

Unit 4

EXPONENTS

EXERCISE NO. 4.1

Q.1 Expand and find the value of each exponential form.

(i) 3^2 :

Solution:

$$3^2 = 3 \times 3 = 9$$

$$3 \times 3 = 9$$

Ans: = 9

(ii) 2^7 :

Solution:

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$$

Ans: = 128

(iii) $2^3 \times 2^4$:

Solution:

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

$$2^4 = 2 \times 2 \times 2 \times 2$$

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$$

Ans: = 128

(iv) $5^2 \times 7^2$:

Solution:

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

$$7^2 = 7 \times 7$$

$$5 \times 5 \times 7 \times 7$$

• **Ans:** $= 5 \times 5 \times 7 \times 7$ and $1 \times 2 \times 2 \times 5$

(v) $2^3 \times 3^3 \times 5^2$:

Solution:

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

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

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

Ans: $= 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$

(vi) $2^4 \times 3^3 \times 7^2$:

Solution:

$$2^4 = 2 \times 2 \times 2 \times 2$$

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

$$7^2 = 7 \times 7$$

Ans: $= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 7 \times 7 = 21168$

2. Identify the base and exponent the following expression. Also find the value of each of:

(i) 2^5 :

Solution:

$$2 \times 2 \times 2 \times 2 \times 2 = 32$$

$$\text{Base} = 2$$

$$\text{Exponent} = 5$$

$$\text{Value} = 32$$

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(ii) 5^4 :

Solution:

$$5 \times 5 \times 5 \times 5 = 625$$

$$\text{Base} = 5$$

$$\text{Exponent} = 4$$

$$\text{Value} = 625$$

(iii) 6^3 :

Solution:

$$6 \times 6 \times 6 = 216$$

$$\text{Base} = 6$$

$$\text{Exponent} = 3$$

$$\text{Value} = 216$$

(iv) $\left[\frac{2}{3}\right]^6$:

Solution:

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$$

$$3 \times 3 \times 3 \times 3 \times 3 \times 3 = 729$$

$$\text{Base} = \frac{2}{3}$$

$$\text{Exponent} = 6$$

$$\text{Value} = \frac{64}{729}$$

(v) $\left[-\frac{1}{5}\right]^7$:

Solution:

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

$$5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 = 78125$$

$$\text{Base} = \frac{1}{5}$$

$$\text{Exponent} = 7$$

$$\text{Value} = \frac{1}{78125}$$

3. Show that:

(i) $(-3)^3 = -27$:

Solution:

$$\begin{aligned} \text{L.H.S} &= (-3)^3 \\ &= -3 \times -3 \times -3 = -27 \end{aligned}$$

$$\text{R.H.S} = -27$$

$$\text{L.H.S} = \text{R.H.S}$$

(ii) $\left[\frac{1}{2}\right]^7 = \frac{1}{128}$

Solution:

$$\begin{aligned} \text{L.H.S} &= \left[\frac{1}{2}\right]^7 \\ &= 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 = 1 \\ &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128 \\ &= \frac{1}{128} \end{aligned}$$

$$\text{R.H.S} = \frac{1}{128}$$

$$\text{L.H.S} = \text{R.H.S}$$

$$(iii) \left[\frac{1}{4} \right]^4 = \frac{1}{256}:$$

Solution:

$$\begin{aligned} L.H.S &= \left[\frac{1}{4} \right]^4 \\ &= 1 \times 1 \times 1 \times 1 = 1 \\ &= 4 \times 4 \times 4 \times 4 = 256 \\ &= \frac{1}{256} \end{aligned}$$

$$R.H.S = \frac{1}{256}$$

$$L.H.S = R.H.S$$

$$(iv) \left[-\frac{1}{10} \right]^6 = \frac{1}{1000000}:$$

Solution:

$$\begin{aligned} L.H.S &= \left[-\frac{1}{10} \right]^6 \\ &= -1 \times 1 \times 1 \times 1 \times 1 \times 1 = 1 \\ &= -10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1000000 \\ &= \frac{1}{1000000} \end{aligned}$$

$$R.H.S = \frac{1}{1000000}$$

$$L.H.S = R.H.S$$

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$$(v) \left[-\frac{5}{3} \right]^4 = \frac{625}{81} :$$

