

6. घातांक

सरावसंच 26

1. पुढील सारणी पूर्ण करा.

अ.क्र.	घातांकित संख्या	पाया	घातांक	गुणाकार रूप	किंमत
(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)	$(-13)^4$	-----	.....	.....	.....

उत्तर :

अ.क्र.	घातांकित संख्या	पाया	घातांक	गुणाकार रूप	किंमत
(i)	3^4	3	4	$3 \times 3 \times 3 \times 3$	81
(ii)	16^3	<u>16</u>	<u>3</u>	<u>$16 \times 16 \times 16$</u>	<u>4096</u>
(iii)	<u>$(-8)^2$</u>	(-8)	2	<u>$(-8) \times (-8)$</u>	<u>64</u>
(iv)	<u>$\left(\frac{3}{7}\right)^4$</u>	<u>$\frac{3}{7}$</u>	<u>4</u>	$\frac{3}{7} \times \frac{3}{7} \times \frac{3}{7} \times \frac{3}{7}$	$\frac{81}{2401}$
(v)	$(-13)^4$	<u>-13</u>	<u>4</u>	<u>$(-13) \times (-13) \times (-13) \times (-13)$</u>	<u>28561</u>

2. किंमत काढा.

(i) 2^{10}

उकल :

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

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

(ii) 5^3

उकल :

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

$$\therefore 5^3 = 125$$

(iii) $(-7)^4$

उकल :

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

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

(iv) $(-6)^3$

उकल :

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

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

(v) 8^1

उकल :

$$8^1 = 8$$

$$\therefore 8^1 = 8$$

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

उकल :

$$\begin{aligned}\left(\frac{4}{5}\right)^3 &= \left(\frac{4}{5}\right) \times \left(\frac{4}{5}\right) \times \left(\frac{4}{5}\right) \\ &= \frac{4 \times 4 \times 4}{5 \times 5 \times 5} = \frac{64}{125}\end{aligned}$$

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

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

उकल :

$$\begin{aligned}\left(-\frac{1}{2}\right)^4 &= \left(-\frac{1}{2}\right) \times \left(-\frac{1}{2}\right) \times \left(-\frac{1}{2}\right) \times \left(-\frac{1}{2}\right) \\ &= \frac{(-1) \times (-1) \times (-1) \times (-1)}{2 \times 2 \times 2 \times 2} = \frac{1}{16}\end{aligned}$$

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

1. सोपे रूप द्या.

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

उकल :

$$7^4 \times 7^2$$

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

$$= 7^6$$

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

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

उकल :

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

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

$$= (-11)^7$$

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

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

उकल :

$$\begin{aligned} & \left(\frac{6}{7}\right)^3 \times \left(\frac{6}{7}\right)^5 \\ &= \left(\frac{6}{7}\right)^{3+5} \quad \dots\dots(a^m \times a^n = a^{m+n}) \\ &= \left(\frac{6}{7}\right)^8 \\ \therefore \left(\frac{6}{7}\right)^3 \times \left(\frac{6}{7}\right)^5 &= \left(\frac{6}{7}\right)^8 \end{aligned}$$

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

उकल :

$$\begin{aligned} & \left(-\frac{3}{2}\right)^5 \times \left(-\frac{3}{2}\right)^3 \\ &= \left(-\frac{3}{2}\right)^{5+3} \quad \dots(a^m \times a^n = a^{m+n}) \\ &= \left(-\frac{3}{2}\right)^8 \\ \therefore \left(-\frac{3}{2}\right)^5 \times \left(-\frac{3}{2}\right)^3 &= \left(-\frac{3}{2}\right)^8 \end{aligned}$$

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

उकल :

$$\begin{aligned} & a^{16} \times a^7 \\ &= a^{16+7} \quad \dots (a^m \times a^n = a^{m+n}) \\ &= a^{23} \\ \therefore a^{16} \times a^7 &= a^{23} \end{aligned}$$

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

उकल :

$$\begin{aligned} & \left(\frac{p}{5}\right)^3 \times \left(\frac{p}{5}\right)^7 \\ &= \left(\frac{p}{5}\right)^{3+7} \quad \dots (a^m \times a^n = a^{m+n}) \\ &= \left(\frac{p}{5}\right)^{10} \\ \therefore \left(\frac{p}{5}\right)^3 \times \left(\frac{p}{5}\right)^7 &= \left(\frac{p}{5}\right)^{10} \end{aligned}$$

1. सोपे रूप द्या.

