6. Indices

Practice Set 26

1. Complete the table below :

Sr. No.	Indices(numbers	Base	Index	Multiplication form	Value
(i)	3^4	3	4	$3 \times 3 \times 3 \times 3$	81
(ii)	16^3				
(iii)		(-8)	2		
(iv)				$\frac{3}{7} \times \frac{3}{7} \times \frac{3}{7} \times \frac{3}{7}$	$\frac{81}{2401}$
(v)	$(-13)^4$				

Ans. :

Sr. No.	Index from	Base	Index	Multiplication form	Value
(i)	3^4	3	4	$3 \times 3 \times 3 \times 3$	81
(ii)	16^3	16	3	$16 \times 16 \times 16$	4096
(iii)	$(-8)^2$	(-8)	2	$(-8) \times (-8)$	64
(iv)	$\left(\frac{3}{7}\right)^4$	$\frac{3}{7}$	4	$\frac{3}{7} \times \frac{3}{7} \times \frac{3}{7} \times \frac{3}{7}$	$\frac{81}{2401}$
(v)	$(-13)^4$	-13	4	$(-13) \times (-13) \times (-13) \times (-13)$	28561

2. Find the value.

(i) 2^{10}

Solution :

$$2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1024$$

$\therefore\ 2^{10} = 1024$

(ii) 5^3

Solution :

$$5^3 = 5 \times 5 \times 5 = 125$$

$\therefore\ 5^3 = 125$

(iii) $(-7)^4$

Solution :

$$(-7)^4 = (-7) \times (-7) \times (-7) \times (-7) = 2401$$

$\therefore\ (-7)^4 = 2401$

(iv) $(-6)^3$

Solution :

$$(-6)^3 = (-6) \times (-6) \times (-6) = -216$$

$\therefore\ (-6)^3 = -216$

(v) 8^1

Solution :

$$8^1 = 8$$

$$\therefore 8^1 = 8$$

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

Solution :

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

$$= \frac{4 \times 4 \times 4}{5 \times 5 \times 5} = \frac{64}{125}$$

$$\therefore \left(\frac{4}{5}\right)^3 = \frac{64}{125}$$

(viii) $\left(-\frac{1}{2}\right)^4$

Solution :

$$\left(-\frac{1}{2}\right)^4 = \left(-\frac{1}{2}\right) \times \left(-\frac{1}{2}\right) \times \left(-\frac{1}{2}\right) \times \left(-\frac{1}{2}\right)$$

$$= \frac{(-1) \times (-1) \times (-1) \times (-1)}{2 \times 2 \times 2 \times 2} = \frac{1}{16}$$

$$\therefore \left(-\frac{1}{2}\right)^4 = \frac{1}{16}$$

Practice Set 27

(1) Simplify.

(i) $7^4 \times 7^2$

Solution :

$7^4 \times 7^2$

$= 7^{4+2}$ ......($a^m \times a^n = a^{m+n}$)

$= 7^6$

$\therefore 7^4 \times 7^2 = 7^6$

(ii) $(-11)^5 \times (-11)^2$

Solution :

$(-11)^5 \times (-11)^2$

$= (-11)^{5+2}$ .....($a^m \times a^n = a^{m+n}$)

$= (-11)^7$

$\therefore (-11)^5 \times (-11)^2 = (-11)^7$

(iii) $\left(\frac{6}{7}\right)^3 \times \left(\frac{6}{7}\right)^5$

Solution :

$\left(\frac{6}{7}\right)^3 \times \left(\frac{6}{7}\right)^5$

$= \left(\frac{6}{7}\right)^{3+5}$ ……$(a^m \times a^n = a^{m+n})$

$= \left(\frac{6}{7}\right)^8$

$\therefore \left(\frac{6}{7}\right)^3 \times \left(\frac{6}{7}\right)^5 = \left(\frac{6}{7}\right)^8$

(iv) $\left(-\frac{3}{2}\right)^5 \times \left(-\frac{3}{2}\right)^3$

Solution :

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

$= \left(-\frac{3}{2}\right)^{5+3}$ …$(a^m \times a^n = a^{m+n})$

$= \left(-\frac{3}{2}\right)^8$

$\therefore \left(-\frac{3}{2}\right)^5 \times \left(-\frac{3}{2}\right)^3 = \left(-\frac{3}{2}\right)^8$

(v) $a^{16} \times a^{7}$

Solution :

$a^{16} \times a^{7}$

$= a^{16+7}$ $\quad\ldots(a^{m} \times a^{n} = a^{m+n})$

$= a^{23}$

$\therefore a^{16} \times a^{7} = a^{23}$

(vi) $\left(\frac{p}{5}\right)^{3} \times \left(\frac{p}{5}\right)^{7}$

Solution :

$\left(\frac{p}{5}\right)^{3} \times \left(\frac{p}{5}\right)^{7}$

$= \left(\frac{p}{5}\right)^{3+7}$ $\quad\ldots(a^{m} \times a^{n} = a^{m+n})$

$= \left(\frac{p}{5}\right)^{10}$

$\therefore \left(\frac{p}{5}\right)^{3} \times \left(\frac{p}{5}\right)^{7} = \left(\frac{p}{5}\right)^{10}$

Practice Set 28

(1) Simplify.

