PRACTICE SET 3.1 PAGE NO: 15

1. Express the following numbers in index form.
(1) Fifth root of 13
(2) Sixth root of 9
(3) Square root of 256
(4) Cube root of 17
(5) Eighth root of 100
(6) Seventh root of 30
Solution:
In general, n^{th} root of 'a' is expressed as $a^{1/n}$. where, a is the base and 1/5 is the index.
So now,
(1) Fifth root of 13
Index form of fifth root of 13is expressed as $13^{1/5}$.

(2) Sixth root of 9
Index form of sixth root of 9 is expressed as $9^{1/6}$.

(3) Square root of 256
Index form of square root of 256 is expressed as $256^{1/2}$.

(4) Cube root of 17
Index form of cube root of 17 is expressed as $17^{1/3}$.

(5) Eighth root of 100
Index form of eighth root of 100 is expressed as $100^{1/8}$.

(6) Seventh root of 30
Index form of seventh root of 30 is expressed as $30^{1/7}$.

2. Write in the form 'n^{th} root of a' in each of the following numbers.
(1) $(81)^{\frac{1}{4}}$ (2) $49^{\frac{1}{2}}$ (3) $(15)^{\frac{1}{5}}$ (4) $(512)^{\frac{1}{9}}$ (5) $100^{\frac{1}{19}}$ (6) $(6)^{\frac{1}{7}}$
Solution:
In general, $a^{1/n}$ is written as 'n^{th} root of a'.
So now,
(1) $(81)^{1/4}$
$(81)^{1/4}$ is written as '4^{th} root of 81'.

(2) $(49)^{1/2}$
$(49)^{1/2}$ is written as 'square root of 49'.

(3) $(15)^{1/5}$
$(15)^{1/5}$ is written as '5^{th} root of 15'.

(4) $(512)^{1/9}$
$(512)^{1/9}$ is written as '9^{th} root of 512'.

(5) $(100)^{1/19}$
$(100)^{1/19}$ is written as '19^{th} root of 100'.

(6) $(6)^{1/7}$
$(6)^{1/7}$ is written as '7^{th} root of 6'.

PRACTICE SET 3.2 PAGE NO: 16

1. Complete the following table.

Sr. No.	Number	Power of the root	Root of the power
(1)	$(225)^{3/2}$	**Cube of square root of 225**	**Square root of cube of 225**
(2)	$(45)^{4/5}$		
(3)	$(81)^{6/7}$		
(4)	$(100)^{4/10}$		
(5)	$(21)^{3/7}$		

Solution:

Generally we can express the number $a^{m/n}$ as

$a^{m/n} = (a^m)^{1/n}$ means 'n^{th} root of m^{th} power of a'.

$a^{m/n} = (a^{1/n})^m$ means 'm^{th} power of n^{th} root of a'.

So by using the above rules let us fill the table:

Sr. No.	Number	Power of the root	Root of the power
(1)	$(225)^{3/2}$	Cube of square root of 225	Square root of cube of 225
(2)	$(45)^{4/5}$	Fourth power of fifth root of 45	Fifth root of fourth power of 45
(3)	$(81)^{6/7}$	Sixth power of seventh root of 81	Seventh root of sixth power of 81
(4)	$(100)^{4/10}$	Fourth power of tenth root of 100	Tenth root of fourth power of 100
(5)	$(21)^{3/7}$	Cube of seventh root of 21	Seventh root of cube of 21

2. Write the following number in the form of rational indices.

(1) Square root of 5^{th} power of 121.

(2) Cube of 4^{th} root of 324.

(3) 5^{th} root of square of 264.

(4) Cube of cube root of 3.

Solution:
We know that 'n^{th} root of m^{th} power of a' is expressed as $(a^m)^{1/n}$.
And 'm^{th} power of n^{th} root of a' is expressed as $(a^{1/n})^m$.

So by using the above rules let us find
(1) Square root of 5^{th} power of 121.
Square root of 5^{th} power of 121 is expressed as $(121^5)^{1/2}$ or $(121)^{5/2}$.

(2) Cube of 4^{th} root of 324.
Cube of 4^{th} root of 324 is expressed as $(324^{1/4})^3$ or $(324)^{3/4}$.

(3) 5^{th} root of square of 264.
5^{th} root of square of 264 is expressed as $(264^2)^{1/5}$ or $(264)^{2/5}$.

