CBSE Class –VII Mathematics

NCERT Solutions

Chapter 13 Exponents and Powers (Ex. 13.2)

Question 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) $\left(5^2\right)^2 \div 5^3$

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

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

(viii) $\left(3^4\right)^3$

(ix) $(2^{20} \div 2^{15})$ x2^3

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

Answer: (i) $3^2 \times 3^4 \times 3^8 = 3^{(2+4+8)} = 3^{14}$ $[\because\ a^m \times a^n = a^{m+n}]$

(ii) $6^{15} \div 6^{10} = 6^{15-10} = 6^5$ $[\because\ a^m \div a^n = a^{m-n}]$

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

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

(v) $\left(5^2\right)^3 \div 5^3 = 5^{2\times3} \div 5^3 = 5^6 \div 5^3$ $[\because\ (a^m)^n = a^{m\times n}]$ = 5

(vi) $2^5 \times 5^5 = (2 \times 5)^5 = 10^5$ $[\because\ a^m \times b^m = (a \times b)^m]$

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

(viii) $\left(3^4\right)^3$ = $3^{4\times3} = 3^{12}$ $[\because\ (a^m)^n = a^{m\times n}]$

(ix) $\left(2^{20} \div 2^{15}\right) \times 2^3$ = $\left(2^{20-15}\right) \times 2^3$ $[\because\ a^m \div a^n = a^{m-n}]$

= 2^5 x 2^3 = 2^{5+3} $[\because\ a^m \times b^m = (a \times b)^m]$ = 2^8

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

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

(i) $\frac{2^3\times3^4\times4}{3\times32}$

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

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

(iv) $\frac{3\times7^2\times11^8}{21\times11}$

(v) $\frac{3^7}{3^4\times3^3}$

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

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

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

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

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

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

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

Answer: (i) $\frac{2^3\times3^4\times4}{3\times32} = \frac{2^3\times3^4\times2^2}{3\times2^5} = \frac{2^{3+2}\times3^4}{3\times2^5}$ $[\because\ a^m \times a^n = a^{m+n}]$

= $\frac{2^5\times3^4}{3\times2^5} = 2^{5-5} \times 3^{4-3}$ $[\because\ a^m \div a^n = a^{m-n}]$

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

(ii) $\left[\left(5^2\right)^3 \times 5^4\right] \div 5^7 = \left[5^6 \times 5^4\right] \div 5^7 \ [\because \ (a^m)^n = a^{m\times n}]$

= $\left[5^{6+4}\right] \div 5^7 = 5^{10} \div 5^7 \ [\because \ a^m \times a^n = a^{m+n}]$

= $5^{10-7} = 5^3 \ [\because \ a^m \div a^n = a^{m-n}]$

(iii) $25^4 \div 5^3 = \left(5^2\right)^4 \div 5^3 = 5^8 \div 5^3 \ [\because \ (a^m)^n = a^{m\times n}]$

= $5^{8-3} = 5^3 \ [\because \ a^m \div a^n = a^{m-n}]$

(iv) $\frac{3\times 7^2\times 11^8}{21\times 11^3} = \frac{3\times 7^2\times 11^8}{3\times 7\times 11^3} = 3^{1-1} \times 7^{2-1} \times 11^{8-3} \ [\because \ a^m \div a^n = a^{m-n}]$

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

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

= $3^{7-7} = 3^0 = 1 \ [\because \ a^m \div a^n = a^{m-n}]$

(vi) $2^0 + 3^0 + 4^0 = 1 + 1 + 1 = 3 \ [\because \ a^0 = 1]$

(vii) $2^0 \times 3^0 \times 4^0 = 1 \times 1 \times 1 = 1 \ [\because \ a^0 = 1]$

(viii) $\left(3^0 + 2^0\right) \times 5^0 = (1+1) \times 1 = 2 \times 1 = 2 \ [\because \ a^0 = 1]$

(ix) $\frac{2^8\times a^5}{4^3\times a^3} = \frac{2^8\times a^5}{\left(2^2\right)^3\times a^3} = \frac{2^8\times a^5}{2^6\times a^3} \ [\because \ (a^m)^n = a^{m\times n}]$

= 2^{8-6} x a^{5-3} = 2^2 x a^2

(x) $\left(\frac{a^5}{a^3}\right) \times a^8 = \left(a^{5-3}\right) \times a^8 = a^2 \times a^8 \ [\because \ a^m \div a^n = a^{m-n}]$

= a^{2+8} = a^{10} $[\because \ a^m \times a^n = a^{m+n}]$

(xi) $\frac{4^5\times a^8 b^3}{4^5\times a^5 b^2} = 4^{5-5} \times a^{8-5} \times b^{3-2} = 4^0 \times a^3 \times b \ [\because \ a^m \div a^n = a^{m-n}]$

= 1x a^3 x b = a^3 x b $[\because \ a^0 = 1]$

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

= $2^{4\times 2} = 2^8 \ [\because \ (a^m)^n = a^{m\times n}]$

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

(i) 10×10^{11} =100^{11}

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

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

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

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

L.H.S. 10^{1+11} = 10^{12} and R.H.S. $\left(10^2\right)^{11} = 10^{22}$

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

Therefore, it is false.

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

L.H.S. $2^3 = 8$ and R.H.S. $5^2 = 25$

Since, L.H.S. is not greater than R.H.S.

Therefore, it is false.

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

L.H.S. $2^3 \times 3^2 = 8 \times 9 = 72$ and R.H.S. $6^5 = 7,776$

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

Therefore, it is false.

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

L.H.S. $3^0 = 1$ and R.H.S. $(1000)^0$ = 1

Since, L.H.S. = R.H.S.

Therefore, it is true.

Question 4. 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

Answer: (i) 108 x 192

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

= $2^{2+6} \times 3^{3+1}$

= $2^8 \times 3^4$

(ii) 270

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

(iii) 729 x 64

= $3^6 \times 2^6$

(iv) 768

= $2^8 \times 3$

Question 5. Simplify:

(i) $\frac{\left(2^5\right)^2 \times 7^3}{8^3 \times 7}$

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

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

Answer: (i) $\frac{\left(2^5\right)^2 \times 7^3}{8^3 \times 7} = \frac{2^{5 \times 2} \times 7^3}{\left(2^3\right)^3 \times 7}$

= $\frac{2^{10} \times 7^3}{2^9 \times 7}$

= $2^{10-9} \times 7^{3-1} = 2 \times 7^2$

= 2 x 49

= 98

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

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

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

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

= $\frac{5t^4}{8}$

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

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

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

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

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

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

= 1 x 1 x 1

= 1