\times b^m)$$

$$=\frac{3^5\times2^5\times5^{5+2}}{5^7\times2^5\times3^5} \qquad (a^m\times a^n = a^{m+n})$$

$$=\frac{3^5\times2^5\times5^7}{5^7\times2^5\times3^5}$$

$$=3^{5-5}\times2^{5-5}\times5^{7-7} \qquad (a^m\div a^n = a^{m-n})$$

$$=3^0\times2^0\times5^0=1\times1\times1=1$$

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