(4) Cube of cube root of 3.
Cube of cube root of 3 is expressed as $(3^{1/3})^3$ or $(31)^{3/3}$.

PRACTICE SET 3.3 PAGE NO: 18

1. Find the cube root of the following numbers.
(1) 8000
(2) 729
(3) 343
(4) -512
(5) -2744
(6) 32768
Solution:
(1) 8000
Firstly let us find the factor of 8000
$8000 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5$
So to find the cube root, we pair the prime factors in 3's.
$8000 = (2 \times 2 \times 5)^3$
$= (2 \times 10)^3$
$= 20^3$
Hence, cube root of 8000 $= \sqrt[3]{(8000)}$
$= (20^3)^{1/3}$
$= 20$

(2) 729
Firstly let us find the factor of 729
$729 = 9 \times 9 \times 9$
So to find the cube root, we pair the prime factors in 3's.
$729 = 9^3$
Hence, cube root of 729 $= \sqrt[3]{(729)}$
$= (9^3)^{1/3}$
$= 9$

(3) 343
Firstly let us find the factor of 343
$343 = 7 \times 7 \times 7$
So to find the cube root, we pair the prime factors in 3's.
$343 = 7^3$
Hence, cube root of 343 $= \sqrt[3]{(343)}$
$= (7^3)^{1/3}$
$= 7$

(4) -512
Firstly let us find the factor of -512
$-512 = (-8) \times (-8) \times (-8)$
So to find the cube root, we pair the prime factors in 3's.
$-512 = (-8)^3$
Hence, cube root of -512 $= \sqrt[3]{(-512)}$
$= (-8^3)^{1/3}$
$= -8$

(5) -2744
Firstly let us find the factor of -2744
$-2744 = (-14) \times (-14) \times (-14)$
So to find the cube root, we pair the prime factors in 3's.
$-2744 = (-14)^3$
Hence, cube root of -2744 $= \sqrt[3]{(-2744)}$
$= (-14^3)^{1/3}$
$= -14$

(6) 32768
Firstly let us find the factor of 32768
$32768 = 32 \times 32 \times 32$
So to find the cube root, we pair the prime factors in 3's.
$32768 = 32^3$
Hence, cube root of 32768 $= \sqrt[3]{(32768)}$
$= (32^3)^{1/3}$
$= 32$

2. Simplify:

(1) $\sqrt[3]{\frac{27}{125}}$

(2) $\sqrt[3]{\frac{16}{54}}$

(3) If $\sqrt[3]{729} = 9$ **then** $\sqrt[3]{0.000729} = ?$

Solution:

(1) $\sqrt[3]{\frac{27}{125}}$

So firstly let us find the factors for the numbers,

$$\sqrt[3]{\frac{27}{125}} = \frac{\sqrt[3]{27}}{\sqrt[3]{125}}$$

$$= \frac{\sqrt[3]{3\times3\times3}}{\sqrt[3]{5\times5\times5}}$$

$$= \frac{\sqrt[3]{3^3}}{\sqrt[3]{5^3}}$$

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

$$\therefore \sqrt[3]{\frac{27}{125}} = \frac{3}{5}$$

(2) $\sqrt[3]{\frac{16}{54}}$

So firstly let us find the factors for the numbers,

$$\sqrt[3]{\frac{16}{54}} = \frac{\sqrt[3]{8}}{\sqrt[3]{27}}$$

$$= \frac{\sqrt[3]{2\times2\times2}}{\sqrt[3]{3\times3\times3}}$$

$$= \frac{\sqrt[3]{2^3}}{\sqrt[3]{3^3}}$$

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

$$\therefore \sqrt[3]{\frac{16}{54}} = \frac{2}{3}$$

(3) If $\sqrt[3]{729} = 9$ then $\sqrt[3]{0.000729} = ?$

So firstly let us find the factors for the numbers,

$$\sqrt[3]{0.000729} = \sqrt[3]{\frac{729}{1000000}}$$

$$= \frac{\sqrt[3]{729}}{\sqrt[3]{100 \times 100 \times 100}}$$

$$= \frac{\sqrt[3]{729}}{\sqrt[3]{100^3}}$$

It is given that $\sqrt[3]{729} = 9$

So,

$$\sqrt[3]{0.000729} = \frac{9}{100}$$

$$= 0.09$$

$$\therefore \sqrt[3]{0.000729} = 0.09$$