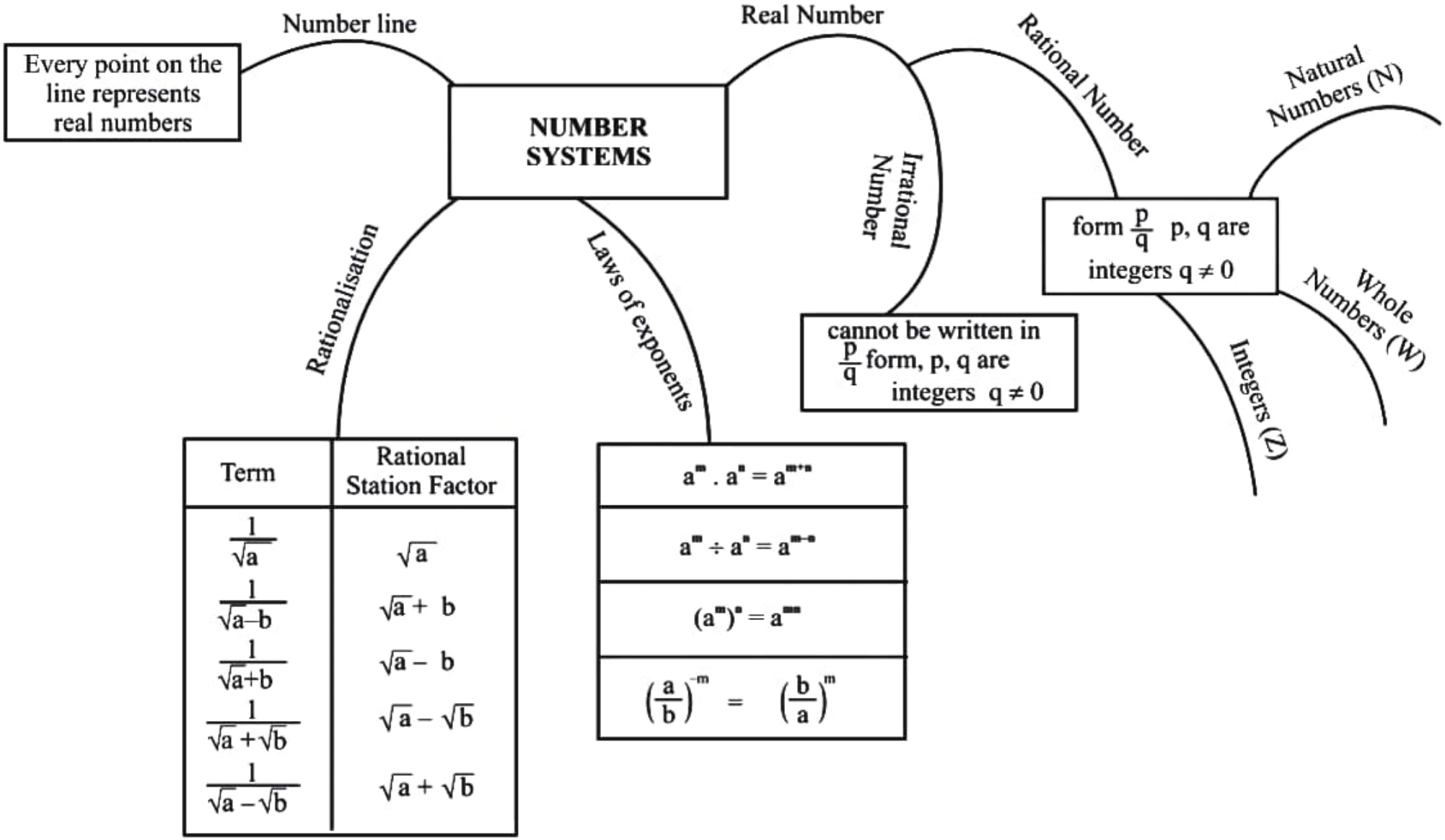
NUMBER SYSTEMS
Number line
Every point on the line represents real numbers
Real Number
Rational Number
Irrational Number
cannot be written in $\frac{p}{q}$ form, p, q are integers $q \neq 0$
form $\frac{p}{q}$ p, q are integers $q \neq 0$
Natural Numbers (N)
Whole Numbers (W)
Integers (Z)
Rationalisation
Laws of exponents
Term
Rational Station Factor
$\frac{1}{\sqrt{a}}$
$\sqrt{a}$
$\frac{1}{\sqrt{a}-b}$
$\sqrt{a}+b$
$\frac{1}{\sqrt{a}+b}$
$\sqrt{a}-b$
$\frac{1}{\sqrt{a}+\sqrt{b}}$
$\sqrt{a}-\sqrt{b}$
$\frac{1}{\sqrt{a}-\sqrt{b}}$
$\sqrt{a}+\sqrt{b}$
$a^m \cdot a^n = a^{m+n}$
$a^m \div a^n = a^{m-n}$
$(a^m)^n = a^{mn}$
$\left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^m$

