REAL NUMBERS

Learning Objectives:

- ♦ Know about the properties of Rational numbers.
- ♦ Understand the Decimal representation of rational numbers.
- ♦ Understand the terminating decimals and non terminating decimals.

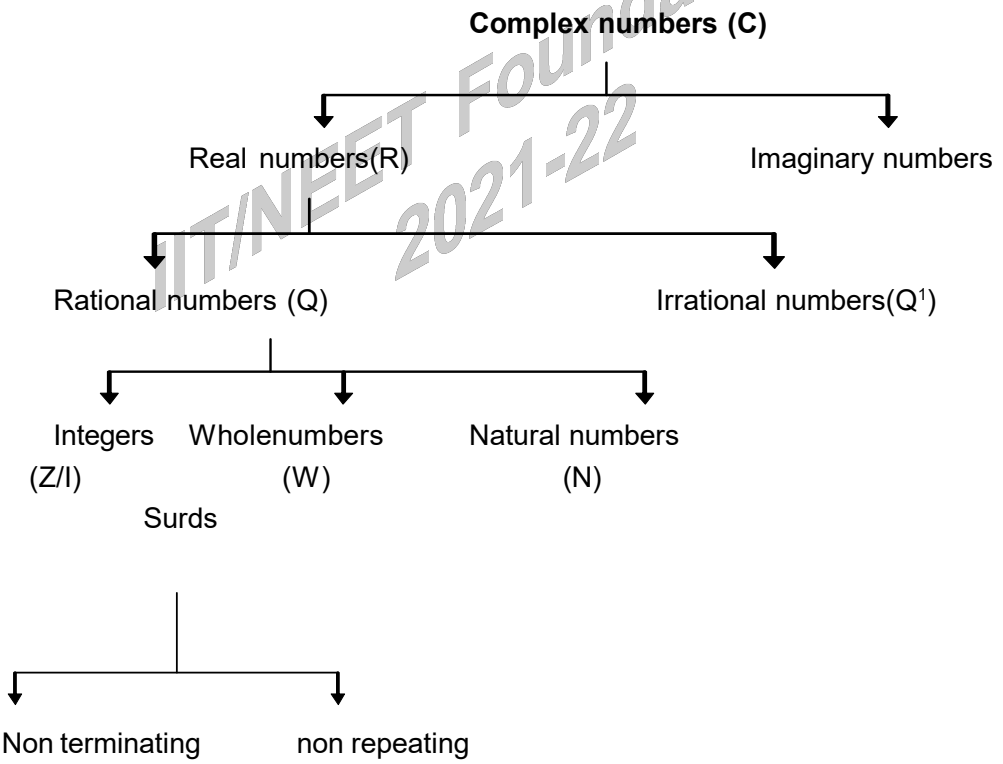
Real time applications:

Φ The word 'real' was introduced in the 17th century by Descartes.

Φ In physical sciences, most of the physical constants are modeled using real numbers.

Φ Real numbers satisfies the usual rules of arithmetic.

Φ In our daily lives we interact with numbers when making calculations and timing.



§§ ***Natural Numbers :***

The numbers 1, 2, 3 ..... which are used in counting are called Natural numbers (or) positive integers

§§ **Whole Numbers:** Natural numbers together with zero are called whole numbers

$W=\{0,1,2,3,---\}$

$N\cup\{0\}=w$

§§ Integers : Z = { ....., -3, -2, -1, 0, 1, 2, 3, 4, ...}

§§ Rational Numbers: The numbers, that can be expressed in the form of p/q, where p and q are integers and $q\neq 0$ are called rational numbers .

$$Q=\left\{\frac{p}{q};p,q\in Z\ \&\ q\neq 0\right\}$$

Ex: 1. $\frac{4}{7},\frac{-3}{10},\frac{7}{5}etc$ are rational numbers.

2. The square root of every perfect square number is rational. $\sqrt{1},\sqrt{4},\sqrt{9},\sqrt{16},\sqrt{25},etc$ are all rational numbers.

3. 0 can be written as $\frac{0}{1}$, which is rational.

4. $\frac{1}{0}$ is not defined and therefore it is not a rational number.

§§ Irrational number:

Every number which when expressed in decimal form is expressible as a non terminating and non-repeating decimal is called an irrational number.

1. Square root of every non perfect square natural number is irrational number $\sqrt{2},\sqrt{3},\sqrt{5},\sqrt{6},\sqrt{7},\sqrt{8},\sqrt{10}$ etc

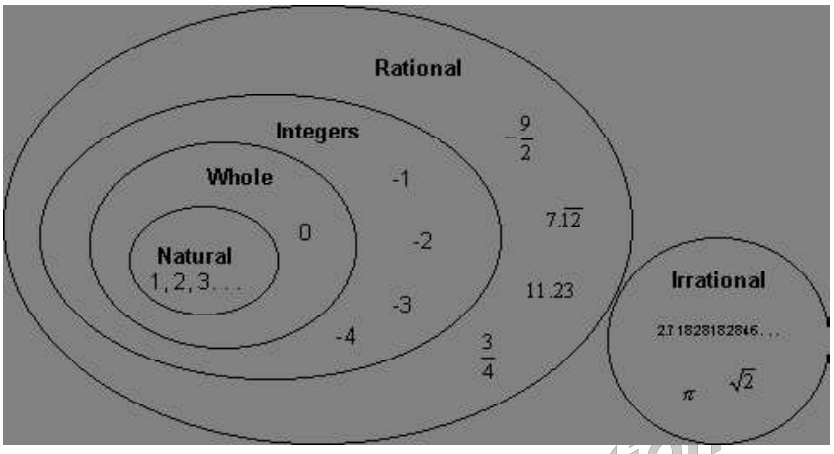
2. If m is a positive integer which is not a perfect cube, then $\sqrt[3]{m}$ is an irrational number. Thus $\sqrt[3]{2},\sqrt[3]{3},\sqrt[3]{4},\sqrt[3]{5},\sqrt[3]{7},\sqrt[3]{9}etc$ are all irrational numbers.

3. Every non-terminating and non-repeating decimal is an irrational number 0.10110111011110------ and 0.434434443---etc are irrational numbers

4. The value of π is 3.1416----- which is a non-terminating and non repeating decimal.so π is irrational.

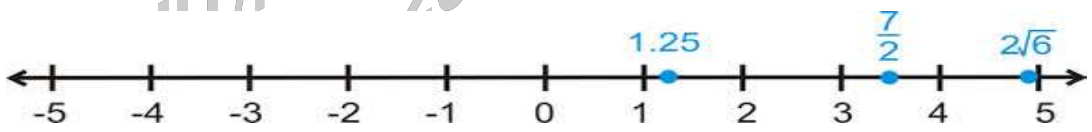
§§ Real Numbers :

All rational and all irrational numbers together form the set of all real numbers.



§§ **Equivalent rational numbers:** If $\frac{p}{q}$ is a rational number and 'n' is non-zero integer,then $\frac{p}{q} = \frac{p \times n}{q \times n}$.

¶¶ **Representing Real numbers on number line:**



§§ ***Absolute Value*** **:** The absolute value of a rational number is the numerical value of the number regard to its sign.

|x| = x, if x>0

|x| = 0, if x = 0

|x| = -x, if x <0

Eg : |-3|=3, |5| = 5, |0|=0

¶¶ **Standard form of a rational number :**

A rational number is said to be in standard form it is in its lowest terms.