(i) $a^6 \div a^4$

Solution :

$a^6 \div a^4$

$= \ a^{6-4}$ .....$(a^m \div a^n = a^{m-n})$

$= \ a^2$

$\therefore \ a^6 \div a^4 = a^2$

(ii) $m^5 \div m^8$

Solution :

$m^5 \div m^8$

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

$= m^{-3}$

$\therefore \ m^5 \div m^8 = m^{-3}$

(iii) $p^3 \div p^{13}$

Solution :

$p^3 \div p^{13}$

$= p^{3-13}$ .....$(a^m \div a^n = a^{m-n})$

$= p^{-10}$

$\therefore\ p^3 \div p^{13} = p^{-10}$

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

Solution :

$x^{10} \div x^{10}$

$= x^{10-10}$ ....$(a^m \div a^n = a^{m-n})$

$= x^0$

$= 1$ ..... $(a^0 = 1)$

$\therefore\ x^{10} \div x^{10} = 1$

2. Find the value.

(i) $(-7)^{12} \div (-7)^{12}$

Solution :

$(-7)^{12} \div (-7)^{12}$

$= (-7)^{12-12}$ ....$(a^m \div a^n = a^{m-n})$

$= (-7)^0$

$= 1$ ....$(a^0 = 1)$

$\therefore (-7)^{12} \div (-7)^{12} = 1$

(ii) $7^5 \div 7^3$

Solution :

$7^5 \div 7^3$

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

$= 7^2$

$= 7 \times 7 = 49$

$\therefore 7^5 \div 7^3 = 49$

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

Solution :

$\left(\frac{4}{5}\right)^3 \div \left(\frac{4}{5}\right)^2$

$= \left(\frac{4}{5}\right)^{3-2}$ ...$(a^m \div a^n = a^{m-n})$

$= \left(\frac{4}{5}\right)^1 = \frac{4}{5}$ .....$(a^1 = 1)$

$\therefore \left(\frac{4}{5}\right)^3 \div \left(\frac{4}{5}\right)^2 = \frac{4}{5}$

(iv) $4^7 \div 4^5$

Solution :

$4^7 \div 4^5$

$= 4^{7-5}$ ....$(a^m \div a^n = a^{m-n})$

$= 4^2$

$= 4 \times 4 = 16$

$\therefore\ 4^7 \div 4^5 = 16$

Practice Set 29

(1) Simplify.

(i) $\left[\left(\frac{15}{12}\right)^3\right]^4$

Solution :

$\left[\left(\frac{15}{12}\right)^3\right]^4$

$= \left(\frac{15}{12}\right)^{3 \times 4}$ .....$[(a^m)^n = a^{m \times n}]$

$= \left(\frac{15}{12}\right)^{12}$

$\therefore \left[\left(\frac{15}{12}\right)^3\right]^4 = \left(\frac{15}{12}\right)^{12}$

(ii) $(3^4)^{-2}$

Solution :

$= 3^{4 \times (-2)}$ ….. $[(a^m)^n = a^{m \times n}]$

$= 3^{-8}$

$\therefore (3^4)^{-2} = 3^{-8}$

(iii) $\left[\left(\frac{1}{7}\right)^{-3}\right]^4$

Solution :

$\left[\left(\frac{1}{7}\right)^{-3}\right]^4$

$= \left(\frac{1}{7}\right)^{(-3) \times 4}$ ….. $[(a^m)^n = a^{m \times n}]$

$= \left(\frac{1}{7}\right)^{-12}$

$\therefore \left[\left(\frac{1}{7}\right)^{-3}\right]^4 = \left(\frac{1}{7}\right)^{-12}$

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

Solution :

$$\left[\left(\frac{2}{5}\right)^{-2}\right]^{-3}$$

$$= \left(\frac{2}{5}\right)^{(-2)\times(-3)} \quad \ldots\ldots \; [(a^m)^n = a^{m\times n}]$$

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

$$\therefore \left[\left(\frac{2}{5}\right)^{-2}\right]^{-3} = \left(\frac{2}{5}\right)^{6}$$

