



Number System

- **Digits** The symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 are known as digits in Hindu Arabic system.
- **Number or Numerals** A mathematical symbol which represent the digits, are known as number or numerals.

Face Value and Place Value

We represent a number '309872547' as

Crore		Lakhs		Thousands		Units		
Ten Crore 10^8	Crore 10^7	Ten Lakh 10^6	Lakh 10^5	Ten Thousand 10^4	Thousand 10^3	Hundred 10^2	Tens 10^1	One 10^0
3	0	9	8	7	2	5	4	7

- Face Value** The face value of a digit is the value of the digit itself irrespective of its place in the numeral e.g. In the above number, face value of 8 is 8, face value of 5 is 5 and so on.
- Place Value** The place value of a digit depends on its position in the number.
In the above numbers
Place value of 8 is $8 \times 10^5 = 800000$
Place value of 2 is $2 \times 10^3 = 2000$
Place value of 5 is $5 \times 10^2 = 500$

Types of Numbers

Some types of numbers are given below

- Natural Numbers** Those numbers which are used for counting, are known as natural numbers. These are denoted by N.
e.g. $N = 1, 2, 3, \dots$
- Whole Numbers** If 0 is included in natural numbers, then these numbers are known as whole numbers.
These number are denoted by W.
e.g. $W = 0, 1, 2, 3, \dots$
- Integers** All whole numbers and their negative numbers are known as integers. It is denoted by I.
 $\therefore I = \pm 1, \pm 2, \pm 3, \dots$
'0' is neither + ve nor -ve integer.
- Even Numbers** Those numbers which are divisible by 2, are known as even numbers.
e.g. 2, 4, 6, ...
- Odd Numbers** Those numbers, which are not divisible by 2, are known as odd numbers.
e.g. 1, 3, 5, 7, ...
- Prime Numbers** Those numbers which are divisible by 1 and the number itself, are known as prime numbers.
e.g. 2, 3, 5, 7, 11, 13, ...

- (vii) **Coprime Numbers** Two natural numbers are said to be coprimes, if their HCF is 1.
e.g. (7, 9), (15, 16)
- (viii) **Composite Numbers** Those numbers which are divisible by atleast one number except 1 and the number itself, are known as composite numbers. e.g. 8, 12 and 15 etc., are composite numbers.
- (ix) **Rational Numbers** Numbers in the form of $\frac{p}{q}$, where $p, q \in \mathbb{I}$ and $q \neq 0$, are known as rational numbers. It is denoted by \mathbb{Q} .
Here 'p' is called numerator and 'q' is called denominator.

e.g. $\frac{2}{3}, \frac{5}{6}, 6, \frac{-4}{5}$, etc.

Positive rational numbers are also called as **fractions**.

e.g. $\frac{3}{5}, \frac{2}{7}, \frac{12}{24}$ etc.

In its standard form it cannot be simplified further.

Rational numbers can be expressed as

(a) **Terminating decimal**

e.g. $\frac{25}{10} = 2.5$ or $\frac{25}{100} = 0.25$

(b) **Non-terminating decimal**

e.g. $\frac{1}{3} = 0.333... = 0.\bar{3}$

Note To convert non-terminating decimal fractions into simple fractions, in the numerator take the difference between the number formed by all the digits after decimal point (repeated digits will be taken only once) and the number formed by non-repeating digits. In the denominator, place as many nines as there are repeating digits and after nine put as many zeroes as the number of non-repeating digits.

e.g. $0.333... = 0.\bar{3} = \frac{3}{9}$

$0.3666... = 0.3\bar{6} = \frac{(36-3)}{90} = \frac{33}{90}$

- (x) **Irrational numbers** Numbers which can not be expressed in the form of $\frac{p}{q}$, where

$p, q \in \mathbb{I}$ and $q \neq 0$, are known as irrational number e.g. $\sqrt{2}, \sqrt{6}, \sqrt[3]{11}$, etc.