§§ **Comparision of Rational numbers :**

1. While comparing positive rational numbers, with the same denominator, the number with the greatest numerator is the largest

$\frac{36}{20} > \frac{30}{20} > \frac{26}{20}$

2. A positive rational number is always greater than a negative rational number

$$\frac{6}{4} > \frac{-6}{4}$$

3. While comparing negative rational numbers with the same denominator compare there numerators ignoring the minus sign. The number with the greatest numerator is the smallest $\frac{-5}{2} < \frac{-3}{2}, \frac{-6}{7} < \frac{-1}{7}$

4. Positive Rational numbers lie to the right of '0' while negative rational numbers lie to the left of '0' on the number line

5. To compare rational numbers with diffrent denominators , convert them into equalant rational numbers with the same denominator, which is equal to the L.C. M of there denominators

¶¶ **Difference between fraction and a rational number :**

A fraction is a number of the form $\frac{p}{q}$ where 'p' and 'q' are natural numbers.A

Rational number is a number of the form $\frac{p}{q}$ where 'p' and 'q' are integers and $q \neq 0$

§§ **Properties of Rational numbers :**

Under addition:

i) Closure : For any two rational numbers a and b , **(a+b)** is also a rational number

ii) Commutative : For any two rational numbers a and b **a+b=b+a** this property is called commutative.

iii) Associative : For any three rational numbers a,b,and c **(a+b)+c =a+(b+c)**

iv) Identity : For any rational number a, **a+0=0+a=a**

v) Inverse : **a+(-a) =-a+a=0**

Under multiplication:

i) Closure : For any two rational numbers a and b , **(axb)** is also a rational number.

ii) Commutative : For any two rational numbers a and b **axb=bxa** this property is called commutative.

iii) Associative : For any three rational numbers a,b,and c **(axb)xc =ax(bxc)**

iv) Identity : For any rational number a, **ax1=1xa=a**

v) Inverse : **ax($\frac{1}{a}$) =($\frac{1}{a}$)X a = 1**

vi) Distributive Law: $ax(b+c)=(axb)+(axc)$ **or** $(a+b)xc=(axc)+(bxc)$

§§ **Additional Properties of Rational Numbers :**

1) Law of Tricotomy: For every $a,b,\in Q$ any one of the following is hold.

i) a<b ii) a>b iii) a=b

This property of Rational numbers is called 'Law of Tricotomy'

2) Transitive property: For every $a,b,c\in Q$ and if a>b and b>c then a>c

This property of rational numbers is called 'Transitive property'.

3) Density property: Between two rational numbers infinite number of rational numbers are there. This property of rational numbers is called Density property.

4) i) If $a,b\in Q$ and c is positive integer and if a>b then (i) a+c > b+c

ii) If $a,b\in Q$ and c is negative integer and if a>b then (i) a - c > b - c

5) i) If $a,b\in Q$ and c is the positive integer if a>b then a.c>b.c also $\frac{a}{c}>\frac{b}{c}$

ii) If $a,b\in Q$ and c is negative integer if a>b then a.c<b.c

§§ **Insertion of Rational numbers between two Rational numbers:** If a and b are two rational numbers then $\frac{1}{2}$(a+b) is also a rational number between a and b.Actually between any two rational numbers there exist an infinite number of rational numbers.

a < $\frac{1}{2}$(a+b) < b

¶¶ **Conversion of decimals to rationals and rationals to decimals**

a) Property : Every rational number can be represented by either a “terminating decimal” or a repeating decimal.

Ex : $\frac{35}{16}=2.1875$ (Terminating decimal)

Ex : $\frac{5}{18}=0.2777...=0.2\overline{7}$ (Repeating decimal)

A repeating decimal is also called “recurring decimal”.

i) **Period:** The recurring part of the decimal is called period of the decimal.

Ex : Period of $2.1\overline{254}$ is 254

ii) **Periodicity :** The number of terms which are recur is called periodicity of the decimal.

Ex : Periodicity of $2.1\overline{254}$ is 3.

b) Pure recurring decimal : A decimal in which all the figures after the decimal point are repeated is called a "Pure recurring decimal". Thus $0.\overline{2},\ 0.\overline{34},\ 5.\overline{3982}$ are pure recurring decimals.

c) Mixed recurring decimal : A decimal in which at least one figure after the decimal point is not repeated and then a figure or a set of figures is repeated is known as a mixed recurring decimals.

Ex : $0.2\overline{3}$, $0.3.\overline{51}$

TEACHING TASK

I) MCQ's with single correct answers :

1. The number $1.\overline{27}$ in the form of $\frac{p}{q}, q \neq 0$ is....

A) $\frac{14}{11}$ B) $\frac{14}{9}$ C) $\frac{14}{13}$ D) $\frac{14}{15}$

2. Four rational numbers between 3 and 4...

A) $\frac{3}{5},\frac{4}{5},1,\frac{6}{5}$ B) $\frac{13}{5},\frac{14}{5},\frac{16}{5},\frac{17}{5}$ C) 3.1,3.2,4.1,4.2 D) 3.1,3.2,3.8,3.9

3. $0.4\overline{7}$ in the form of $\frac{p}{q}, q \neq 0 \ \& \ p, q \in Z$, is...

A) $\frac{47}{100}$ B) $\frac{47}{90}$ C) $\frac{43}{90}$ D) $\frac{43}{99}$

4. If the decimal representaion of a number is a non-terminating non-repeating then the number is...

A) a natural number B) a rational number
C) a whole number D) an irrational number

5. The period of $\frac{3}{11}$ is..

A) 17 B) 27 C) 37 D) 47

6. The periodicity of $\frac{1}{6}$ is

A) 1 B) 2 C)3 D) 4

7. The periodicity of $\frac{5}{13}$ is

A) 2 B) 4 C) 6 D) 8

8. If $x = 0.\overline{82}$, $y = 0.\overline{17}$, $A = 0.\overline{7}$, $B = 0.\overline{2}$ then $[(x+y)+(A+B)]^{(x+y)+(A+B)}$ is

A) 4 B) 2 C) 8 D) 16

9. Given $0.\overline{6} = \frac{2}{3}$, the value of $2.\overline{6}$ is ....

A) $\frac{2}{3}$ B) $\frac{2}{3}-2$ C) $2+\frac{2}{3}$ D) $2\frac{1}{3}$

10. What real number should be added to $2.3\overline{4}$ in order to get $4.5\overline{3}$?

A) $2.\overline{7}$ B) $2.\overline{07}$ C) $2.0\overline{7}$ D) $2.1\overline{8}$

11. What real number should be taken away from $5.3\overline{6}$ to get $2.7\overline{5}$?

A) 2.61 B) $2.6\overline{1}$ C) $2.\overline{61}$ D) $2.\overline{6}$

12. a x $3.2\overline{7} = 7.8\overline{3}$. Express 'a' in $\frac{p}{q}$ form.

A) $\frac{141}{59}$ B) $\frac{131}{59}$ C) $\frac{141}{57}$ D) $\frac{131}{57}$

13. What real number should divide $8.4\overline{6}$ in order to get $3.4\overline{3}$ and Express the result in $\frac{p}{q}$ form.

