6. Exponents Exercise - 6.1 VII

Solution - 01.

(i) $13^2 = 13 \times 13 = 169$

(ii) $7^3 = 7 \times 7 \times 7 = 49 \times 7 = 343$

(iii) $3^4 = 3 \times 3 \times 3 \times 3 = 3 \times 3 \times 9 = 9 \times 9 = 81$

Solution - 02.

(i) $(-7)^2 = (-7) \times (-7) = +49$

(ii) $(-3)^4 = (-3) \times (-3) \times (-3) \times (-3)$

$= (9) \times (9)$

$= 81$

(iii) $(-5)^5 = (-5) \times (-5) \times (-5) \times (-5) \times (-5)$

$= 25 \times 25 \times -5$

$= 625 \times -5$

$= -3125$

Solution - 03 :-

(i) $3 \times 10^2 = 3 \times 10 \times 10$

$= 300$

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

$= 4 \times 25 \times 5$

$= 500$

(iii) $3^3 \times 5^2 = 3 \times 9 \times 25$

$= 675$

(iv)

Solution-04.

(i) $3^2 \times 10^4 = 9 \times 100 \times 100$ $[\because 3 \times 3 \times 10 \times 10 \times 10 \times 10 = 3^2 \times 10^2 \times 10^2)$

$= 9 \times 10000$

$= 90000$

5 (ii) $(-3)^2 \times (-5)^3 = 9 \times -5 \times -5 \times -5$

$= -9 \times 25 \times 5$

$= -9 \times 125$

$= -1125.$

(i) $(-2) \times (-3)^3 = -2 \times -3 \times -3 \times -3$

$= 6 \times 9$

$= 54$

(iii) $(-2)^5 \times (-10)^2 = -2 \times -2 \times -2 \times -2 \times -2 \times -10 \times -10$

$= -32 \times 100$

$= -3200.$

Solution-04.

(ii) $2^4 \times 3^2 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$

$= 8 \times 2 \times 9$

$= 8 \times 18.$

$= 144.$

(iii) $5^2 \times 3^4 = 5 \times 5 \times 3 \times 3 \times 3 \times 3$

$= 25 \times 9 \times 9$

$= 25 \times 81$

$= 2025.$

$= 2025.$

Solution -06:-

(i) $\left(\frac{3}{4}\right)^2 = \frac{3}{4} \times \frac{3}{4} = \frac{3\times3}{4\times4} = \frac{9}{16}.$

(ii) $\left(-\frac{2}{3}\right)^4 = \frac{(-2)\times(-2)\times(-2)\times(-2)}{3\times3\times3\times3}$

$= \frac{4\times4}{9\times9}$

$= \frac{16}{81}$

(iii) $\cancel{3^5 \text{ (or)}}$ $\left(\frac{-4}{5}\right)^5 = \frac{(-4)(-4)(-4)(-4)(-4)}{5\times5\times5\times5\times5}$

$= -\frac{[16\times16\times4]}{25\times25\times5}$

$= \frac{-1024}{3125}.$

Solution-07:-

(i) 2^5 or 5^2

$2^5 = 2\times2\times2\times2\times2$

$= 32$

$5^2 = 5\times5$

$= 25.$

$2^5 > 5^2$

(ii) 3^4 or 4^3

$3^4 = 3\times3\times3\times3$

$= 9\times9$

$= 81.$

(iii) 3^5 (or) 5^3

$3^5 = 3\times3\times3\times3\times3$

$= 9\times9\times3$

$= 81\times3$

$= 243.$

$5^3 = 5\times5\times5$

$= 25\times5$

$= 125.$

Solution-08:

(i) $(-5)\times(-5)\times(-5) = +25\times(-5)$

$= -125$

$= (-5)^3$

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

(iii) $\frac{4}{3}\times\frac{4}{3}\times\frac{4}{3}\times\frac{4}{3}\times\frac{4}{3} = \left(\frac{4}{3}\right)^5$

Solution-09:-

(i) $x\times x\times x\times x\times a\times a\times b\times b\times b = x^4\times a^2\times b^3$

$= x^4a^2b^3.$

(ii) $(-2)\times(-2)\times(-2)\times(-2)\times a\times a\times a = (-2)^4\times a^3$

(iii) $\left(\frac{-2}{3}\right)\times\left(\frac{-2}{3}\right)\times x\times x\times x = \left(\frac{-2}{3}\right)^3\times x^3$

$= \left(\frac{-2}{3}\right)^3\times x^3.$

Solution-10.