Solution:

$$\begin{aligned} \text{L.H.S} &= \left[-\frac{5}{3} \right]^4 \\ &= -5 \times 5 \times 5 \times 5 = 625 \\ &= -3 \times 3 \times 3 \times 3 = 81 \\ &= \frac{625}{81} \\ \text{R.H.S} &= \frac{625}{81} \\ \text{L.H.S} &= \text{R.H.S} \end{aligned}$$

$$(vi) \left[\frac{4}{5} \right]^5 = \frac{1024}{3125} :$$

Solution:

$$\begin{aligned} \text{L.H.S} &= \left[\frac{4}{5} \right]^5 \\ &= 4 \times 4 \times 4 \times 4 \times 4 = 1024 \\ &= 5 \times 5 \times 5 \times 5 \times 5 = 3125 \\ &= \frac{1024}{3125} \\ \text{R.H.S} &= \frac{1024}{3125} \\ \text{L.H.S} &= \text{R.H.S} \end{aligned}$$

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4. Express each rational numbers in exponential form:

(i) 1000:

Solution:

$$\begin{aligned} &= 1000 \\ &= 10 \times 10 \times 10 = 1000 \\ &= 10^3 \end{aligned}$$

Ans: $= 10^3$

(ii) 512:

Solution:

$$\begin{aligned} &= 512 \\ &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 512 \\ &= 2^9 \end{aligned}$$

Ans: $= 2^9$

(iii) -343:

Solution:

$$\begin{aligned} &= -343 \\ &= -7 \times -7 \times -7 = -343 \\ &= -7^3 \end{aligned}$$

Ans: $= (-7)^3$

(iv) 625:

Solution:

$$\begin{aligned} &= 625 \\ &= 5 \times 5 \times 5 \times 5 = 625 \\ &= 5^4 \end{aligned}$$

Ans: $= 5^4$

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$$(v) -\frac{1}{100000} :$$

Solution:

$$\begin{aligned} &= -\frac{1}{100000} \\ &= \frac{1}{100000} \\ &= -1 \times 1 \times 1 \times 1 \times 1 = -1 \\ &= -10 \times 10 \times 10 \times 10 \times 10 = -10^5 \\ &= -\frac{1}{10^5} \end{aligned}$$

$$\text{Ans:} = \left[-\frac{1}{10} \right]^5$$

$$(vi) -\frac{125}{343} :$$

Solution:

$$\begin{aligned} &= -\frac{125}{343} \\ &= -\frac{5 \times 5 \times 5}{7 \times 7 \times 7} = -\frac{125}{343} \\ &= -\frac{125}{343} = -\frac{5^3}{7^3} \end{aligned}$$

$$\begin{aligned} &= \left[-\frac{5}{7} \right]^3 \\ \text{Ans:} &= \left[-\frac{5}{7} \right]^3 \end{aligned}$$

(vii) $\frac{32}{243} :$

Solution:

$$= \frac{32}{243}$$

$$= 2 \times 2 \times 2 \times 2 \times 2 = 32$$

$$= 3 \times 3 \times 3 \times 3 \times 3 = 243$$

$$= \frac{32}{243} = \frac{2^5}{3^5}$$

$$= \left[\frac{2}{3} \right]^5$$

Ans: $= \left[\frac{2}{3} \right]^5$

(viii) $\frac{729}{64} :$

Solution:

$$= \frac{729}{64}$$

$$= 9 \times 9 \times 9 = 729$$

$$= 4 \times 4 \times 4 = 64$$

$$= \frac{729}{64} = \left[\frac{9}{4} \right]^3 = \left[\frac{3}{2} \right]^3$$

Ans: $= \left[\frac{3}{2} \right]^3$

EXERCISE 4.2

1. Simplify using product law.

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

Solution:

$$= \left[\frac{5}{7}\right]^2 \times \left[\frac{5}{7}\right]^3$$

$$= \left[\frac{5}{7}\right]^{4+2}$$

$$= \left[\frac{5}{7}\right]^6$$

Ans: $= \left[\frac{5}{7}\right]^6$

(ii) $\left[\frac{3}{4}\right]^6 \times \left[\frac{1}{5}\right]^6$

Solution:

$$= \left[\frac{3}{4}\right]^6 \times \left[\frac{1}{5}\right]^6$$

$$= \left[\frac{3}{4}\right]^6 \times \left[\frac{1}{5}\right]^6 = \left[\frac{3}{4} \times \frac{1}{5}\right]^6 = \left[\frac{3}{20}\right]^6$$

$$= \left[\frac{3}{20}\right]^6$$

Ans: $= \left[\frac{3}{20}\right]^6$

(iii) $\left[\frac{1}{7}\right]^5 \times \left[\frac{1}{7}\right]^5 \times \left[-\frac{5}{7}\right]^8 \times \left[-\frac{5}{7}\right]^8$:

Solution:

$$\begin{aligned} &= \left[\frac{1}{7}\right]^5 \times \left[\frac{1}{7}\right]^5 \times \left[-\frac{5}{7}\right]^8 \times \left[-\frac{5}{7}\right]^8 \\ &= \left[\frac{1}{7}\right]^5 \times \left[\frac{1}{7}\right]^5 = \left[\frac{1}{7}\right]^{5+5} = \left[\frac{1}{7}\right]^{10} \\ &= \left[-\frac{5}{7}\right]^8 \times \left[-\frac{5}{7}\right]^8 = \left[-\frac{5}{7}\right]^{8+8} = \left[-\frac{5}{7}\right]^{16} \\ \text{Ans: } &= \left[\frac{1}{7}\right]^{10} \times \left[\frac{5}{7}\right]^{16} \end{aligned}$$

(iv) $P^6 \times P^7$:

Solution:

$$\begin{aligned} &= P^6 \times P^7 \\ &= P^{6+7} \\ &= P^{13} \\ \text{Ans: } &= P^{13} \end{aligned}$$

(v) $y^5 \times x^{11} \times y^6$:

Solution:

$$\begin{aligned} &= x^{11} \times y^5 \times y^6 = y^{5+6} \\ &= y^{11} = (xy)^{11} \\ \text{Ans: } &= (xy)^{11} \end{aligned}$$

(vi) $\left[\frac{4}{3}\right]^5 \times \left[\frac{4}{3}\right]^6 \times \left[\frac{4}{3}\right]^7$:

Solution:

$$\begin{aligned} &= \left[\frac{4}{3}\right]^5 \times \left[\frac{4}{3}\right]^6 \times \left[\frac{4}{3}\right]^7 \\ &= \left[\frac{4}{3}\right]^{5+6+7} = \left[\frac{4}{3}\right]^{18} \\ \text{Ans: } &= \left[\frac{4}{3}\right]^{18} \end{aligned}$$

(vii) $y^5 \times y^6 \times x^2 \times y^7$:

Solution:

$$= y^5 \times y^6 \times y^7 \times x^2$$

$$= x^{2+5} = x^7$$

$$= y^{5+6+7} = y^{13}$$

Ans: $x^7 y^{13}$

(viii) $\left[-\frac{1}{3}\right]^6 \times \left[-\frac{1}{3}\right]^5 \times \left[\frac{1}{3}\right]^3$:

Solution:

$$= \left[-\frac{1}{3}\right]^6 \times \left[-\frac{1}{3}\right]^5 \times \left[\frac{1}{3}\right]^3$$

$$= \left[-\frac{1}{3}\right]^{6+5+3} = \left[-\frac{1}{3}\right]^{14}$$

Ans: $\left[\frac{1}{3}\right]^{14}$

(ix) $x^5 \times y^5 \times z^5$:

Solution:

$$= x^5 \times y^5 \times z^5$$

$$= (x \times y \times z)^5$$

Ans: $(x \times y \times z)^5$

(x) $p^2 \times q^7 \times p^5$:

Solution:

$$= p^2 \times q^7 \times p^5$$

$$= p^2 \times p^5 = p^7$$

Ans: $p^7 \times q^7$

2. Show that:

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

Solution:

$$\begin{aligned} \text{L.H.S} &= 2^5 \times 3^5 \\ &= 2^5 \times 3^5 = 6^5 \\ &= 6^5 \end{aligned}$$

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

L.H.S = R.H.S verified

(ii) $p^7 \times q^7 = (pq)^7$:

Solution:

$$\begin{aligned} \text{L.H.S} &= p^7 \times q^7 \\ &= p^7 \times q^7 = (pq)^7 \\ &= (pq)^7 \end{aligned}$$

$$\text{R.H.S} = (pq)^7$$

L.H.S = R.H.S verified

(iii) $\left[\frac{3}{4}\right]^4 \times \left[\frac{3}{4}\right]^8 = \left[\frac{3}{4}\right]^{12}$:

Solution:

$$\begin{aligned} \text{L.H.S} &= \left[\frac{3}{4}\right]^4 \times \left[\frac{3}{4}\right]^8 \\ &= \left[\frac{3}{4}\right]^{4+8} = \left[\frac{3}{4}\right]^{12} \\ &= \left[\frac{3}{4}\right]^{12} \end{aligned}$$

$$\text{R.H.S} = \left[\frac{3}{4}\right]^{12}$$

L.H.S = R.H.S verified

$$(iv) \left[\frac{1}{7} \right]^4 \times \left[\frac{1}{7} \right]^5 = \left[\frac{1}{7} \right]^9;$$

Solution:

$$\begin{aligned} L.H.S &= \left[\frac{1}{7} \right]^4 \times \left[\frac{1}{7} \right]^5 \\ &= \left[\frac{1}{7} \right]^{4+5} = \left[\frac{1}{7} \right]^9 \\ &= \left[\frac{1}{7} \right]^9 \\ R.H.S &= \left[\frac{1}{7} \right]^9 \end{aligned}$$

L.H.S = R.H.S verified

$$(v) \left[-\frac{1}{8} \right]^6 \times \left[-\frac{3}{5} \right]^6 = \left[\frac{3}{40} \right]^6$$

Solution:

$$\begin{aligned} L.H.S &= \left[-\frac{1}{8} \right]^6 \times \left[-\frac{3}{5} \right]^6 \\ &= \left[-\frac{1}{8} \right]^6 \times \left[-\frac{3}{5} \right]^6 = \left[\frac{1}{8} \times \frac{3}{5} \right]^6 \\ &= \left[\frac{1}{8} \times \frac{3}{5} \right]^6 = \left[\frac{3}{40} \right]^6 \\ R.H.S &= \left[\frac{3}{40} \right]^6 \end{aligned}$$

L.H.S = R.H.S verified

EXERCISE 4.3

1. Simplify by using quotient law.

(i) $5^7 \div 5^4$:

Solution:

$$\begin{aligned} &= 5^7 \div 5^4 \\ &= \frac{5^{7-4}}{5} = 5^3 \\ &= 5^3 = 125 \end{aligned}$$

Ans: $= 125$ or 5^3

(ii) $\left[\frac{5}{7}\right]^5 \div \left[\frac{5}{7}\right]^3$:

Solution:

$$\begin{aligned} &= \left[\frac{5}{7}\right]^5 \div \left[\frac{5}{7}\right]^3 \\ &= \left[\frac{5}{7}\right]^{5-3} = \left[\frac{5}{7}\right]^2 \\ &= 5 \times 5 \times 5 = 125 \\ &= 7 \times 7 \times 7 = 343 \end{aligned}$$