A) $\frac{245}{103}$ B) $\frac{245}{130}$ C) $\frac{254}{130}$ D) $\frac{254}{103}$

14. Find the value of $1.4\overline{34}$ X100. Express the result in the fomr of $\frac{p}{q}$

A) $\frac{1420}{90}$ B) $\frac{1420}{9}$ C) $\frac{1420}{990}$ D) None

15. Half of what number is $2.3\overline{7} + 3.0\overline{4}$?

A) $10.8\overline{4}$ B) $10.\overline{84}$ C) $10.4\overline{8}$ D) $10.\overline{48}$

II) MCQs with one or more than one correct answer :

- *This section contains multiple choice questions. Each question has 4 choices (A), (B), (C),(D), out of which **ONE or MORE** is correct. Choose the correct options*

1. A rational number equivalent to the rational number $\frac{7}{19}$ is...

A) $\frac{17}{119}$ B) $\frac{14}{57}$ C) $\frac{14}{38}$ D) $\frac{21}{57}$

2. A rational number between $\frac{1}{7} and \frac{2}{7}$ is...

A) $\frac{1}{14}$ B) $\frac{2}{21}$ C) $\frac{3}{14}$ D) $\frac{5}{21}$

3. Which of the following is rational?

A) $\sqrt{4}$ B) π C) $\frac{4}{0}$ D) $\frac{0}{4}$

4. Which of the following numbers can be represented as non-terminating repeating decimals?

A) $\frac{39}{24}$ B) $\frac{3}{16}$ C) $\frac{3}{11}$ D) $\frac{137}{25}$

5. Which of the following are false statements?
A) Decimal expansion of a rational number is terminating
B) Decimal expansion of a rational number is non-terminating
C) Decimal expansion of an irrational number is terminating
D) Decimal expansion of an irrational number is non-terminating and non repeating

6. Which of the following is value of π

A) $\frac{22}{7}$ B) 3.14159..... C) $\frac{7}{22}$ D) 3.41.....

7. Which of the following will change into a terminating decimal

A) $\frac{7}{12}$ B) $\frac{5}{64}$ C) $\frac{13}{125}$ D) $\frac{2}{9}$

8. Which of the following will be converted into a non terminating decimal

A) $\frac{15}{99}$ B) $\frac{-9}{75}$ C) $\frac{7}{20}$ D) $\frac{23}{60}$

9. Which is the value of $0.1\overline{6}$

A) $\frac{15}{99}$ B) $\frac{15}{90}$ C) $\frac{1}{6}$ D) $\frac{16}{90}$

10. ***Match the following :***

- *This section contains Matrix-Match Type questions. Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in **Column–I** have to be matched with statements (p, q, r, s) in **Column–II**. The answers to these questions have to be appropriately bubbled as illustrated in the following example.*
  *If the correct matches are A-p,A-s,B-r,B-r,C-p,C-q and D-s,then the correct bubbled 4*4 matrix should be as follows:*

Column - I	***Column - II***
a) $15.0\bar{2}$	**1)** $\frac{4}{3}$
b) $1.\bar{3}$	**2)** $\frac{1}{4}$
c) 0.25	**3)** $\frac{1352}{90}$
d) $0.37\bar{5}$	**4)** $\frac{5}{6}$
	5) $\frac{169}{450}$

A) a-3,b-1,c-2,d-5 B) a-1,b-3,c-2,d-5
C) a-3,b-1,c-5,d-2 D)a-3,b-1,c-4,d-5

III) ***Solve the following :***

1. Represent the following rational numbers on the number line.

A) $\frac{8}{7}$ B) $\frac{-5}{4}$ C) $\frac{3}{5}$ D) $-5\frac{1}{2}$ E) $3\frac{2}{3}$

2. List two rational numbers between the following.

1) -1 and 0 2) -2 and - 1 3) $\frac{-4}{5}$ and $\frac{-2}{3}$ 4) $\frac{1}{2}$ and $\frac{2}{3}$

3. Find three rational numbers between $\frac{1}{5}$ and $\frac{1}{3}$?

4. Arrange $3\frac{4}{5}, 6\frac{2}{3}, -7\frac{2}{3}$ and $-5\frac{1}{4}$ in descending order ?

5. If the sum of two fractions is $5\frac{1}{7}$. One of them is $4\frac{1}{7}$. What is the other fraction.

6. What should be subtracted from $\frac{-2}{13}$ to get $\frac{5}{2}$

7. The product of two rational numbers is $\frac{-28}{27}$ and one of the number is $\frac{-4}{9}$. Find other.

8. The cost of $7\frac{2}{3}$ mts of rope is Rs.$12\frac{3}{4}$. Find the cost per meter.

9. The sum and product of two rational numbers are 12 and 35 respectively what will be the sum of their reciprocals.

KEY

ΦΦ TEACHING TASK :

I) 1) A 2) D 3) C 4) D 5) B 6) A
7) C 8) A 9) C 10) D 11) B 12) A
13) D 14) B 15) A

II) 1) C,D 2) C 3) A,D 4) C 5) C,D 6) A,B
7) B,C 8) A,D 9) B,C 10) A

III) 5) 1 6) $\frac{-69}{26}$ 7) $\frac{7}{3}$ 8) $1\frac{61}{92}$ 9) $\frac{12}{35}$

LEARNER'S TASK

BEGINNERS (Level - I)

I) MCQ's with single correct answers :

1. Which of the following is irrational ? .....

A) $\sqrt{\frac{4}{9}}$ B) $\frac{4}{5}$ C) $\sqrt{7}$ D) $\sqrt{81}$

2. The integers which lies between -2 and +2 are

A) -1,0,1 B) -1,1 C) 0, -1 D)-1,0,1,2

3. Which is the "period" and "periodicity" of 5.2 32 32 .....

A) 23, 2 B) 2, 1 C) 3, 1 D) 32, 2

4. 1.272727...can be exressed in rational form as ...

A) $\frac{14}{99}$ B) $\frac{14}{11}$ C) $\frac{11}{14}$ D) $\frac{99}{14}$

5. $0.12\bar{3}$ can be expressed in rational form as

A) $\frac{900}{111}$ B) $\frac{111}{990}$ C) $\frac{123}{10}$ D) $\frac{121}{900}$

6. Given $3.\bar{3} = 3\frac{1}{3}$,the value of 7-3.$\bar{3}$ is

A) $4\frac{1}{3}$ B) $4\frac{2}{3}$ C) $3\frac{1}{3}$ D) $3\frac{2}{3}$

7. If $2.\bar{4} = \frac{22}{9}$, the value of $2.\bar{4}x3$ is

A) $7\frac{2}{3}$ B) $7\frac{1}{3}$ C) $6\frac{2}{3}$ D) $7.\bar{2}$

8. If $0.\bar{7} = \frac{7}{9}, and\, 0.\bar{8} = \frac{8}{9}, then\, 0.\bar{9}$ is

A) 9 B) 6 C) 3 D)1

9. Express $\frac{263}{125}$ in the decimal form

A) 1.104 B) 2.104 C) 3.104 D) 2.890

10. Which of the following will change into a terminating decimal

A) $\frac{7}{12}$ B) $\frac{5}{44}$ C) $\frac{13}{125}$ D) $\frac{2}{9}$

11. Which of the following will be converted into a non terminating decimal

A) $\frac{3}{5}$ B) $\frac{-9}{75}$ C) $\frac{7}{20}$ D) $\frac{23}{60}$

12. Find the average of the numbers $\frac{2}{3}$ and $\frac{1}{2}$

A) $\frac{13}{24}$ B) $\frac{7}{24}$ C) $\frac{7}{12}$ D) $\frac{6}{24}$

13. Find the average of $\frac{7}{12}$ and $\frac{1}{2}$

A) $\frac{13}{24}$ B) $\frac{7}{24}$ C) $\frac{25}{48}$ D) $\frac{6}{24}$

14. $(8+0.\bar{6})\frac{1}{2}$ =.....