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NUMBER SYSTEMS

- 1, 2, 3 ... are natural numbers which are represented by N
- 0, 1, 2, 3 ... are whole numbers which are represented by W.
- ... -3, -2, -1, 0, 1, 2, 3 ... are Integers which are represented by Z.
- Prime Numbers: All natural numbers that have exactly two factors (1 and itself) are called Prime numbers. e.g. - 2, 3, 5, 7 etc.
- Composite Numbers: Those natural numbers which have more than two factors are known as Composite numbers. e.g - 4, 6, 8, 10, 12 ... etc.

* 1 is neither prime nor composite *

- A number is Rational number if:

→ It can be represented in the form of $\frac{p}{q}$ where p and q are integers and $q \neq 0$.

or

→ its decimal is terminating (e.g $\frac{2}{5} = 0.4$)

or

→ its decimal expansion is non terminating but repeating.

(e.g $0.\overline{1234} = 0.12341234....$)

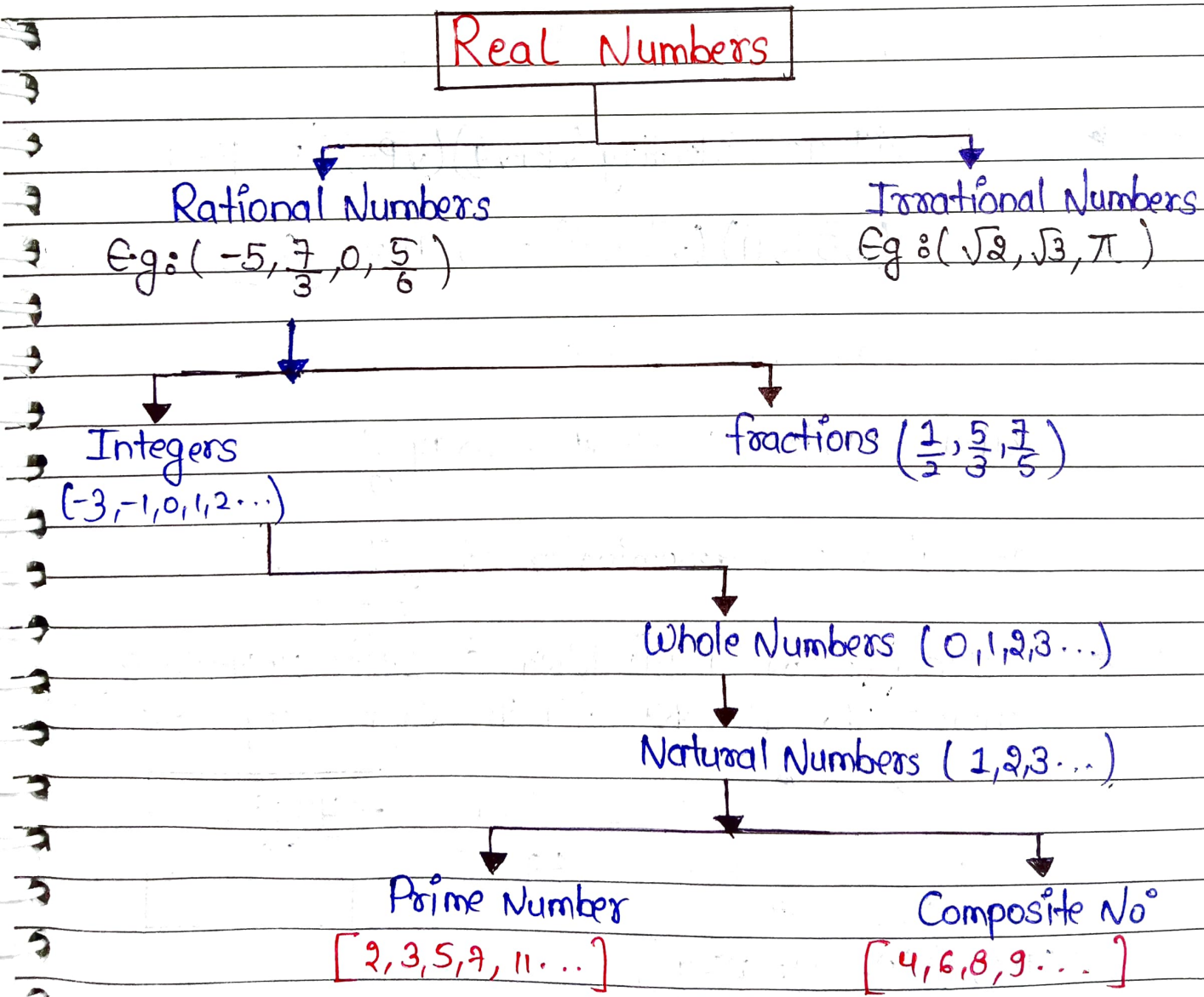
- A number is irrational number if :