(i) 512.

we have,

$512 = 2\times2\times2\times2\times2\times2\times2\times2\times2$

$= 2^9$

$$\begin{array}{r|l} 2 & 512 \\ 2 & 256 \\ 2 & 128 \\ 2 & 64 \\ 2 & 32 \\ 2 & 16 \\ 2 & 8 \\ 2 & 4 \\ & 2 \end{array}$$

(ii) $625 = 5\times5\times5\times5$

$= 25\times25$

$= 5^2\times5^2$

$= 5^4$.

$$\begin{array}{r|l} 5 & 625 \\ 5 & 125 \\ 5 & 25 \\ & 5 \end{array}$$

(iii) 729

we have,

$729 = 3\times3\times3\times3\times3\times3$

$= 3^3\times3^3$

$= 3^6$

Solution-11:

(i) 36

Using prime factorisation of 36, we have

$36 = 2\times2\times3\times3$

$= 2^2\times3^2$

$$\begin{array}{r|l} 2 & 36 \\ 2 & 18 \\ 3 & 9 \\ & 3 \end{array}$$

(ii) Using prime factorisation of 675, We have.

$675 = 5\times5\times3\times3\times3$

$= 3^3\times5^2$

$= 5^2\times3^3$

$$\begin{array}{r|l} 3 & 675 \\ 3 & 225 \\ 5 & 75 \\ 5 & 15 \\ & 3 \end{array}$$

(iii) $392 = 2\times2\times2\times7\times7$

$= 2^3\times7^2$

2 | 392
2 | 196
2 | 98
7 | 49
7

Solution-12

(i) $450 = 2\times3^2\times5^2$

$= 2\times3^2\times5^2$

2 | 450
3 | 225
5 | 75
5 | 15
3

(ii) 2800

Using prime factorisation of 2800, we have

$2800 = 2\times2\times2\times2\times5\times5\times7$

$= 2^4\times5^2\times7.$

2 | 2800
2 | 1400
7 | 700
2 | 100
2 | 50
5 | 25
5

(iii) Using prime factorisation of 24000, we have

$24000 = 2\times12000$

$= 2\times6\times2000$

$= 2\times2\times3\times2\times2\times2\times2\times5\times5\times5$

$= 2^6\times3^1\times5^3.$

2 | 24000
2 | 12000
2 | 6000
2 | 3000
2 | 1500
2 | 750
5 | 375
5 | 75
3 | 15
5

Solution -13:-

(i) $\left(\frac{3}{7}\right)^2 = \frac{9}{49}$

(ii) $\left(\frac{7}{9}\right)^3 = \left(\frac{7}{9}\right)\times\left(\frac{7}{9}\right)\times\left(\frac{7}{9}\right)$

$= \frac{(7)\times(7)\times(7)}{9\times9\times9}$

$= \frac{343}{729}.$

(iii) $\left(\frac{-2}{3}\right)^4 = \left(\frac{-2}{3}\right)\left(\frac{-2}{3}\right)\left(\frac{-2}{3}\right)\left(\frac{-2}{3}\right)$

$= \frac{(-2)(-2)(-2)(-2)}{3\times3\times3\times3}$

$= \frac{16}{81}$.

Solution-14:-

(i) $\frac{49}{64} = \left(\frac{7}{8}\right)^2$

(ii) $-\frac{64}{125} = \frac{-4\times4\times4}{5\times5\times5}$

$= \left(\frac{-4}{5}\right)^3$

(iii) $\frac{-1}{216} = \frac{-1}{6\times6\times6}$

$= \left(\frac{-1}{6}\right)^3$.