A) $4\frac{9}{3}$ B) $3\frac{3}{9}$ C) $4\frac{3}{9}$ D)None

15. Find the multiplicative inverse of $3.1\bar{2}-1.7\bar{8}$?

A) $\frac{3}{4}$ B) $\frac{4}{3}$ C) 0.75 D) None

ACHIEVERS (Level - II)

Solve the following :

1. Write the following rational numbers in the standard form

i) $\frac{-9}{6}$ ii) $\frac{25}{40}$ iii) $\frac{-48}{74}$ iv) $\frac{2009}{2010}$

2. Represent the following rational numbers on the number line.

i) $\frac{7}{5}$ ii) $\frac{-3}{4}$ iii) $\frac{8}{3}$ iv) $\frac{-1}{4}$

3. Find 10 rational numbers between $\frac{1}{4} and \frac{1}{2}$.

4. Write the following numbers in ascending order and also in descending order.

i) $\frac{-3}{5},\frac{-2}{5},\frac{-1}{5}$ ii) $\frac{2010}{19},\frac{2010}{29},\frac{2010}{23}$ iii) $\frac{-2013}{13},\frac{-2013}{31},\frac{-2013}{17}$

iv) $\frac{1}{3},\frac{-2}{7},\frac{-4}{3}$ v) $\frac{-7}{9},\frac{-9}{10},-2,0,-3,\frac{1}{5},\frac{2}{7}$

5. Find (x+y) / (x-y) if

i) x=$\frac{2}{3}$, $y=\frac{3}{2}$ ii) $x=\frac{2}{5},y=\frac{1}{2}$ iii) $x=\frac{5}{4},y=\frac{-1}{3}$

6. Find the value $0.\bar{3}-0.1\bar{8}$ express the result in the fomr of $\frac{p}{q}$

7. Find the value of $8.9\overline{34}$ X100.Express the result in the form of $\frac{p}{q}$

EXPLORERS (Level - III)

II) ***MCQs with one or more than one correct answer :***

- *This section contains multiple choice questions. Each question has 4 choices (A), (B), (C),(D), out of which **ONE or MORE** is correct. Choose the correct options*

1. Find the value of $\left|-1.\bar{3}\right|+\left|2.2\bar{5}\right|$

A) $\frac{3230}{990}$ B) $\frac{323}{990}$ C) $\frac{323}{99}$ D) $\frac{323}{90}$

2. Find the value of $\left|-\frac{3}{5}\right|-\left|\frac{1}{4}\right|$

A) $\frac{7}{20}$ B) 0.35 C) $0.\overline{35}$ D) $\frac{20}{7}$

3. Find the value of $0.\bar{3}-0.1\bar{8}$?

A) $\frac{13}{99}$ B) $\frac{13}{90}$ C) $0.1\bar{4}$ D) $\frac{13}{990}$

4. Find the value of $(7+0.2\bar{6})\frac{1}{2}$

A) $\frac{109}{30}$ B) $4\frac{9}{3}$ C) $\frac{119}{30}$ D) $3.3\bar{6}$

5. If $\frac{x}{y}=\frac{3}{4}$ then which of the following are are true

A) $\frac{x+y}{y}=\frac{7}{4}$ B) $\frac{y}{y-x}=\frac{-4}{1}$ C) $\frac{x+2y}{x}=\frac{11}{3}$ D) $\frac{x-y}{y}=\frac{-1}{4}$

6. Rational number $\frac{8}{3}$ can not be lie between...

A) 2 and 3 B) 3 and 4 C) 4 and 5 D) 2 and $\frac{14}{5}$

7. The value of $\frac{1}{2}-\frac{3}{4}+\frac{5}{6}-\frac{7}{8}$ is...

A) $\frac{-7}{24}$ B) $\frac{-14}{24}$ C) $\frac{-14}{28}$ D) $\frac{-7}{48}$

8. A student can complete a book in 30 days. The part of the book that a student complete in 20 days is...

A) $\frac{2}{3}$ B) $\frac{-8}{12}$ C) $\frac{-8}{-12}$ D) $\frac{4}{6}$

9. Which of the following rational numbers have their own reciprocals.

A) 0 B) 1 C) -1 D) 2

10. The ratinoal number which lie between $\frac{-2}{9}$ and $\frac{5}{9}$

A) $\frac{-1}{9}$ B) 0 C) $\frac{1}{9}$ D) $\frac{2}{9}$

11. ***Match the following :***

◆ *This section contains Matrix-Match Type questions. Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in* ***Column–I*** *have to be matched with statements (p, q, r, s) in* ***Column–II****. The answers to these questions have to be appropriately bubbled as illustrated in the following example.*
*If the correct matches are A-p,A-s,B-r,B-r,C-p,C-q and D-s,then the correct bubbled 4*4 matrix should be as follows:*

Column-I	***Column-II***
a) $\frac{1.\bar{3}}{3.\bar{6}}=$	1) $\frac{161}{30}$
b) $2.3\bar{4}+3.0\bar{2}$	2) $3.\overline{54}$
c) $\frac{3}{10}\div\left(\frac{1}{2}\div\frac{1}{4}\right)$	3) $\frac{4}{11}$
d) $\frac{3}{4}$ X $2\frac{2}{5}$ of $\left(1\frac{2}{3}+\frac{3}{10}\right)$	4) 3.54
	5) $\frac{3}{20}$

A) a-3,b-1,c-2,d-5 B) a-1,b-3,c-2,d-5
C) a-3,b-1,c-5,d-4 D) a-3,b-1,c-4,d-5

12. ***Assertion and Reasoning type questions :***

- *This section contains certain number of questions. Each question contains Statement – 1 (Assertion) and Statement – 2 (Reason). Each question has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct Choose the correct option.*

Statement - I : The numerator of standard rational number is an integer.

Statement - II : The denominator of standard rational number is a non negative integer.

A) Both statements I and II are true. B) Both statements I and II are false.
C) Statement I is true and II is false. D) Statement I is false and II is true.

KEY

ΦΦ LEARNER'S TASK :

☐ **BEGINNERS :**

1) C 2) A 3) D 4) B 5) B 6) D 7) B
8) D 9) B 10) C 11) D 12) C 13) A 14) C 15) A

☐ **ACHIEVERS :**

4) i) $\frac{-3}{5}, \frac{-2}{5}, \frac{-1}{5}$ ii) $\frac{2010}{29}, \frac{2010}{23}, \frac{2010}{19}$ iii) $\frac{-2013}{13}, \frac{-2013}{17}, \frac{-2013}{31}$

iv) $\frac{-4}{3}, \frac{-2}{7}, \frac{1}{3}$ v) $-3, -2, \frac{-9}{10}, \frac{-7}{10}, 0, \frac{1}{5}, \frac{2}{7}$ 5) i) $\frac{-13}{5}$ ii) -9

iii) $\frac{11}{19}$ 6) $\frac{13}{90}$ 7) $\frac{88450}{99}$

☐ **EXPLORERS :**

1) A , D 2) A , B 3) B , C 4) A , B 5) A , C , D 6) B , C 7) A, C
8) A , D 9) B , C 10) A , C 11) A

§§ SQUARES AND SQUARE ROOTS

What is special about the numbers 4, 9, 25, 64 and other such numbers?