(v) $(6^5)^4$

Solution :

$$= (6^5)^4$$

$$= 6^{5\times4} \quad \ldots\ldots \; [(a^m)^n = a^{m\times n}]$$

$$= 6^{20}$$

$$\therefore (6^5)^4 = 6^{20}$$

(vi) $\left[\left(\frac{6}{7}\right)^{5}\right]^{2}$

Solution :

$$=\left[\left(\frac{6}{7}\right)^{5}\right]^{2}$$

$$=\left(\frac{6}{7}\right)^{5\times 2} \quad \ldots\ldots \left[(a^{m})^{n}=a^{m\times n}\right]$$

$$=\left(\frac{6}{7}\right)^{10}$$

$$\therefore \left[\left(\frac{6}{7}\right)^{5}\right]^{2}=\left(\frac{6}{7}\right)^{10}$$

(vii) $\left[\left(\frac{2}{3}\right)^{-4}\right]^{5}$

Solution :

$$\left[\left(\frac{2}{3}\right)^{-4}\right]^{5}$$

$$=\left(\frac{2}{3}\right)^{(-4)\times 5} \quad \ldots\ldots \left[(a^{m})^{n}=a^{m\times n}\right]$$

$$=\left(\frac{2}{3}\right)^{-20}$$

$$\therefore \left[\left(\frac{2}{3}\right)^{-4}\right]^{5}=\left(\frac{2}{3}\right)^{-20}$$

(viii) $\left[\left(\frac{5}{8}\right)^{3}\right]^{-2}$

Solution :

$\left[\left(\frac{5}{8}\right)^{3}\right]^{-2}$

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

$= \left(\frac{5}{8}\right)^{-6}$

$\therefore \left[\left(\frac{5}{8}\right)^{3}\right]^{-2} = \left(\frac{5}{8}\right)^{-6}$

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

Solution :

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

$\left(\frac{3}{4}\right)^{6\times1}$ ..... $[(a^{m})^{n} = a^{m\times n}]$

$\left(\frac{3}{4}\right)^{6}$

$\therefore \left[\left(\frac{3}{4}\right)^{6}\right]^{1} = \left(\frac{3}{4}\right)^{6}$

(x) $\left[\left(\frac{2}{5}\right)^{-3}\right]^{2}$

Solution :

$$\left[\left(\frac{2}{5}\right)^{-3}\right]^{2}$$

$$= \left(\frac{2}{5}\right)^{(-3)\times 2} \quad \ldots\ldots \; [(a^m)^n = a^{m\times n}]$$

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

$$\therefore \left[\left(\frac{2}{5}\right)^{-3}\right]^{2} = \left(\frac{2}{5}\right)^{-6}$$

2. Write the following numbers using positive indices.

(i) $\left(\frac{2}{7}\right)^{-2}$

Solution :

$$\left(\frac{2}{7}\right)^{-2} = \left(\frac{7}{2}\right)^{2} \quad \ldots\ldots. \left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^{m}$$

$$\therefore \left(\frac{2}{7}\right)^{-2} = \left(\frac{7}{2}\right)^{2}$$

(ii) $\left(\frac{11}{3}\right)^{-5}$

Solution :

$$\left(\frac{11}{3}\right)^{-5} = \left(\frac{3}{11}\right)^{5} \qquad \ldots\ldots\ldots \left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^{m}$$

$$\therefore \left(\frac{11}{3}\right)^{-5} = \left(\frac{3}{11}\right)^{5}$$

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

Solution :

$$\left(\frac{1}{6}\right)^{-3} = \left(\frac{6}{1}\right)^{3} \qquad \ldots\ldots\ldots \left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^{m}$$

$$= 6^3$$

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

(iv) $(y)^{-4}$

Solution :

$$(y)^{-4} = \frac{1}{y^4} \qquad \ldots\ldots\ldots \left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^{m}$$

$$\therefore (y)^{-4} = \frac{1}{y^4}$$

Practice Set 30

◘ Find the square root.

(i) 625

Solution :

$625 = 5 \times 125$

$= 5 \times 5 \times 25$

$= \underline{5 \times 5} \times \underline{5 \times 5}$

$= 5 \times 5 = 25$

(ii) 1225

Solution :

$1225 = 5 \times 245$

$= 5 \times 5 \times 49$

$= \underline{5 \times 5} \times \underline{7 \times 7}$

$= 5 \times 7 = 35$

$\therefore \sqrt{1225} = 35$

(iii) 289

Solution :

$289 = \underline{17 \times 17}$

$= 17$

$\therefore \sqrt{289} = 17$

(iv) 4096

Solution :

$$4096 = 2 \times 2048$$

$$= 2 \times 2 \times 1024$$

$$= 2 \times 2 \times 2 \times 512$$

$$= 2 \times 2 \times 2 \times 2 \times 256$$

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

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

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

$$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 16$$

$$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 8$$

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

$$= \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2}$$

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

$$\therefore \sqrt{4096} = 64$$

(v) 1089

Solution :

$$1089 = 3 \times 363$$

$$= 3 \times 3 \times 121$$

$$= \underline{3 \times 3} \times \underline{11 \times 11}$$

$$= 3 \times 11 = 33$$

$$\therefore \sqrt{1089} = 33$$

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