

અધ્યાય-13 (પાઠ અને શક્તિ પાઠ)

Chapter-13 (Exponents and Powers) ①

Ex 13.1

માહત્તી :- ઘણાં દરેકમાં મેથિમાટિક્સ હોય છે, મનજી
અને દરેકની જીવનમાં મેથિમાટિક્સ હોય છે. મેથિમાટિક્સ મેથિમાટિક્સ હોય છે, મનજી અને મેથિમાટિક્સ હોય છે. આ મેથિમાટિક્સ હોય છે.

Introduction:- Very large numbers are difficult to read, understand and compare. To make these numbers easy to read, understand and compare we use exponents.

પાઠ અને શક્તિ :- જો $10^4 = 10 \times 10 \times 10 \times 10$ હોય તો આમાં 10 બેઝ (base) અને 4 પાઠ અને શક્તિ હોય છે.
[આમાં 10 બેઝ અને 4 પાઠ અને શક્તિ હોય છે.]

Exponents :- Now 10^4 stands for $10 \times 10 \times 10 \times 10$. Here 10 is called base and 4 is the exponent.
[10^4 is read as 10 raised to power 4.]

નોંધ :- ① 10^2 10 બેઝ 2 પાઠ 10 ચોરસ
② 10^3 10 બેઝ 3 પાઠ 10 ઘન

Note:- ① 10^2 means 10 raised to power 2 is 10 squared.
② 10^3 means 10 raised to power 3 is 10 cube.

જાણો :- જો મેથિમાટિક્સ હોય તો પાઠ અને શક્તિ હોય છે.
જો મેથિમાટિક્સ હોય તો પાઠ અને શક્તિ હોય છે.

Remember:- To write in exponent form first of all find prime factors of given number.

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મહિમા - 13.1
Exercise - 13.1

②

① જેઠ કિધિઆ દા મુઠ્ઠ
પઝા રહે!:-

Find the value of:-

(i) 2^6

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

$$= 64$$

(ii) 9^3

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

$$= 729$$

(iii) 11^2

$$= 11 \times 11$$

$$= 121$$

(iv) 5^4

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

$$= 625$$

② - જેઠ કિધિઆ કે પાઝ
મીઠી ગુપ દિઠ કિધિ:-

Express the following
in Exponential form:-

(i) $6 \times 6 \times 6 \times 6$

$$= 6^4$$

(ii) $t \times t$

$$= t^2$$

(iii) $b \times b \times b \times b$

$$= b^4$$

(iv) $5 \times 5 \times 7 \times 7 \times 7$

$$= 5^2 \times 7^3$$

(v) $2 \times 2 \times a \times a$

$$= 2^2 \times a^2$$

(vi) $a \times a \times c \times c \times c \times c \times d$

$$= (a \times a) \times (c \times c \times c \times c) \times d$$

$$= a^2 \times c^4 \times d$$

ઉદાહરણ:- મુઠ્ઠ પઝા રહે:-

Example:- Find value:-

(a) $(1)^5 = 1 \times 1 \times 1 \times 1 \times 1 = 1$

(b) $(-1)^3 = -1 \times -1 \times -1 = -1$

(c) $(-1)^4 = -1 \times -1 \times -1 \times -1 = 1$

(d) $(-10)^3 = -10 \times -10 \times -10 = -1000$

(e) $(-5)^4 = -5 \times -5 \times -5 \times -5 = 625$

③ ਜੇਕਰ ਕਿਸੇ ਸੰਖਿਆ ਦੇ ਘਾਤ ਅਤੇ ਸੰਕੇਤ ਦਿੱਤੇ ਹੋਣ

Express each of the following numbers in exponential notation

(i) 512

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

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

$$= 2^9$$

(ii) 343

$$\begin{array}{r|l} 7 & 343 \\ \hline 7 & 49 \\ \hline & 7 \end{array}$$

$$343 = 7 \times 7 \times 7$$

$$= 7^3$$

(iii) 729

$$\begin{array}{r|l} 3 & 729 \\ \hline 3 & 243 \\ \hline 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \end{array}$$

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

$$= 3^6$$

④ ਜੇਕਰ ਕਿਸੇ ਦੋ ਸੰਖਿਆ ਦਿੱਤੀਆਂ ਹੋਣ, ਜਿਹੀ ਸੰਭਵ ਹੋਵੇ, ਵੱਡੀ ਸੰਖਿਆ ਖੋਜੋ:-

I identify the greater number, wherever possible,

(i) 4^3 ਜਾਂ 3^4

$$\text{ਜਾਂ:- } 4^3 = 4 \times 4 \times 4 = 64$$

$$3^4 = 3 \times 3 \times 3 \times 3 = 81$$

$$81 > 64$$

$$3^4 > 4^3 \text{ (} 3^4 \text{ ਵੱਡਾ ਹੈ)}$$

(ii) 5^3 ਜਾਂ 3^5

$$\text{ਜਾਂ:- } 5^3 = 5 \times 5 \times 5 = 125$$

$$3^5 = 3 \times 3 \times 3 \times 3 \times 3 = 243$$

$$243 > 125$$

$$3^5 > 5^3 \text{ (} 3^5 \text{ ਵੱਡਾ ਹੈ)}$$

(iii) 2^8 ਜਾਂ 8^2

$$\text{ਜਾਂ:- } 2^8 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$= 256$$