Since, 4 can be expressed as 2 × 2 = 22, 9 can be expressed as 3 × 3 = 32, all such numbers can be expressed as the product of the number with itself.Such numbers like 1, 4, 9, 16, 25, ... are known as square numbers.

§§ **Square number** :

A rational number *m* can be expressed as n^2, where *n* is also a rational, then m is a square number.

Is 32 a square number?

We know that $5^2 = 25$ and $6^2 = 36$. If 32 is a square number, it must be the square of a natural number between 5 and 6. But there is no natural number between 5 and 6. Therefore 32 is not a square number.

§§ **Perfect squares :**

A rational number that is equal to the square of another rational number.

Ex : $9 = 3 \times 3 = 3^{2.}$

3,5,6,7 are not a perfect squares as it cannot be expressed as the product of two equal factors.

§§ **Properties of Perfect squares :**

1. The number which cannot be written as square of any other rational number is called non-perfect squares.

2. All primes are not perfect squares.

3. Composite numbers may or may not perfect squares.

4. Every perfect square is a composite number.

5. The square of an even number is always an even number.

6. The square of an odd number is always an odd number.

7. The square of integers end with the digits 1,4,5,6,9,0 and not with 2,3,7,8.

8. The number of zero's at the end of square is always even.

9. The numbers ending with an even number of zeros may or may not be a perfect square.

10. For every natural number n, $(n+1)^2 - n^2 = (n+1) + n$ i.e., the difference of squares of two consecutive numbers is equal to their sum.

11. The square of a natural number is equal to the sum of first 'n' odd natural numbers.

12. If 1 is added to the product of two consecutive odd natural numbers, it is equal to the square of the even natural number between them.

Ex: $3 \times 5 + 1 = 16 = 4^2$

$7 \times 9 + 1 = 64 = 8^2$

13. If 1 is added to the product of two consecutive even natural numbers, it is equal to the square of the odd natural number between them.

Ex: $4 \times 6 + 1 = 25 = 5^2$

$8 \times 10 + 1 = 81 = 9^2$

14. The square of any natural number 'n' can be expressed as the sum of two consecutive natural numbers, $\left(\frac{n^2-1}{2}+\frac{n^2+1}{2}\right)$

Ex: 52 = 12 + 13 = $\left(\frac{5^2-1}{2}+\frac{5^2+1}{2}\right)$

§§ **Palindrome :** A palindrome is a word; phrase, a sentence or numerical that reads the same forward or backward.

Ex : NOON ,MALAYALAM,MADAM,15651

§§ **Square Root :** It is the inverse operation of square.

let the number be n, then the square root of n is that number which when multiplied by itself gives n as the product.

Ex : $\sqrt{4}$ = 2

§§ **Properties of a square roots:**

1. If the units digit of number is 2,3,7 or 8 then it does not have a square root in natural numers.

2. If a number ends in an odd numer of zero's then it does not have a square root in natural numbers.

3. The square root on a even square number is even and that square root of an odd square number is odd.

4. If a number has a square root in natural number then its units digit must be 0,1,4,5,6 or 9.

5. i) $\sqrt{ab}=\sqrt{a}\ X\ \sqrt{b}\ (a>0,b>0)$

ii) $\sqrt{a+b}\neq\sqrt{a}+\sqrt{b}$ iii) $\sqrt{a-b}\neq\sqrt{a}-\sqrt{b}$

iv) $\sqrt{a^2+b^2}\neq a+b$ v) $\sqrt{a^2-b^2}\neq a-b$ vi) $\sqrt{\frac{a}{b}}=\frac{\sqrt{a}}{\sqrt{b}}(a>0,b>0)$

§§ **Pythageorean triplet :**

A triplet (a,b,c) of three numbers a,b and c is called a pythagorean triplet if

$$a^2+b^2=c^2$$

¶¶ **Methods :**

There are three methods to find the square root of a number. They are

i) Subtraction of successive odd numbers

ii) Prime factorisation method

iii) Division method

§§ **Finding square root through repeated subtraction :**

We remember that the sum of the first n odd natural numbers is n^2 . Every square number can be expressed as a sum of successive odd natural numbers starting from 1.

Consider 81 . Then,

(i) 81 – 1 = 80 (ii) 80 – 3 = 77 (iii) 77 – 5 = 72 (iv) 72 – 7 = 65

(v) 65 – 9 = 56 (vi) 56 – 11 = 45 (vii) 45 – 13 = 32 (viii) 32 – 15 = 17

(ix) 17 – 17 = 0

From 81 we have subtracted successive odd numbers starting from 1 and obtained 0 at 9th step. Therefore $\sqrt{81}$ = 9.

§§ **Finding square root through prime factorisation :**

Consider the prime factorisation of the following numbers and their squares. Prime factorisation of a Number Prime factorisation of its Square

6 = 2 × 3	36 = 2 × 2 × 3 × 3
8 = 2 × 2 × 2	64 = 2 × 2 × 2 × 2 × 2 × 2
12 = 2 × 2 × 3	144 = 2 × 2 × 2 × 2 × 3 × 3
15 = 3 × 5	225 = 3 × 3 × 5 × 5

How many times does 2 occur in the prime factorisation of 6? Once.

How many times does 2 occur in the prime factorisation of 36? Twice.

Similarly, observe the occurrence of 3 in 6 and 36 of 2 in 8 and 64 etc.

You will find that each prime factor in the prime factorisation of the square of a number, occurs twice the number of times it occurs in the prime factorisation of the number itself. Let us use this to find the square root of a given square number, say 324.

2	324
2	162
3	81
3	27
3	9
	3

we know that the prime factorisation of 324 is

324 = 2 x 2 x 3 x 3 x 3 x 3

§§ **Finding square root by division method :**

- Consider the following steps to find the square root of 529.

Step 1: Place a bar over every pair of digits starting from the digit at one's place.If the number of digits in it is odd, then the left-most single digit too will have a bar.Thus we have, 5 29 .

Step 2: Find the largest number whose square is less than or equal to the number

	2
2	529
	- 4
	1

under the extreme left bar (22 < 5 < 32). Take this number as the divisor and the quotient with the number under the extreme left bar as the dividend (here 5). Divide and get the remainder (1 in this case).

Step 3 : Bring down the number under the next bar (i.e., 29 in this case) to the right of the remainder. So the new dividend is 129.

Step 4 : Double the divisor and enter it with a blank on its right.

	2
2	529
	- 4
4	129

Step 5 Guess a largest possible digit to fill the blank which will also

	23
2	529
	- 4
43	129
	-129
	0

become the new digit in the quotient, such that when the new divisor is multiplied to the new quotient the product is less than or equal to the dividend.

In this case 42 × 2 = 84. As 43 × 3 = 129 so we choose the new digit as 3.

Get the remainder.

Step 6 : Since the remainder is 0 and no digits are left in the given number, therefore,

$\sqrt{529} = 23$

TEACHING TASK

I) MCQ's with single correct answers :

1. $\sqrt{\frac{25}{81}-\frac{1}{9}}=...$

A) $\frac{2}{3}$ B) $\frac{4}{9}$ C) $\frac{16}{81}$ D) $\frac{25}{81}$

2. If $\frac{52}{x}=\sqrt{\frac{169}{289}}$, the value of x is....

A) 52 B) 58 C) 62 D) 68

3. If $\sqrt{18x14x\,a}=84$, then a =...

A) 22 B) 24 C) 28 D) 32

4. $\sqrt{\frac{x}{169}}=\frac{54}{39}$ then the value of x is...