Solution-15:-

(i) $\left(\frac{-1}{2}\right)^2 \times 2^3 \times \left(\frac{3}{4}\right)^2 = \left(\frac{1}{4}\right)\times(8)\times\frac{9}{16}$

$= \frac{9}{8}$

(ii) $\left(\frac{-3}{5}\right)^4 \times \left(\frac{4}{9}\right)^4 \times \left(\frac{-15}{18}\right)^2 = \left(\frac{81}{625}\right)\times\left(\frac{256}{81\times81}\right)\times\left(\frac{225}{18\times18}\right)$

$= \frac{64}{18225}$.

Solution - 16 :-

Given that,

$a = 2,\ b = 3$

(i) $(a+b)^a = (2+3)^2$

$= 5^2$

$= 25.$

(ii) $(ab)^b = (2\times3)^3$

$= 6^3$

$= 216.$

(iii) $\left(\frac{b}{a}\right)^b = \left(\frac{3}{2}\right)^3$

$= \frac{3\times3\times3}{2\times2\times2}$

$= \frac{27}{8}.$

(iv) $\left(\frac{a}{b}+\frac{b}{a}\right)^a = \left(\frac{2}{3}+\frac{3}{2}\right)^2$

$= \left(\frac{4+9}{6}\right)^2$

$= \left(\frac{13}{6}\right)^2$

$= \frac{169}{36}.$

Exercise - 6.2.

Solution - 01.

(i) $2^4 \times 2^3 \times 2^5 = 2^{4+3+5}$

$[\because a^m \times a^n \times a^q = a^{m+n+q}$, where $m=4, n=3, q=5]$

$= 2^{12}$

(ii) $\frac{5^{12}}{5^3} = 5^{12-3}$ $\quad [\because \frac{a^m}{a^n} = a^{m-n}]$

$= 5^9$

(iii) $(7^2)^3 = (7)^6$ $\quad [\because (7^a)^b = 7^{ab}]$

(iv) $(3^2)^5 \div 3^4 = \frac{(3^2)^5}{3^4}$

$= \frac{3^{10}}{3^4}$ $\quad [\because (a^m)^n = a^{m \times n}]$

$= 3^{10-4}$

$= 3^6$ $\quad [\because \frac{a^m}{a^n} = a^{m-n}]$

(v) $3^7 \times 2^7 = (3 \times 2)^7$

$[\because a^n \times b^n = (ab)^n]$

$= 6^7$

(vi) $(5^{21} \div 5^{13}) \times 5^7 = \frac{5^{21}}{5^{13}} \times 5^7$

$= 5^{21-13} \times 5^7$ $\quad [\because \frac{a^m}{a^n} = a^{m-n}]$

$= 5^8 \times 5^7$ $\quad [\because 5^a \times 5^b = 5^{a+b}]$

$= 5^{8+7} = 5^{15}$

Solution - 02 :-

(i) $\{(2^3)^4 \times 2^8\} \div 2^{12} = \dfrac{2^{12} \times 2^8}{2^{12}}$

$= 2^8.$

(ii) $(8^2 \times 8^4) \div 8^3 = \dfrac{8^{2+4}}{8^3}$

$= \dfrac{8^6}{8^3}$

$= 8^{6-3}$

$= 8^3 = 2^9$

(iii) $\left(\dfrac{5^7}{5^2}\right) \times 5^3 = 5^{7-2} \times 5^3$

$= 5^5 \times 5^3$

$= 5^8.$

③ (iv) $\left(\dfrac{2}{3}\right)^5 \times \left(\dfrac{3}{5}\right)^5 = \left(\dfrac{2^5}{\cancel{3^5}} \times \dfrac{\cancel{3^5}}{5^5}\right)$

$= \dfrac{32}{5^5}$

$= \dfrac{2^5}{5^5}$

$= \left(\dfrac{2}{5}\right)^5$

Solution-04:-

$$9 \times 9 \times 9 \times 9 \times 9 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