→ it cannot be represented in the form of $\frac{p}{q}$

or

→ its decimal expansion is non-terminating and non-repeating. [e.g - 0.10100100001...]

■ Real Numbers : All numbers including both rational and irrational numbers are called Real Numbers.



• Identities Related to Square Roots :

If P and q are two positive Real numbers

① $\sqrt{pq} = \sqrt{p}\sqrt{q}$

② $\sqrt{\frac{p}{q}} = \frac{\sqrt{p}}{\sqrt{q}}$

③ $(\sqrt{p}+\sqrt{q})(\sqrt{p}-\sqrt{q}) = p-q$

④ $(p+\sqrt{q})(p-\sqrt{q}) = p^2-q$

⑤ $(\sqrt{p}+\sqrt{q})(\sqrt{r}+\sqrt{s}) = \sqrt{pr}+\sqrt{ps}+\sqrt{qr}+\sqrt{qs}$

⑥ $(\sqrt{p}+\sqrt{q})^2 = p+2\sqrt{pq}+q$

Example : Simplify $(\sqrt{5}+\sqrt{11})(\sqrt{5}-\sqrt{11})$

→ We will use identity $(\sqrt{p}+\sqrt{q})(\sqrt{p}-\sqrt{q}) = p-q$

$(\sqrt{5}+\sqrt{11})(\sqrt{5}-\sqrt{11}) = 5-11 = -6$

■ Rationalizing the Denominator :

Seedha Example से समझो, okay ?

Ex Rationalise the denominator of $\frac{7}{7-\sqrt{3}}$.

→ denominator में जो लिखा है, उसको Multiply & divide कर दो बस बीच का Sign change कर के।

$$\frac{7}{7-\sqrt{3}} \times \frac{7+\sqrt{3}}{7+\sqrt{3}} = \frac{7(7+\sqrt{3})}{49-3} = \boxed{\frac{49+7\sqrt{3}}{46}}$$

$(\because (p+\sqrt{q})(p-\sqrt{q}) = p^2-q)$

Laws of Exponents :

Let $a > 0$ be a real number and m, n are rational numbers, then

1. $a^m a^n = a^{m+n}$
2. $\frac{a^m}{a^n} = a^{m-n}$
3. $(a^m)^n = a^{mn}$
4. $a^m \cdot b^m = (ab)^m$
5. $a^0 = 1$
6. $a^{-m} = \frac{1}{a^m}$

PART - A

1. If $x = 2$ and $y = 4$, then $\left(\frac{x}{y}\right)^{x-y} + \left(\frac{y}{x}\right)^{y-x}$ = _____

   a) 4 b) 8

   c 12 d) 2

2. Which of the following is the greatest ?

   a) 4^2 b) $(16)^{3/2}$

   c) $\left(\frac{1}{64}\right)^{-1/3}$ d) $(256)^{-1/4}$

3. $\frac{(32)^{0.2} + (81)^{0.25}}{(256)^{0.5} - (121)^{0.5}}$ = _____

   a) 2 b) 5

   c) 1 d) 11

4. $\frac{3}{7}$ line between _____

   a) $\frac{4}{9}, \frac{5}{9}$ b) $\frac{43}{99}, \frac{4}{9}$

   c) $\frac{42}{99}, \frac{4}{9}$ d) $\frac{41}{99}, \frac{41}{9}$

5. The number 0.3185643185643185643..... is

   a) a natural number b) an integer

   c) a rational number d) an irrational number

6. The number $0.\overline{7}$ in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$, is

   a) $\frac{77}{100}$ b) $\frac{7}{10}$

   c) $\frac{7}{9}$ d) $\frac{7}{100}$

7. The value of $0.\overline{23} + 0.\overline{22}$ is

   a) 0.45 b) $0.\overline{45}$

   c) $\frac{45}{99}$ d) both (B) and (C)