A) 108 B) 324 C) 2916 D) 4800

5. If $\sqrt{1+\frac{x}{169}}=\frac{14}{13}$, then x =....

A) 1 B) 13 C) 27 D) None

6. The denominator of a fraction is 3 more than the numerator. If the numerator as well as the denominator is increased by 4, the fractions becomes $\frac{4}{5}$. What was the orginal fraction.

A) $\frac{8}{11}$ B) $\frac{5}{8}$ C) $\frac{10}{13}$ D) $\frac{7}{10}$

II) Solve the following :

1. What will be the unit digit of the squares of the following numbers?

(i) 81 (ii) 1234 (iii) 52698 (iv)26387

2. Without adding, find the sum.

(i) 1 + 3 + 5 + 7 + 9 (ii) 1 + 3 + 5 + 7 + 9 + I1 + 13 + 15 + 17 +19

(iii) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23

3. Find the squares of the following numbers
(i)36 (ii)45 (iii)27 (iv)60

4. What could be the possible 'ones' digits of the square root of each of the following numbers?
(i) 4761 (ii) 99856 (iii) 178929 (iv) 657666025

5. Find the square roots of 100 and 169 by the method of repeated subtraction.

6. Find the square roots of the following numbers by the Prime Factorisation Method.
(i) 729 (ii) 1936 (iii) 4624 (iv) 7921 (v) 7744

7. Find the square root of each of the following numbers by Division method.
(i) 2401 (ii) 4489 (iii) 3481 (iv) 7.29 (v) 31.36

8. Area of a square plot is 2916 m^2. Find the side of the square plot.

9. Find the least number of four digits number which is a perfect squares.

10. The figure is made up of squares of the same size.The area of the figure is 324 square meters. Find the side length of the squares.

KEY

ΦΦ TEACHING TASK :

I) 1) B 2) D 3) C 4) B 5) C 6) A

II) 1) i) 1 ii) 6 iii) 4 iv) 9 2) i) 25 ii)100 iii) 144
3) i) 1296 ii) 2025 iii) 729 iv) 3600 4) i) 1 or 9 ii) 4 or 6
iii) 3 or 7 iv) 5 5) 10 and 13 6) i) 27 ii) 44 iii) 68
iv) 89 v) 88 7) i) 49 ii) 67 iii) 59 iv) 2.7 v) 5.6 8) 54
9) 1024 10) 18

LEARNER'S TASK

BEGINNERS (Level - I)

I) MCQ with single correct answers :

1. Which of the following number is a perfect square?
A) 136 B) 121 C) 234 D) 240

2. Which of the following number is not a perfect square?
A) 625 B) 1024 C) 1369 D) 2161

3. How many two-digit numbers satisfy this property : The last digit (unit's digit) of

the square of the two - digit number is 8.

A) 1 B) 0 C) 3 D) None

4. What will be the possible units digits for the square number?

A) 2 B) 9 C) 7 D) 8

5. The value of $5^2 + 6^2 + 30^2$ is...

A) 25^2 B) 30^2 C) 31^2 D) 38^2

6. Which of the following are consecutive square numbers?

A) p^2 , $(p+2)^2$ B) $(p+1)^2$, $(p+3)^2$ C) p^2 , $(p+1)^2$ D) $(p+1)^2$, $(p+3)^2$

7. 1^2, 11^2 , 111^2 , 1111^2 , ... are the examples for...

A) square root B) cube root C) palindrome D) perfect numbers

8. 370 , 5000 , 1000 are all....

A) perfect squares B) non-perfect squares C) square root D) none

9. Which of the following have 6 in units place....

A) 144^2 B) 251^2 C) 118^2 D) 299^2

10. The square of a natural number n is equal to the sum of first n ..... numbers.

A) even natural B) odd natural C) natural D) none

ACHIEVERS (Level - II)

Solve the following :

1. Find the least perfect square with four digits.

2. Find the smallest number which must be added to 2300 so that it becomes a perfect square.

3. A gardenar wishes to plant 6096 plants in the form of a square and found that there were 12 plants left. How many plants were planted in each row.

4. Find the smallest number by which 3645 must be multiplied to get a perfect square.

5. Find the smallest number by which 6000 should be divided to get a perfect square.

6. A man plants 15376 apple trees in his garden and arranges them so that there are as many rows as there are apple trees in each row. Then find the number of rows are?

7. Find the square roots of the following numbers by division method.

i) 286225 ii) 44521 iii) 29929 iv) 3136

8. Using prime factorization method, find the square root of

i) 15876 ii) 32400 iii) 19044 iv) 5184

9. Find the square root of $\frac{256}{441}, \frac{625}{1296}$

10. Find the length of a side of a square playground whose area is equal to the area of rectangular field of dimensions 72 m and 338 m

EXPLORERS (Level - III)

II) MCQ with one or more than one correct answers :

*This section contains multiple choice questions. Each question has 4 choices (A), (B), (C),(D), out of which **ONE or MORE** is correct. Choose the correct options*

1. Which of the following end with digit 1?

A) 161^2 B) 77^2 C) 109^2 D) 123^2

2. Which of the following is a pythagorean triplet?

A) $(2p, p^2-1, p^2+1)$ B) (3,4,5) C) (5,12,13) D) (8,15,17)

3. Which of the followign is a palindrome?

A) 1234321 B) 11111 C) 1231 D) 10000

4. Non-perfect square numbers generally ends with...

A) 2 B) 3 C) 8 D) 7

5. $\left(\sqrt{3}-\frac{1}{\sqrt{3}}\right)^2$ simplifies to...

A) $\frac{4}{3}$ B) $\frac{4}{\sqrt{3}}$ C) $\frac{12}{3\sqrt{3}}$ D) $\frac{\sqrt{48}}{3\sqrt{3}}$

6. What should be divided to $\sqrt{27}$ to make it a natural number?

A) $\sqrt{3}$ B) $\sqrt{27}$ C) $3\sqrt{3}$ D) 3

7. The smallest number by which 5808 should be multiplied so that the product becomes a perfect square is...

A) 6 B) 30 C) 4 D) 3

II) Match the following :

*This section contains Matrix-Match Type questions. Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in **Column–I** have to be matched with statements (p, q, r, s) in **Column–II**. The answers to these questions have to be appropriately bubbled as illustrated in the following example.*
*If the correct matches are A-p,A-s,B-r,B-r,C-p,C-q and D-s,then the correct bubbled 4*4 matrix should be as follows:*

8.