Ans: $= \left[\frac{5}{7}\right]^2$ or 343

(iii) $\left[\frac{1}{2}\right]^6 \div \left[\frac{1}{2}\right]^2$:

Solution:

$$\begin{aligned} &= \left[\frac{1}{2}\right]^6 \div \left[\frac{1}{2}\right]^2 \\ &= \left[\frac{1}{2}\right]^{6-2} = \left[\frac{1}{2}\right]^4 \\ &= 1 \times 1 \times 1 \times 1 = 1 \\ &= 2 \times 2 \times 2 \times 2 = 16 \end{aligned}$$

$$\begin{aligned} &= \left[\frac{1}{2}\right]^4 \\ \text{Ans: } &= \left[\frac{1}{4}\right]^4 \text{ or } \frac{1}{16} \end{aligned}$$

(iv) $x^{10} \div x^4$

Solution:

$$\begin{aligned} &= x^{10} \div x^4 \\ &= x^{10-4} = x^6 \end{aligned}$$

Ans: $= x^6$

(v) $(5)^6 \div (3)^6$:

Solution:

$$\begin{aligned} &= (5)^6 \div (3)^6 \\ &= \left(\frac{5}{3}\right)^6 \\ &= 5 \times 5 \times 5 \times 5 \times 5 \times 5 = 15625 \\ &= 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 729 \end{aligned}$$

Ans: $= \left(\frac{5}{3}\right)^6$ or $\frac{15625}{729}$

(vi) $[10]^5 \div [2]^5$:

Solution:

$$\begin{aligned} &= [10]^5 \div [2]^5 \\ &= \left[\frac{10}{2}\right]^5 = (5)^5 \end{aligned}$$

Ans: $= 5^5$ or 3125

(vii) $(-7)^4 \div (-5)^4$:

Solution:

$$\begin{aligned} &= (-7)^4 \div (-5)^4 \\ &= \left(\frac{7}{5}\right)^4 \\ &= 7 \times 7 \times 7 \times 7 = 2401 \\ &= 5 \times 5 \times 5 \times 5 = 625 \end{aligned}$$

Ans: $= \left(\frac{7}{5}\right)^4$ or $\frac{2401}{625}$

(viii) $\left[\frac{2}{5}\right]^6 \div \left[\frac{3}{5}\right]^6$:

Solution:

$$\begin{aligned} &= \left[\frac{2}{5}\right]^6 \div \left[\frac{3}{5}\right]^6 \\ &= \left[\frac{2}{5} \times \frac{5}{3}\right]^6 \end{aligned}$$

Ans: $= \left[\frac{2}{3}\right]^6 = \frac{64}{729}$

(ix) $\left[\frac{7}{11}\right]^6 \div \left[\frac{7}{11}\right]^5$:

Solution:

$$\begin{aligned} &= \left[\frac{7}{11}\right]^6 \div \left[\frac{7}{11}\right]^5 \\ &= \left[\frac{7}{11}\right]^{6-5} = \left[\frac{7}{11}\right] \end{aligned}$$

Ans: $= \frac{7}{11}$

(x) $x^4 \div y^4$:

Solution:

$$= x^4 \div y^4$$

$$= \frac{x^4}{y^4}$$

Ans: $= \frac{x^4}{y^4}$

2. Verify:

(i) $\left[\frac{2}{9}\right]^5 \div \left[\frac{2}{9}\right]^2 = 2^3 \div 9^3$:

Solution:

$$L.H.S = \left[\frac{2}{9}\right]^5 \div \left[\frac{2}{9}\right]^2$$

$$= \left[\frac{2}{9}\right]^{5-2} = \left[\frac{2}{9}\right]^3$$

$$= \left[\frac{2}{9}\right]^3$$

$$R.H.S = 2^3 \div 9^3$$

$$= \left[\frac{2}{9}\right]^3$$

$$L.H.S = R.H.S \text{ verified}$$

$$(ii) \quad [-3]^8 \div [-5]^8 = \left[\frac{3}{5}\right]^{10} \div \left[\frac{3}{5}\right]^2;$$