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

$$= 3^{10}$$

Solution-05:-

(i) $$\frac{25^3}{5^3} = \frac{(5^2)^3}{5^3}$$

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

$$= \frac{5^6}{5^3}$$

$$= 5^{6-3}$$

$$= 25.$$

(ii) $$\frac{(81)^5}{(3^2)^5} = \frac{(3^4)^5}{(3^2)^5}$$

$$= \frac{3^{20}}{3^{10}}.$$

$$= 3^{20-10}$$

$$= 3^{10}.$$

(iii) $$\frac{9^8 \times (x^2)^5}{(27)^4 \times (x^3)^2} = \frac{9^8 \times \cancel{x^{10}}\, x^4}{(3^3)^4 \times \cancel{x^6}}$$

$$= \frac{3^{16}}{3^{12}} x^4 = (3x)^4.$$

(iv) $\frac{3^2 \times 7^8 \times 13^6}{21^2 \times 91^3} = \frac{\cancel{3^2} \times 7^8 \times 13^6}{\cancel{3^2} \times 7^2 \times 91^3}$

$= \frac{7^{8-2} \times 13^6}{13^3 \times 7^3}$

$= 7^3 \times 13^3$

$= (91)^3.$

2 (iv) $\frac{5^4 \times x^{10} y^5}{5^4 \times x^7 y^4} = x^{10-7} \cdot y^{5-4}$

$= x^3 \cdot y^1$

3 (i) $\{(3^2)^3 \times 2^6\} \times 5^6 = \{3^6 \times 2^6\} \times 5^6$

$= \{3 \times 2 \times 5\}^6$

$= 30^6$

(ii) $(8^2 \times 8^4) \div 8^3 = \frac{8^6}{8^3}$

$= 8^{6-3}$

$= 8^3$

$= (2^3)^3$

$= 2^9.$

3. (ii) $\frac{x^{12}}{y^{12}} \times y^{24} \times 2^{12} = x^{12} \cdot y^{24-12} \cdot 2^{12}$

$= x^{12} \cdot y^{12} \cdot 2^{12}$

$= (2xy)^{12}$

(iii) $\left(\frac{5}{2}\right)^6 \times \left(\frac{5}{2}\right)^2 = \frac{5^6}{2^6} \times \frac{5^2}{2^2}$

$= \frac{5^{6+2}}{2^{6+2}}$

$= \frac{5^8}{2^8}$

Solution - 06:-

(i) $(3^5)^{11} \times (3^{15})^4 - (3^5)^{18} \times (3^5)^{25}$

$= 3^{55} \times 3^{60} - 3^{90} \times 3^{25}$

$= 3^{55+60} - 3^{90+25}$

$= 3^{115} - 3^{115}$

$= 0.$

(ii) $\frac{16 \times 2^{n+1} - 4 \times 2^n}{16 \times 2^{n+2} - 2 \times 2^{n+2}}$

$= \frac{16 \times 2^n \cdot 2^1 - 4 \cdot 2^n}{16 \cdot 2^2 \cdot 2^n - 2 \cdot 2^2 \cdot 2^n} = \frac{2^n [32-4]}{2^n [64-8]}$

$= \frac{1}{2}.$

6.

(iii) $$\frac{10\times 5^{n+1} + 25\times 5^{n}}{3\times 5^{n+2} + 10\times 5^{n+1}}$$

$$= \frac{5^{n}[10\cdot 5 + 25]}{5^{n}[3\times 5^{2} + 10\times 5]}$$

$$= \frac{75}{125}$$

$$= \frac{3}{5}$$

(iv) $$\frac{16^{7}\times (25)^{5}\times (81)^{3}}{15^{7}\times 24^{5}\times 80^{3}}$$

$$= \left(\frac{16}{15}\right)^{7}\times\left(\frac{25}{24}\right)^{5}\times\left(\frac{81}{80}\right)^{3}$$

$$= \frac{4^{7}\cdot 4^{7}}{5^{7}\cdot 3^{7}}\times\frac{5^{5}\cdot 5^{5}}{6^{5}\cdot 4^{5}}\times\frac{3^{3}\cdot 3^{3}\cdot 9^{3}}{4^{3}\cdot 5^{3}\cdot 4^{3}}$$

$$= \frac{4^{3}\cdot 3\cdot 9^{3}}{6^{5}} = \frac{4^{3}\cdot 9^{3}\cdot 3}{2^{5}\cdot 3^{5}}$$

$$= 2.$$

Solution-07.