Column - I			Column-II
a.	$1^2+2^2+3^2$=...	[ ]	1) 49
b.	$2^2+3^2+6^2$=...	[ ]	2) 13^2
c.	$3^2+4^2+12^2$ = ...	[ ]	3) 7^2
d.	$4^2+5^2+20^2$ = ...	[ ]	4) 3^2
			5) 21^2

A) a-4, b-1, c-2, d-5 B) a-4, b-3, c-2, d-5

C) a-3, b-1, c-5, d-2 D)a-3, b-, c-4, d-5

RESEARCHERS (Level - IV)

I) MCQ with single correct answers :

1. The value of $\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{5}}}}$ **[AMTI-2007]**

A) $\frac{77}{60}$ B) $\frac{68}{157}$ C) $\frac{2007}{2008}$ D) None

2. If P=2x3x5x7 and Q=11x13x17x19. What is the integer part of $\frac{Q}{P}$? **[Ramanujan-14]**

A) 220 B) 219 C) 218 D) 217

3. It is given that $5\frac{3}{a} X\, b\frac{1}{2} = 19$ (where the two fractions are mixed fractions) then a+b=... **[AMTI-07]**

A) 10 B) 12 C) 9 D) 15

4. If 1.5a=0.04y then the value of $\left(\frac{b-a}{b+a}\right)$ is... **[NSO-12]**

A) $\frac{730}{770}$ B) $\frac{73}{77}$ C) $\frac{7.3}{7.7}$ D) $\frac{730}{77}$

5. Express $0.\overline{001}$ as a fraction in simplest form. **[AMT-10]**

A) $\frac{9}{999}$ B) $\frac{111}{999}$ C) $\frac{1}{999}$ D) $\frac{11}{999}$

6. Sum of $\frac{0.1}{0.01}+\frac{0.01}{0.1}+\frac{0.001}{0.01}+\frac{0.01}{0.001}$ is... **[APAMT-10]**

A) 2.2 B) 22 C) 20.2 D) 11.11

7. The value of $\sqrt{53824}$ =... **[Bank PO's-13]**

A) 202 B) 232 C) 242 D) 252

8. a x b=a+b+$\sqrt{ab}$, the value of 6 x 24 is... **[CBI-98]**

A) 41 B) 42 C) 43 D) 44

9. What is the square root of 0.16 **[S.S.C-98]**

A) 0.004 B) 0.04 C) 0.4 D) 4

10. $\sqrt{0.00004761}$ =... **[CBI-98]**

A) 0.00069 B) 0.0069 C) 0.0609 D) 0.069

11. If $\sqrt{3^n}$ =729, then the value of n is... **[S.S.C-08]**

A) 6 B) 8 C) 10 D) 12

12. The square root of $\left(7+3\sqrt{5}\right)\left(7-3\sqrt{5}\right)$ is... **[S.S.C-04]**

A) $\sqrt{5}$ B) 2 C) 4 D) $3\sqrt{5}$

13. Given $\sqrt{2}$ =1.414. The value of $\sqrt{8}+2\sqrt{32}-3\sqrt{128}+4\sqrt{50}$ is... **[S.S.C-03]**

A) 8484 B) 8.484 C) $\frac{84.84}{100}$ D) $\frac{8484}{1000}$

14. $\left(\sqrt{3}-\frac{1}{\sqrt{3}}\right)^2$ simplifies to... **[Bank PO's-10]**

A) $\frac{4}{3}$ B) $\frac{4}{\sqrt{3}}$ C) $\frac{12}{3\sqrt{3}}$ D) $\frac{\sqrt{48}}{3\sqrt{3}}$

KEY

ΦΦ LEARNER'S TASK :

- **BEGINNERS :** 1) B 2) D 3) B 4) B 5) C 6) C 7) C 8) B 9) A 10) B
- **ACHIEVERS :** 1) 1024 2) 4 3) 78 4) 5 5) 20 6)124 7) i) 535 ii) 211 iii) 173 iv) 56 8) i) 126 ii) 180 iii) 138 iv) 72 9) $\frac{16}{21}$ *and* $\frac{25}{36}$ 10) 156
- **EXPLORERS :** 1) A , C 2) A , B, C, D 3) A , B 4) A , B , C , D 5) A , D 6) A, B, C 7) D 8) A, B
- **RESEARCHERS :** 1) B 2) B 3) A 4) A,B,C 5) C 6) C 7) B 8) B 9) C 10) B 11) D 12) B 13) B,D 14) A,D

§§ CUBE AND CUBE ROOTS

§§ Introduction :

This is a story about one of India's great mathematical geniuses, S. Ramanujan. Once another famous mathematician Prof. G.H. Hardy came to visit him in a taxi whose number was 1729. While talking to Ramanujan, Hardy described this number "a dull number". Ramanujan quickly pointed out that 1729 was indeed interesting. He said it is the smallest number that can be expressed as a sum of two cubes in two different ways: $1729 = 1728 + 1 = 12^3 + 1^3$ $1729 = 1000 + 729 = 10^3 + 9^3$

§§ **Cubes :** A natural number 'a' is called a perfect cubes if there exists another number 'b' such that $a = b \times b \times b = b^3$ .In a simple language, if we multiply a number by itself three times , we get the cube of a number.

¶¶ Squares and Cubes and their unit's digit:

Number(**x**)	Square(x^2)	Cubes(x^3)
1	1	1
2	4	8
3	9	27
4	16	64
5	25	125
6	36	216
7	49	343
8	64	512
9	81	729
10	100	1000
11	121	1331
12	144	1728
13	169	2197
14	196	2744
15	225	3375
16	256	4096
17	289	4913
18	324	5832
19	381	6859
20	400	8000

§§ Properties of cubes :

1. If a number can be expressed as a product of three equal factors then it is said to be a perfect cube or cubic number.

2. If the number has 1 in the units place, then its cube ends with 1.

3. If the number has 0,4,5,6 or 9 in the units place then its cube ends with 0,4,5,6 or 9.

4. The cube of 2 ends with 8 and cube of 8 ends with 2.

5. The cube of 3 ends with 7 and cube of 7 ends with 3.

6. Cubes of all even natural numbers are even.

7. Cubes of all odd natural numbers are odd.

8. Cube of a negative rational number is always negative.Also $\sqrt[3]{-a} = -\sqrt[3]{a}$

9. Cubes of all odd number are odd.

10. Cubes of all even number are even.

11. Cubes of a natural numbers of the form 3n is a multiple of 27.

12. Cubes of a natural numbers of the form 3n+1 is also number of the form 3n+1.

13. Cubes of a natural numbers of the form 3n+2 is also is in the form 3n+2.

14. Cubes of a number which ends in a zero, ends in three zeros.

15. Cubes of a negative number always ends in negative.

Note : The sum of cubes of first 'n' natural numbers is equal to the square of their sum.

i.e., $1^3+2^3+3^3+....+n^3 = (1+2+3+....n)^2$

§§ **Some interesting patterns :**

Adding consecutive odd numbers Observe the following pattern of sums of odd numbers.

$1 = 1 = 1^3$

$3 + 5 = 8 = 2^3$

$7 + 9 + 11 = 27 = 3^3$

$13 + 15 + 17 + 19 = 64 = 4^3$

$21 + 23 + 25 + 27 + 29 = 125 = 5^3$

How many consecutive odd numbers will be needed to obtain the sum as 103?

§§ **Cubes and their prime factors**

Consider the following prime factorisation of the numbers and their cubes.

Prime factorisation	Prime factorisation of a number of its cube
$4 = 2 \times 2$	$4^3 = 64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^3 \times 2^3$
$6 = 2 \times 3$	$6^3 = 216 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2^3 \times 3^3$
$15 = 3 \times 5$	$15^3 = 3375 = 3 \times 3 \times 3 \times 5 \times 5 \times 5 = 3^3 \times 5^3$
$12 = 2 \times 2 \times 3$	$12^3 = 1728 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2^3 \times 2^3 \times 3^3$

§§ **Cube root :**

Finding the square root, as you know, is the inverse operation of squaring. Similarly, finding the cube root is the inverse operation of finding cube.

We know that $2^3 = 8$; so we say that the cube root of 8 is 2.