Solution:

$$L.H.S = [-3]^8 \div [-5]^8$$

$$= \left[\frac{3}{5}\right]^8$$

$$R.H.S = \left[\frac{3}{5}\right]^{10} \div \left[\frac{3}{5}\right]^2$$

$$= \left[\frac{3}{5}\right]^{10-2} = \left[\frac{3}{5}\right]^8$$

$$= \left[\frac{3}{5}\right]^8$$

L.H.S = R.H.S verified

$$(iii) \quad \left[\frac{x}{y}\right]^7 \div \left[\frac{x}{y}\right]^5 = x^2 \div y^2;$$

Solution:

$$L.H.S = \left[\frac{x}{y}\right]^7 \div \left[\frac{x}{y}\right]^5$$

$$= \left[\frac{x}{y}\right]^{7-5} = \left[\frac{x}{y}\right]^2$$

$$= \left[\frac{x}{y}\right]^2$$

$$R.H.S = x^2 \div y^2$$

$$= x^2 \div y^2 = \left[\frac{x}{y}\right]^2$$

$$= \left[\frac{x}{y}\right]^2$$

L.H.S = R.H.S verified

(iv) $5^{11} \div 5^8 = (20)^3 \div (4)^3$:

Solution:

$$\begin{aligned} \text{L.H.S} &= 5^{11} \div 5^8 \\ &= 5^{11-8} = 5^3 \\ &= 5^3 \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= (20)^3 \div (4)^3 \\ &= \left[\frac{20}{4} \right]^3 = 5^3 \\ &= 5^3 \end{aligned}$$

L.H.S = R.H.S verified

EXERCISE 4.4

1. Simplify using power law:

(i) $(5^2)^7$:

Solution:

$$\begin{aligned} &= (5^2)^7 \\ &= (5)^{2 \times 7} \end{aligned}$$

Ans: $= 5^{14}$

(ii) $\left[\left(\frac{1}{3} \right)^6 \right]^8$:

Solution:

$$= \left[\left(\frac{1}{3} \right)^6 \right]^8$$

$$= \left[\frac{1}{3} \right]^{6 \times 8} = \left[\frac{1}{3} \right]^{48}$$

Ans: $= \left[\frac{1}{3} \right]^{48}$

$$(iii) \{(-3)^2\}^{10} :$$

Solution:

$$= \{(-3)^2\}^{10}$$

$$= (-3)^{2 \times 10}$$

$$= 3^{20}$$

Ans: $= 3^{20}$

$$(iv) [x^5]^{20} :$$

Solution:

$$= [x^5]^{20}$$

$$= (x)^{5 \times 20}$$

$$= x^{100}$$

Ans: $= x^{100}$

$$(v) \left\{\left(\frac{4}{7}\right)^9\right\}^2 :$$

Solution:

$$= \left\{\left(\frac{4}{7}\right)^9\right\}^2$$

$$= \left(\frac{4}{7}\right)^{9 \times 2}$$

$$= \left(\frac{4}{7}\right)^{18}$$

$$= \left[\frac{4}{7}\right]^{18}$$

Ans: $= \left[\frac{4}{7}\right]^{18}$

$$(vi) \left\{\left[-\frac{3}{4}\right]^{20}\right\}^2 :$$

Solution:

$$= \left\{\left[-\frac{3}{4}\right]^{20}\right\}^2$$

$$= \left[-\frac{3}{4}\right]^{20 \times 2}$$

$$= \left[-\frac{3}{4}\right]^{20 \times 2}$$

$$= \left[-\frac{3}{4}\right]^{40}$$

Ans: $= \left[\frac{3}{4}\right]^{40}$

2. Convert into Negative exponent:

$$(i) \frac{1}{5^2} :$$

Solution:

$$= \frac{1}{5^2}$$

$$= 5^{-2}$$

Ans: $= 5^{-2}$

$$(ii) \frac{1}{3^7} :$$

Solution:

$$= \frac{1}{3^7}$$

$$= 3^{-7}$$

Ans: $= 3^{-7}$

2. Simplify using of law of exponent.

(i) $\left[-\frac{1}{2}\right]^4 \times \left[-\frac{1}{2}\right]^2 :$

Solution:

$$\begin{aligned} &= \left[-\frac{1}{2}\right]^{4+2} = \left[-\frac{1}{2}\right]^6 \\ &= \left[-\frac{1}{2}\right]^6 = \frac{1}{64} \\ &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64 \end{aligned}$$

Ans: $= \frac{1}{64}$

(ii) $\left[-\frac{4}{5}\right]^2 \times \left[-\frac{4}{5}\right]^2 :$

Solution:

$$\begin{aligned} &= \left[-\frac{4}{5}\right]^{2+2} = \left[-\frac{4}{5}\right]^4 \\ &= \frac{4 \times 4 \times 4 \times 4}{5 \times 5 \times 5 \times 5} = \frac{256}{625} \end{aligned}$$

Ans: $= \frac{256}{625}$

(iii) $6^7 \div 6^4 :$

Solution:

$$\begin{aligned} &= 6^{7-4} \\ &= 6^3 \\ &= 6 \times 6 \times 6 = 216 \end{aligned}$$

Ans: $= 216$

$$(iv) \left[\frac{2}{7} \right]^5 \div \left[\frac{2}{7} \right]^3 :$$

Solution:

$$\begin{aligned} &= \left[\frac{2}{7} \right]^{5-3} \\ &= \left[\frac{2}{7} \right]^2 = \frac{2 \times 2}{7 \times 7} = \frac{4}{49} \end{aligned}$$

$$\text{Ans:} = \frac{4}{49}$$

$$(v) [3^2]^5 :$$

Solution:

$$\begin{aligned} &= [3]^{2 \times 5} \\ &= [3]^{10} \\ &= 3^{10} \end{aligned}$$

$$\text{Ans:} = 3^{10}$$

$$(vi) [(-4)^2]^5 :$$

Solution:

$$\begin{aligned} &= [-4]^{2 \times 5} \\ &= 4^{10} \end{aligned}$$

$$\text{Ans:} = 4^{10}$$

$$(vii) [6^0]^2 :$$

Solution:

$$\begin{aligned} &= [6^0]^{0 \times 2} \\ &= [6]^0 = 6^0 = 1 \end{aligned}$$

$$\text{Ans:} = 1$$

(viii) $[5^0]^2 \times [-5] \times [a^0]^2$:

Solution:

$$\begin{aligned} &= [5^0]^2 \times [-5] \times [a^0]^2 \\ &= 5^{0 \times 2} \times -5 \times a^{0 \times 2} \\ &= 5^0 \times -5 \times a \\ &= 1 \times -5 \times 1 \end{aligned}$$

Ans: $= -5$

3. Verify:

(i) $\left[\frac{1}{5}\right]^4 \times \left[\frac{1}{5}\right]^5 = \left[\frac{3}{5}\right]^9 \times \left[\frac{1}{3}\right]^9$:

Solution:

$$\begin{aligned} \text{L.H.S} &= \left[\frac{1}{5}\right]^4 \times \left[\frac{1}{5}\right]^5 \\ &= \left[\frac{1}{5}\right]^{4+5} = \left[\frac{1}{5}\right]^9 \\ \text{R.H.S} &= \left[\frac{3}{5}\right]^9 \times \left[\frac{1}{3}\right]^9 \\ &= \left[\frac{3}{5} \times \frac{1}{3}\right]^9 = \left[\frac{1}{5}\right]^9 \\ \text{L.H.S} &= \text{R.H.S verified} \end{aligned}$$