- (xi) **Real Numbers** Those numbers which are either rational or irrational, are known real numbers. It is denoted by \mathbb{R} . All natural, whole, integer, rational and irrational numbers are real numbers.

e.g. 2, 0, -5, $\frac{1}{2}, \sqrt{6}$, etc.

Example 1 Sum of first five prime numbers is

- (a) 25 (b) 26
(c) 27 (d) 28

Sol. (d) We know that first five prime numbers are 2, 3, 5, 7, 11.

\therefore Their sum = $2 + 3 + 5 + 7 + 11 = 28$

Example 2 Which of the following is not true?

- (a) 11 is prime number
(b) $\frac{2}{5}$ is rational number
(c) ± 8 is real number
(d) $\frac{6}{0}$ is rational number

Sol. (d) $\frac{6}{0}$ is not rational number in its denominator

(p / q form), where $q = 0$, which is wrong.

Divisibility Test

By No.	Condition
2	Unit's place digit is either even or zero, i.e. numbers ending with 2, 4, 6, 8, 0.
3	The sum of digits of given number is divisible by 3.
4	The number formed with last two right handed digits is divisible by 4.
5	Unit's place digit is either 0 or 5.
6	The number is divisible by 2 and 3.
7	Twice of the digit at units place is subtracted from the number obtained after omitting the unit digit. If the remainder is divisible by 7, then the given number is divisible by 7.
8	The number formed with last three right handed digits is divisible by 8.

By No.	Condition
9	Sum of digits of given number is divisible by 9.
10	Unit's place digit is zero.
11	The difference of sums of even and odd places digits of given number is either zero or divisible by 11.
25	The last two digits is divisible by 25.

Example 3 Which number is not divisible by 3?

- (a) 75 (b) 52 (c) 63 (d) 42

Sol. (b) Adding the digits of given numbers, we have

$$75 = 7 + 5 = 12 \text{ (divisible by 3)}$$

$$52 = 5 + 2 = 7 \text{ (not divisible by 3)}$$

$$63 = 6 + 3 = 9 \text{ (divisible by 3)}$$

$$42 = 4 + 2 = 6 \text{ (divisible by 3)}$$

\therefore 52 is not divisible by 3, since its sum is not divisible by 3.

Division Algorithm

Divide the number 38 by 5, we have

$$\begin{array}{r} 5 \overline{) 38} \quad (7 \\ \underline{-35} \\ 3 \end{array}$$

Here, 38 = Dividend

5 = Divisor

7 = Quotient

and 3 = Remainder

i.e. Dividend = Divisor \times Quotient + Remainder

$$\Rightarrow 38 = 5 \times 7 + 3$$

Test of Number to be a Prime

Suppose we have to check a number 'p' whether it is a prime number or not, then first of all we have to find a whole number 'x' greater than \sqrt{p} . Now, we have to check the divisibility of p by all the prime numbers upto 'x'. If all these prime numbers upto 'x' do not completely divide p, then p is a prime number,

e.g. Check whether the number 181 is a prime number or not.

$$\text{Here, } \sqrt{181} < 14$$

Prime number upto 14 = 2, 3, 5, 7, 11, 13

Now, we can see that, 181 is not completely divisible by any of the prime number upto 14.

So, 181 is a prime number.

Simplification

To solve any expression or to simplify, it we follow the rule of VBODMAS, i.e.

V \rightarrow Vinculum or bar ' $\bar{}$ '

B \rightarrow Bracket, i.e. (), { }, []

O \rightarrow Of

D \rightarrow Division, \div

M \rightarrow Multiplication ' \times '

A \rightarrow Addition ' $+$ '

S \rightarrow Subtraction ' $-$ '

To solve brackets, we follow the order

(i) (), circular bracket

(ii) { }, curly bracket

(iii) [], square bracket

Example 4 $\frac{3}{4}$ of $\frac{2}{7}$ of $\frac{1}{5}$ of 560 = ?