(i) $5^{2n} \times 5^{3} = 5^{11}$

Bases are equal, Then powers should be added

$2n+3 = 11$

$2n = 11-3$

$n = \frac{8}{2}$

$n = 4$.

(ii) $9 \times 3^{n} = 3^{7}$

$3^{2} \times 3^{n} = 3^{7}$

$3^{2+n} = 3^{7}$

$2+n = 7$

$n = 7-2$

$n = 5$.

(iii) $8 \times 2^{n+2} = 32$

$2^{3} \times 2^{n+2} = 32$

$2^{n+5} = 32 = 2^{5}$

$n+5 = 5$

$n = 5-5$

$n = 0$

(iv) $7^{2n+1} \div 49 = 7^3$

$$\frac{7^{2n+1}}{7^2} = 7^3$$

$$7^{2n+1-2} = 7^3$$

$$2n-1 = 3$$

$$2n = 3+1$$

$$2n = 4.$$

$$n = 2.$$

(v) $\left(\frac{3}{2}\right)^4 \times \left(\frac{3}{2}\right)^5 = \left(\frac{3}{2}\right)^{2n+1}$

$$\left(\frac{3}{2}\right)^{4+5} = \left(\frac{3}{2}\right)^{2n+1}$$

$$9 = 2n+1$$

$$\Rightarrow 2n = 9-1$$

$$\Rightarrow 2n = 8$$

$$\Rightarrow n = \frac{8}{2}.$$

$$\Rightarrow n = 4.$$

(vi) $\left(\frac{2}{3}\right)^{10} + \left\{\left(\frac{3}{2}\right)^2\right\}^5 = \left\{\frac{2}{5}\right\}^{2n-2}$

$$\Rightarrow \frac{2^{10}}{3^{10}} + \frac{3^{10}}{2^{10}} = \left(\frac{2}{5}\right)^{2n-2}$$

$$\Rightarrow \frac{2^{20} + 3^{20}}{2^{10}.3^{10}} = \left(\frac{2}{5}\right)^{2n-2}$$

$$\Rightarrow \frac{2^{20}+3^{20}}{2^{8}\,\cancel{2^{10}}\times 3^{10}} \times \frac{\cancel{2^{2}}}{\cancel{5^{2}}} = \frac{2^{2n}}{5^{2n}}$$

$$\Rightarrow \frac{2^{20}+3^{20}}{2^{8}\cdot 5^{2}\cdot 3^{10}} = \frac{2^{2n}}{5^{2n}} \Rightarrow \frac{2^{20}}{2^{8}\cdot 5^{2}\cdot 3^{10}} + \frac{3^{20}}{2^{8}\cdot 5^{2}\cdot 3^{10}} = \frac{2^{2n}}{5^{2n}}$$

$$\Rightarrow \frac{2^{12}}{5^{2}\times 3^{10}} + \frac{3^{10}}{2^{8}\times 25} = \frac{2^{2n}}{5^{2n}}$$

$\rightarrow$ Question is wrong.