(ii) $(6)^4 \div (2)^4 = 3^8 \div 3^4$:

Solution:

$$\text{L.H.S} = (6)^4 \div (2)^4$$

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

$$= 3^4$$

$$\text{R.H.S} = 3^8 \div 3^4$$

$$= 3^4$$

$$\text{L.H.S} = \text{R.H.S} \text{ verified}$$

(iii) $6z^0 = 6 = [z^0]^2$:

Solution:

$$\text{L.H.S} = 6z^0$$

$$= 6z^0 = 1$$

$$\text{R.H.S} = 6 = [z^0]^2$$

$$= 6z^0 = 1$$

$$\text{L.H.S} = \text{R.H.S} \text{ verified}$$

4. Which one is positive and which one is negative.

(i) $(-2)^7$:

Ans: Negative

(iii) $(-3)^8$:

Ans: Positive

(ii) $(-5)^0$:

Ans: Positive

(iv) $(-6)^{-7}$:

Ans: Negative

(v) $(-8)^{-10}$;

Ans: Positive

5. Simplify:

(i) $6^2 \div 3^3$;

Solution:

$$= 6^2 \div 3^3$$

$$= \frac{6^{2-3}}{3}$$

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

Ans: = 2

(ii) $5^0 \div 5^{-2} \times 5^2$;

Solution:

$$= 5^0 \div 5^{-2} \times 5^2$$

$$= 5^{-2} \times 5^2 = 5^4$$

$$= 1 \times 5^4$$

Ans: = 5^4

(iii) $\left\{\left(\frac{2}{5}\right)^2\right\}^3 \div \left[\left(\frac{3}{5}\right)^4\right] \times \left[\frac{2}{5}\right]^3$;

Solution:

$$= \left\{\left(\frac{2}{5}\right)^2\right\}^3$$

$$= \left(\frac{2}{5}\right)^{2 \times 3} = \left(\frac{2}{5}\right)^{6-4} = \left(\frac{2}{5}\right)^2$$

$$= \left[\frac{2}{5}\right]^2 \times \left[\frac{2}{5}\right]^3 = \left[\frac{2}{5}\right]^5$$

$$= \left[\frac{2}{5}\right]^5 = \frac{2 \times 2 \times 2 \times 2 \times 2}{5 \times 5 \times 5 \times 5 \times 5} = \frac{64}{3125}$$

Ans: = $\frac{2}{5} = \frac{64}{3125}$

6. Find the value of x:

(i) $25x = 125$:

Solution:

$$25x = 125$$

$$x = \frac{125}{25} = 25$$

$$x = \frac{25}{5} = 5$$

$$x = 5$$

Ans: $x = 5$

(ii) $\left[\frac{2}{3}\right]^x \times \left[\frac{2}{3}\right]^4 = \left[\frac{2}{3}\right]^{10} \div \left[\frac{2}{3}\right]^2$:

Solution:

$$= \left[\frac{2}{3}\right] \times \left[\frac{2}{3}\right]^4$$

$$= \left[\frac{2}{3}\right]^{4x} = \left[\frac{2}{3}\right]^{10} \div \left[\frac{2}{3}\right]^2$$

$$= \left[\frac{2}{3}\right]^{4x} = \left[\frac{2}{3}\right]^8$$

$$= 4x = 8$$

$$= x = \frac{8}{4} = 2$$

Ans: $x = 2$

$$(iii) \left\{ \left[\frac{2}{7} \right]^x \right\}^5 = \left[\frac{2}{7} \right]^{10} :$$

Solution:

$$= \left\{ \left[\frac{2}{7} \right]^x \right\}^5 = \left[\frac{2}{7} \right]^{10}$$

$$= \left[\frac{2}{7} \right]^{x5} = \left[\frac{2}{7} \right]^{10}$$

$$= x5 = 10$$

$$= x = \frac{10}{5} = 2$$

Ans: = x = 2

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