$$8^2 = 8 \times 8 = 64$$

$$256 > 64$$

$$2^8 > 8^2 \text{ (} 2^8 \text{ ਵੱਡਾ ਹੈ)}$$

(iv) 100^2 ਜਾਂ 2^{100}

$$2^{100} > 100^2 \text{ (} 2^{100} \text{ ਵੱਡਾ ਹੈ)}$$

(v) 2^{10} ਜਾਂ 10^2

$$\text{ਜਾਂ:- } 2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$= 1024$$

$$10^2 = 10 \times 10 = 100$$

$$2^{10} > 10^2 \text{ (} 2^{10} \text{ ਵੱਡਾ ਹੈ)}$$

5) ਹੇਠ ਲਿਖੇ ਅੰਕਾਂ ਨੂੰ ਗੁਣਨਯੋਗ ਦੇ ਪਾਤਰ-ਅੰਕਾਂ ਦੇ ਗੁਣਨਯੋਗ ਦੇ ਰੂਪ ਵਿੱਚ ਦਰਸਾਉ :-

Express each of the following as product of powers of their prime factors:-

(i) 648

ਭੰਡ:- 648

$$\begin{array}{r|l} 2 & 648 \\ \hline 2 & 324 \\ \hline 2 & 162 \\ \hline 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline \end{array}$$

$$648 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \\ = 2^3 \times 3^4$$

(ii) 405

ਭੰਡ:- 405

$$\begin{array}{r|l} 5 & 405 \\ \hline 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline \end{array}$$

$$405 = 5 \times 3 \times 3 \times 3 \times 3 \\ = 5^1 \times 3^4$$

(iii) 540

ਭੰਡ:- 540

$$\begin{array}{r|l} 2 & 540 \\ \hline 2 & 270 \\ \hline 3 & 135 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline 3 & 5 \\ \hline \end{array}$$

$$540 = 2 \times 2 \times 3 \times 3 \times 3 \times 5 \\ = 2^2 \times 3^3 \times 5$$

(iv) 3600

ਭੰਡ:- 3600

$$\begin{array}{r|l} 2 & 3600 \\ \hline 2 & 1800 \\ \hline 2 & 900 \\ \hline 2 & 450 \\ \hline 3 & 225 \\ \hline 3 & 75 \\ \hline 5 & 25 \\ \hline 5 & 5 \\ \hline \end{array}$$

$$3600 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5 \\ = 2^4 \times 3^2 \times 5^2$$

6) ਸਰਲ ਕਰੋ (Simplify)

(i) 2×10^3

$$= 2 \times 10 \times 10 \times 10 \\ = 2 \times 1000 = 2000$$

(ii) $7^2 \times 2^2$

$$= 7 \times 7 \times 2 \times 2 \\ = 49 \times 4 = 196$$

(iii) $2^3 \times 5$

$$= 2 \times 2 \times 2 \times 2 \times 5 \\ = 8 \times 5 = 40$$

(iv) 3×4^4

$$= 3 \times 4 \times 4 \times 4 \times 4 \\ = 3 \times 256 = 768$$

(v) 0×10^2

$$= 0 \times 10 \times 10 = 0$$

$$\begin{aligned} \text{(vi)} \quad & 5^2 \times 3^3 \\ & = 5 \times 5 \times 3 \times 3 \times 3 \\ & = 25 \times 27 \\ & = 675 \end{aligned}$$

$$\begin{aligned} \text{(vii)} \quad & 2^4 \times 3^2 \\ & = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \\ & = 16 \times 9 \\ & = 144 \end{aligned}$$

$$\begin{aligned} \text{(viii)} \quad & 3^2 \times 10^4 \\ & = 3 \times 3 \times 10 \times 10 \times 10 \times 10 \\ & = 9 \times 10000 \\ & = 90000 \end{aligned}$$

7) सरल करें (Simplify)

$$\begin{aligned} \text{(i)} \quad & (-4)^3 \\ & = (-4) \times (-4) \times (-4) \\ & = -64 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad & (-3) \times (-2)^3 \\ & = (-3) \times (-2) \times (-2) \times (-2) \\ & = (-3) \times (-8) \\ & = 24 \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad & (-3^2) \times (-5)^2 \\ & = (-3) \times (-3) \times (-5) \times (-5) \\ & = 9 \times 25 \\ & = 225 \end{aligned}$$

8) निम्नलिखित की तुलना करें:-
Compare the following numbers.

$$\begin{aligned} \text{(i)} \quad & 2.7 \times 10^{12} \\ & = 2.7 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \end{aligned}$$

$$\begin{aligned} & = 2.7 \times 1000000000000 \\ & = 2700000000000 \end{aligned}$$

$$1.5 \times 10^8$$

$$\begin{aligned} & = 1.5 \times 100000000 \\ & = 150000000 \end{aligned}$$

$$2700000000000 > 150000000$$

$$2.7 \times 10^{12} > 1.5 \times 10^8$$

$$\text{(i)} \quad 4 \times 10^{14} ; 3 \times 10^{17}$$

$$\text{जैसे}- 4 \times 10^{14}$$

$$\begin{aligned} & = 4 \times 100000000000000 \\ & = 400000000000000 \end{aligned}$$

$$3 \times 10^{17}$$

$$= 300000000000000000$$

$$3 \times 10^{17} > 4 \times 10^{14}$$

घर का काम (Homework)

$$\text{(i)} \quad \text{निम्न पता करें } 2^5$$

Find value:-

$$\text{(ii)} \quad 3125 \text{ का पाउ मान है}$$

मैंने देखा कि यह (exponent form)

$$\text{(iii)} \quad \text{किसका बड़ा (greater) है?}$$

$$2^3 \text{ या } 3^2$$