<u>Solution-08</u> :-

$$\frac{9^{n}\times 3^{2}\times 3^{n}-(27)^{n}}{(3^{3})^{5}\times 2^{3}} = \frac{1}{27}$$

$$\Rightarrow \frac{3^{2n+2+n}-3^{3n}}{3^{15}\times 2^{3}} = \frac{1}{27}$$

$$\Rightarrow 3^{2n+2+n}-3^{3n} = 3^{12}\times 2^{3}$$

$$\Rightarrow 3^{3n+2}-3^{3n} = 3^{12}\times 2^{3}$$

$$\Rightarrow 3^{2n}[3^{2}-1] = 3^{12}\times 2^{3}$$

$$\Rightarrow 3^{2n}\times 8 = 3^{12}\times 8$$

$$\Rightarrow 3^{2n} = 3^{12}$$

$$2n = 12$$

$$n = \frac{12}{2}$$

$$\boxed{n=6}$$

7.

(vi) $\frac{2^{\cancel{10}}}{3^{\cancel{10}}} * \frac{\cancel{(3^2)^5}}{\cancel{(2^2)^5}} = \left(\frac{2}{5}\right)^{2n-2}$

$\Rightarrow \quad 1 = \left(\frac{2}{5}\right)^{2n-2}$

$\Rightarrow \quad \left(\frac{2}{5}\right)^{0} = \left(\frac{2}{5}\right)^{2n-2} \qquad [\because a^0 = 1]$

$\Rightarrow \quad 2n - 2 = 0$

$\Rightarrow \quad 2n = 2$

$\Rightarrow \quad n = 1.$

Exercise- 6.3.

1. (i) 3908.78

we have,

3908.78

clearly, the decimal point is moved through ~~five~~ three places to obtain a number in which there is must one digit to the left of the decimal point

$\therefore 3908.78 = 3.90878 \times 10^3$

(ii) $5,00,000,000 = 5.0000000 \times 10^7$

$= 5 \times 10^7$

(iii) we have,

$3,18,65,00,000 = 3.1865000000000 \times 10^9$

$= 3.1865 \times 10^9$

(iv) $846 \times 10^7 = 8.46 \times 10^2 \times 10^7$

$= 8.46 \times 10^{2+7}$

$= 8.46 \times 10^9$.

Solution-02:-

(i) $4.83 \times 10^7 = \frac{483 \times 10^7}{10^2}$

$= 4,83,00,000$

(ii) $3.21 \times 10^5 = 321,000$

(iii) $3.5 \times 10^3 = 3,500$

Solution-02:-

(i) ~~3~~ $384,000,000 = 3.84 \times 10^8$ m.

(ii) $1,27,56,000 = 1.2756 \times 10^7$ m

(iii) $1,400,000,000 = 1.4 \times 10^9$ m.

(iv) ~~12~~ $12,000,000,000 = 1.2 \times 10^{10}$ years old.

Exercise - 6.4

1> (i) we know that a number can be written as the sum of the place values of all digits of the numbers.

$200068 = 2\times10000 + 0\times10^3 + 0\times100 + 6\times10^1 \times$
8×10^0

$= 2\times10^4 + 0\times10^3 + 0\times10^2 + 6\times10^1 + 8\times10^0$

(ii) $420719 = 4\times10^5 + 2\times10^4 + 0\times10^3 + 7\times10^2$
$+ 1\times10^1 + 9\times10^0.$

(iii) $7805192 = 7\times10^6 + 8\times10^5 + 0\times10^4 + 5\times10^3 +$
$1\times10^2 + 9\times10^1 + 2\times10^0.$

(iv) $5004132 = 5\times10^6 + 0\times10^5 + 0\times10^4 + 4\times10^3 + 1\times10^2$
$+ 3\times10^1 + 2\times10^0$

(v) $927303 = 9\times10^5 + 2\times10^4 + 7\times10^3 + 3\times10^2 + 0\times10^1$
$+ 3\times10^0.$

Solution -02.

(i) $7\times10^4 + 6\times10^3 + 0\times10^2 + 4\times10^1 + 5\times10^0 = 76045$

(ii) $5\times10^5 + 4\times10^4 + 2\times10^3 + 3\times10^0 = 542003$

(iii) $9\times10^5 + 5\times10^2 + 3\times10^1 = 900530$

(iv) $3\times10^4 + 4\times10^2 + 5\times10^0 = 30405$