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

उकल :

$$\begin{aligned} & a^6 \div a^4 \\ &= a^{6-4} && \text{.....}(a^m \div a^n = a^{m-n}) \\ &= a^2 \\ &\therefore a^6 \div a^4 = a^2 \end{aligned}$$

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

उकल :

$$\begin{aligned} & m^5 \div m^8 \\ &= m^{5-8} && \text{.....}(a^m \div a^n = a^{m-n}) \\ &= m^{-3} \\ &\therefore m^5 \div m^8 = m^{-3} \end{aligned}$$

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

उकल :

$$\begin{aligned} & p^3 \div p^{13} \\ &= p^{3-13} && \text{....}(a^m \div a^n = a^{m-n}) \\ &= p^{-10} \end{aligned}$$

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

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

उकल :

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

$$= x^{10-10}$$

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

$$= x^0$$

$$= 1 \quad(a^0 = 1)$$

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

2. किंमत काढा.

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

उकल :

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

$$= (-7)^{12-12}$$

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

$$= (-7)^0$$

$$= 1 \quad(a^0 = 1)$$

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

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

उकल :

$$7^5 \div 7^3$$

$$= 7^{5-3}$$

$$\dots(a^m \div a^n = a^{m-n})$$

$$= 7^2$$

$$= 7 \times 7 = 49$$

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

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

उकल :

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

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

$$\dots(a^m \div a^n = a^{m-n})$$

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

$$\dots\dots(a^1 = 1)$$

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

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

उकल :

$$4^7 \div 4^5$$

$$= 4^{7-5}$$

$$\dots(a^m \div a^n = a^{m-n})$$

$$= 4^2$$

$$= 4 \times 4 = 16$$

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

सरावसंच 29

1. सोपे रुप द्या.

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

उकल :

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

$$= \left(\frac{15}{12}\right)^{3 \times 4}$$

$$\dots [(a^m)^n = a^{mn}]$$

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

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

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

उकल :

$$\begin{aligned} & (3^4)^{-2} \\ &= 3^{4 \times (-2)} \dots [(a^m)^n = a^{mn}] \\ &= 3^{-8} \\ &\therefore (3^4)^{-2} = 3^{-8} \end{aligned}$$

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

उकल :

$$\begin{aligned} & \left[\left(\frac{1}{7} \right)^{-3} \right]^4 \\ &= \left(\frac{1}{7} \right)^{(-3) \times 4} \dots [(a^m)^n = a^{m \times n}] \\ &= \left(\frac{1}{7} \right)^{-12} \\ &\therefore \left[\left(\frac{1}{7} \right)^{-3} \right]^4 = \left(\frac{1}{7} \right)^{-12} \end{aligned}$$

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

उकल :

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

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

$$..... [(a^m)^n = a^{m \times n}]$$

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

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

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

उकल :

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

$$= 6^{5 \times 4}$$

$$..... [(a^m)^n = a^{m \times n}]$$

$$= 6^{20}$$

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

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

उकल :

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

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

$$..... [(a^m)^n = a^{m \times n}]$$

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

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

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

उकल :

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

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

$$..... [(a^m)^n = a^{m \times n}]$$

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

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

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

उकल :

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

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

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

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

$$\dots [(a^m)^n = a^{m \times n}]$$

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

उकल :

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

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

$$\dots [(a^m)^n = a^{m \times n}]$$

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

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

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

उकल :

$$\begin{aligned} & \left[\left(\frac{2}{5} \right)^{-3} \right]^2 \\ &= \left(\frac{2}{5} \right)^{(-3) \times 2} \quad \dots\dots [(a^m)^n = a^{m \times n}] \\ &= \left(\frac{2}{5} \right)^{-6} \\ &\therefore \left[\left(\frac{2}{5} \right)^{-3} \right]^2 = \left(\frac{2}{5} \right)^{-6} \end{aligned}$$

2. खालील संख्या धन घातांक वापरून लिहा.

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

उकल :

$$\begin{aligned} & \left(\frac{2}{7} \right)^{-2} = \left(\frac{7}{2} \right)^2 \quad \dots\dots \left(\frac{a}{b} \right)^{-m} = \left(\frac{b}{a} \right)^m \\ &\therefore \left(\frac{2}{7} \right)^{-2} = \left(\frac{7}{2} \right)^2 \end{aligned}$$

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

उकल :

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

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

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

उकल :

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

$$= 6^3$$

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

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

उकल :

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

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

■ वर्गमूल काढा.

(i) 625

उकल :

$$625 = 5 \times 125$$

$$= 5 \times 5 \times 25$$

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

$$= 5 \times 5 = 25$$

(ii) 1225

उकल :

$$1225 = 5 \times 245$$

$$= 5 \times 5 \times 49$$

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

$$= 5 \times 7 = 35$$

$$\therefore \sqrt{1225} = 35$$

(iii) 289

उकल :

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

$$= 17$$

$$\therefore \sqrt{289} = 17$$

(iv) 4096

उकल :

$$4096 = 2 \times 2048$$

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

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

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

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

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

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

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

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

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

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

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

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

(v) 1089

उकल :

$$1089 = 3 \times 363$$

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

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

$$= 3 \times 11 = 33$$

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