We write $\sqrt[3]{8} = 2$. The symbol $\sqrt[3]{\ }$ denotes 'cube-root.'

TEACHING TASK

I) MCQ's with single correct answers :

1. $\sqrt[3]{-17576} = \cdots$

A) -24 B) -26 C) -16 D) -36

2. What will be the unit digit of the cube of the 27?

A) 2 B) 7 C) 3 D) 9

3. $\sqrt[3]{\frac{8}{125000}} = \ldots$

A) 0.4 B) 0.04 C) 0.8 D) 0.6

4. The value of $1^3+2^3+3^3+4^3$ =

A) 50 B) 100 C) 150 D) 75

5. $\sqrt[3]{4\frac{12}{125}} = \ldots.$

A) $\frac{1}{5}$ B) $\frac{1}{8}$ C) $\frac{8}{5}$ D) $\frac{5}{8}$

II) Solve the following :

1. Consider the following pattern.

$2^3 - 1^3 = 1 + 2 \times 1 \times 3$

$3^3 - 2^3 = 1 + 3 \times 2 \times 3$

$4^3 - 3^3 = 1 + 4 \times 3 \times 3$

Using the above pattern, find the value of the following.

(i) $7^3 - 6^3$ (ii) $12^3 - 11^3$ (iii) $20^3 - 19^3$ (iv) $51^3 - 50^3$

2. Is 392 a perfect cube? If not, find the smallest natural number by which 392 must be multiplied so that the product is a perfect cube.

3. Which of the following numbers are not perfect cubes?

(i) 216 (ii) 512 (iii) 8000 (iv) 256 (v) 4665

4. Find the one's digit of $(9)^3$.

5. Find the cube root of each of the following numbers by prime factorisation method.

(i) 512 (ii) 15625 (iii) 13824

(iv) 19683 (v)32768 (vi)125000

6. Find the smallest number by which each of the following numbers must be multiplied to obtain a perfect cube.

(i) 243 (ii) 256 (iii) 72 (iv) 675

7. Can we find the cube root of (-10648) ? If yes find the integer.

8. Find the value of $\sqrt[3]{392} X \sqrt[3]{448}$

9. The volume of cubical box is 46656 cubic meters. Find the length of each side of the box.

LEARNER'S TASK

BEGINNERS (Level - I)

I) MCQ's with single correct answers :

1. How many perfect cubes are present between 1 to 500...

A) 5 B) 6 C) 7 D) 8

2. If $2^x = \sqrt[3]{32}$ then x=...

A) $\frac{5}{2}$ B) $\frac{5}{3}$ C) $\frac{125}{75}$ D) $\frac{3}{5}$

3. Which of the following one is a perfect cube?

A) 225 B) 900 C) 27000 D) 3025

4. What will be the unit digit of the cube pf the 27?

A) 2 B) 7 C) 3 D) 9

5. The cube of 2013 ends with (i.e units digit is)

A) 3 B) 9 C) 1 D) 7

6. The digit in the unit place of 13^3+25^3 is ...

A) 7 B) 2 C) 5 D) 3

ACHIEVERS (Level - II)

Solve the following :

1. By what least number should 288 be multiplied to get a perfect cube? What is this perfect cube? Find its cube root?

2. By what least number should 1029 be divided to get a perfect cube? What is this perfect cube? Find its cube root?

3. Find the cube root of

i) 3375 ii) 13824 iii) 91125 iv) 9261

4. Evaluate $\sqrt[3]{1372} X \sqrt[3]{1458}$ and $\sqrt[3]{\frac{125}{216}}$

5. Find the cube root of 1728 , 4096 through prime factorization method.

EXPLORERS(Level - III)

I) MCQs with one or more than one correct answer :

*This section contains multiple choice questions. Each question has 4 choices (A), (B), (C),(D), out of which **ONE or MORE** is correct. Choose the correct options*

1. Which of the following are perfect cubes?

A) 1331 B) 512 C) 2500 D) 216

2. Which of the following are not perfect cubes?

A) 700 B) 516 C) 1000 D) 729

3. The value of $1^3+2^3+3^3$ is...

A) $(1+2+3)^3$ B) $(1+2+3)^2$ C) 36 D) 216

4. If the number has 0,4,5,6 in the units place, then its cube ends with...

A) 0 B) 4 C) 5 D) 6

5. What is the smallest number by which 1323 is to multipled so that the product is a perfect cube?

A) 7 B) 49 C) $\sqrt[3]{343}$ D) $\sqrt{49}$

6. Matching the following:

*This section contains Matrix-Match Type questions. Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in **Column–I** have to be matched with statements (p, q, r, s) in **Column–II**. The answers to these questions have to be appropriately bubbled as illustrated in the following example.*
*If the correct matches are A-p,A-s,B-r,B-r,C-p,C-q and D-s,then the correct bubbled 4*4 matrix should be as follows:*

Column - I		Column - II
a. By what least number 675 be multiplied to obtain a number which is a perfect cube	[ ]	1) 17
b. What is the smallest number by which 8640 must be divided so that the quotient is a perfect cube	[ ]	2) 450
c. What smallest number should 7803 be multiplied with so that the produt becomes a perfect cube.	[ ]	3) 5
d. What is the smallest number by which 3600 be divided to make it a perfect cube	[ ]	4) 45 x 10

5) $(4913)^{\frac{1}{3}}$

A) a-3,b-3,c-1,d-2 B) a-3,b-3,c-5,d-4

C) a-3,b-1,c-5,d-2 D)a-3,b-1,c-4,d-5

7. Comprehension questions:

- *This section contains paragraph. Based upon each paragraph multiple choice questions have to be answered. Each question has 4 choices (A) , (B) ,(C) and (D) out of which **ONLY ONE i**s correct. Choose the correct option.*

Consider the following pattern

$2^3 - 1^3 = 1 + 2x1x3 = 7$

$3^3 - 2^3 = 1 + 3x2x3 = 19$

$4^3 - 3^3 = 1 + 4x3x3 = 37$ *and so on...*

i) The value of 10^3-9^3 by using above pattern is...

A) 281 B) 271 C) 217 D) 218

ii) The value of 15^3-14^3 by using above pattern is...

A) 631 B) 613 C) 531 D) 513

iii) The value of 26^3-25^3 by using the above pattern is...

A) 1981 B) 1951 C) 1915 D) 1918

iv) Sum of the values of the above three questions is...

A) 2835 B) 2358 C) 2853 D) 2538

KEY

ΦΦ TEACHING TASK :

I) 1) B 2) C 3) B 4) B 5) C

II) 1) i) 127 ii) 397 iii) 1141 iv) 7551

2) 7 3) i) 6 ii) 8 iii) 20 iv) not perfect cube

v) not perfect cube

4) 9 5) i) 8 ii) 25 iii) 24 iv) 27 v) 32 vi) 50

6) i) 3 ii) 2 iii) 3 iv) 5

7) -22 8) 56 9) 36

ΦΦ TEACHING TASK :

☐ **BEGINNERS :**

1) B 2) B 3) C 4) C 5) D 6) B

☐ **ACHIEVERS:** 1) 6, 1728 , 12 2) 3 , 343 , 7 3) i) 15 ii) 24 iii) 45 iv) 21

4) 126 and $\frac{5}{6}$ 5) 12 and 16

☐ **EXPLORERS :** 1) A , C, D 2) A , B 3) B 4) A,B,C,D 5) A,C,D

6) A, B 7) i) B ii) A iii) B iv) D

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