(a) 28

(b) 24

(c) 32

(d) 36

Sol. (b) We have, $\frac{3}{4}$ of $\frac{2}{7}$ of $\frac{1}{5}$ of 560

$$= \frac{3}{4} \times \frac{2}{7} \times \frac{1}{5} \times 560 = 24$$

Example 5 Find the value of

$$1 \div [1 + 1 \div \{1 + 1 \div (1 + 1 \div 2)\}]$$

(a) $\frac{5}{8}$

(b) $\frac{8}{5}$

(c) $\frac{2}{5}$

(d) $\frac{3}{8}$

Sol. (a) We have,

$$1 \div [1 + 1 \div \{1 + 1 \div (1 + 1 \div 2)\}]$$

$$= 1 \div \left[1 + 1 \div \left\{ 1 + 1 \div \left(1 + \frac{1}{2} \right) \right\} \right]$$

$$= 1 \div \left[1 + 1 \div \left\{ 1 + 1 \div \frac{3}{2} \right\} \right]$$

$$= 1 \div \left[1 + 1 \div \left\{ 1 + \frac{2}{3} \right\} \right] = 1 \div \left[1 + 1 \div \frac{5}{3} \right]$$

$$= 1 \div \left[1 + \frac{3}{5} \right] = 1 \div \frac{8}{5} = \frac{5}{8}$$

Example 6 The value of $1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{7}}}$ is

- (a) $\frac{29}{37}$ (b) $\frac{37}{29}$ (c) $\frac{29}{17}$ (d) $\frac{17}{29}$

Sol. (c) $1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{7}}} = 1 + \frac{1}{1 + \frac{5}{12}}$
 $= 1 + \frac{12}{17} = \frac{29}{17}$

Practice Exercise

- Smallest 3-digit prime number is
 (a) 103 (b) 107 (c) 101 (d) 109
- Which statement is true?
 (a) $-5 + 3 \neq 3 - 5$
 (b) $\frac{-8}{12} = \frac{10}{-15}$
 (c) 2 is not natural number
 (d) 17 is not prime number
- Which of the following number is in standard form?
 (a) $\frac{28}{106}$ (b) $\frac{-24}{52}$ (c) $\frac{-27}{48}$ (d) $\frac{-49}{71}$
- The value of $0.\overline{12}$ is
 (a) $\frac{12}{199}$ (b) $\frac{3}{33}$ (c) $\frac{2}{33}$ (d) $\frac{4}{33}$
- Evaluate $\frac{2}{3} + 0.\overline{11}$
 (a) $\frac{7}{9}$ (b) $\frac{9}{7}$
 (c) $\frac{77}{9}$ (d) $\frac{11}{99}$
- The value of $\frac{3}{5} + \frac{3}{5} + \dots$ upto 25 times is
 (a) 25 (b) 10 (c) 15 (d) 35
- The sum of $\frac{3}{8} + \frac{3}{8} + \dots$ 40 times is
 (a) 10 (b) 15
 (c) 25 (d) 30
- Which number is not divisible by 4?
 (a) 270 (b) 385 (c) 312 (d) 432
- Which number is not divisible by 5?
 (a) 5010 (b) 6051
 (c) 2055 (d) 1555
- Which of the following numbers is divisible by 9?
 (a) 4621 (b) 2834
 (c) 9216 (d) 1560
- By which number, 91476 is not divisible?
 (a) 11 (b) 7
 (c) 2 (d) 8
- Which number is divisible by 5 and 9?
 (a) 585 (b) 285
 (c) 389 (d) 560
- Which number is divisible by 5 and 25?
 (a) 2170 (b) 5125
 (c) 3107 (d) 4115
- If $157x234$ is divisible by 3, then the digit at the place of x is
 (a) 0 (b) 1
 (c) 2 (d) None of these
- The value of K, where $3\text{K}2$ is divisible by 6, is
 (a) 1 (b) 2 (c) 3 (d) 7
- If a number $573xy$ is divisible by 90, then the value of $x + y$ is
 (a) 13 (b) 3
 (c) 8 (d) 6
- What least number should be subtracted from 1365 to get a number exactly divisible by 25?
 (a) 15 (b) 5 (c) 10 (d) 20
- If dividend = 64, quotient = 5 and remainder = 4 Find divisor.
 (a) 12 (b) 16 (c) 20 (d) 18