8. The value of $[3-4(3-4)^4]^3$, is

a) 1 b) -1

c) 0 d) 7

9. The cube root of 125 divided by square root of 25, is

a) 5 b) 1

c) 1/5 d) None of these

10. If $y^2 = 625$ then y is

a) a rational number b) an irrational number

c) neither rational nor irrational d) a natural number

11. $\sqrt[2]{(81)^{25}}$ = _____

a) 1/81 b) 81

c) 243 d) 343

12. The value of x, if $5^{x-3} \cdot 3^{2x-8} = 225$, is

a) 2 b) 3

c) 5 d) 7

13. If $a = 2 + \sqrt{3}$, then the value of $\frac{1}{a}$ is

a) $2+\sqrt{3}$ b) $2-\sqrt{3}$

c) $\sqrt{3}-2$ d) 1

14. The smallest natural number is

a) -1 b) 0

c) 1 d) 2

15. Which of the following is not a rational number ?

a) $\sqrt{2}$ b) $\sqrt{4}$

c) $\sqrt{9}$ d) $\sqrt{25}$

16. Choose the wrong statement :

a) Every natural number is a whole number.

b) Every integer is a rational number.

c) Every rational number is an integer.

d) Every rational number is a real number.

17. The decimal expansion of the number $\sqrt{3}$ is

a) a finite decimal
b) 1.732
c) non-terminating recurring
d) non-terminating non-recurring

18. Between two rational numbers

a) there is no rational number.
b) there is exactly one rational number.
c) there are infinitely many rational numbers.
d) there are only rational numbers and no irrational number.

19. Which of the following is an irrational number ?

a) $\sqrt{\frac{4}{9}}$
b) $\frac{\sqrt{12}}{\sqrt{3}}$
c) $\sqrt{7}$
d) $\sqrt{81}$

20. Every rational number is

a) a natural number
b) an integer
c) a real number
d) a whole number

21. $\sqrt{6} \times \sqrt{8}$ is equal to

a) $3\sqrt{4}$
b) $4\sqrt{3}$
c) $\sqrt{14}$
d) $6\sqrt{8}$

22. After rationalising the denominator of $\frac{3\sqrt{2}}{3\sqrt{2} - 2\sqrt{2}}$, we get the denominator as

a) 13
b) 5
c) 19
d) 35

23. Which of the following is equal to 'a' ?

a) $a^{\frac{10}{6}} - a^{\frac{4}{6}}$
b) $\sqrt[12]{(a^4)^{1/3}}$
c) $(\sqrt{a^3})^{\frac{2}{3}}$
d) $a^{\frac{12}{7}} \times a^{\frac{7}{12}}$

24. The product of any two irrational numbers is

a) always an irrational number.

b) always a rational number.

c) always an integer.

d) sometimes rational, sometimes irrational.

25. a rational number between $\sqrt{2}$ and $\sqrt{3}$ is

a) $\frac{\sqrt{2} + \sqrt{3}}{2}$

b) $\frac{\sqrt{2} \times \sqrt{3}}{2}$

c) 1.5

d) 1.8

CHAPTER-1
NUMBER SYSTEMS
ANSWERS

1. b) 8

2. b) $(16)^{3/2}$

3. c) 1

4. c) $\frac{42}{99}, \frac{4}{9}$

5. c) a rational number

6. c) $\frac{7}{9}$

7. d) Both (B) and (C)

8. b) –1

9. b) 1

10. a) a rational number

11. c) 243

12. c) 5

13. b) $2 - \sqrt{3}$

14. c) 1

15. a) $\sqrt{2}$

16. c) Every rational number is an integer

17. d) Non-ternimating non-recurring

18. c) There are infinitely many rational numbers

19. c) $\sqrt{7}$

20 c) a real number

21. b) $4\sqrt{3}$

22. c) 19

23. c) $(\sqrt{9^3})^{2/3}$

24. d) Sometimes rational, sometimes irrational

25. c) 1.5