19. The product $\frac{3}{4}$, $\frac{2}{5}$ and $\frac{25}{3}$ is
 (a) $\frac{5}{2}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) $\frac{5}{3}$

20. $8\frac{1}{4} + 8\frac{1}{2} + ? = 20\frac{1}{8}$

- (a) $8\frac{1}{4}$ (b) $3\frac{5}{8}$
 (c) $3\frac{3}{8}$ (d) None of these

21. The value of $\frac{5 - [4 - \{3 - (3 - 3 - 6)\}]}{2}$ is

- (a) 6 (b) -1 (c) 5 (d) -4

22. Simplify $2\frac{4}{5} + 3\frac{1}{2}$ of $\frac{4}{5}$

- (a) 0 (b) 1
 (c) 2 (d) 3

23. The value of A and B is

$$\begin{array}{r} A \\ A \\ + A \\ \hline BA \end{array}$$

- (a) 5 and 1 (b) 4 and 2
 (c) 3 and 2 (d) 4 and 1

Answers

1	(c)	2	(b)	3	(d)	4	(d)	5	(a)	6	(c)	7	(b)	8	(b)	9	(b)	10	(c)
11	(d)	12	(a)	13	(b)	14	(c)	15	(c)	16	(b)	17	(a)	18	(a)	19	(a)	20	(c)
21	(c)	22	(b)	23	(a)														

Hints & Solutions

1. (c) $\because \sqrt{101} < 11$

Prime number upto 11 = 2, 3, 5, 7, 11

Now, we can see that, 101 is not completely divisible by any of the prime number upto 11.

So, 101 is a prime number.

2. (b) By options,

(a) $-5 + 3 = -2$

and $3 - 5 = -2$, which are equal.

(b) $\frac{-8}{12} = \frac{10}{-15}$

$\Rightarrow \frac{-2}{3} = \frac{-2}{3},$

which is true.

(c) 2 is a natural number.

(d) 17 is also a prime number.

3. (d) In the option (d), $\frac{-49}{71}$, there is no common

factor between numerator and denominator.

Hence, option (d) is in standard form.

4. (d) We have, $0.\overline{12} = \frac{12}{99} = \frac{4}{33}$

5. (a) We have, $\frac{2}{3} + 0.\overline{11} = \frac{2}{3} + \frac{11}{99}$
 $= \frac{66 + 11}{99} = \frac{77}{99} = \frac{7}{9}$

6. (c) $\frac{3}{5} + \frac{3}{5} + \dots$ upto 25 times

$$= \frac{3}{5} \times 25 = 3 \times 5 = 15$$

7. (b) We have,

$$\frac{3}{8} + \frac{3}{8} + \dots 40 \text{ times} = \frac{3}{8} \times 40 = 3 \times 5 = 15$$

8. (b) We know that if any number divisible by 2 and 3, it is also divisible by 6.

\therefore From option (b), 385 is not divisible by 2. Hence, it is not divisible by 6.

9. (b) We know that if any number is divisible by 5, have last digit 0 or 5.

Here, except 6051, all numbers have last digits 0 or 5. So, 6051 is not divisible by 5.

10. (c) We have, $4621 = 4 + 6 + 2 + 1 = 13$

[13 is not divisible by 9]

$$2834 = 2 + 8 + 3 + 4 = 17$$

[17 is not divisible by 9]

$$9216 = 9 + 2 + 1 + 6 = 18$$

[18 is divisible by 9]

$$1560 = 1 + 5 + 6 + 0 = 12$$

[12 is not divisible by 9]

So, 9216 is divisible by 9.

11. (d) For 11,

91476 = sum of odd places digits

– sum of even places digits

$$= (9 + 4 + 6) - (1 + 7)$$

$$= 19 - 8 = 11$$

which is divisible by 11.

$$\text{For } 7 = 91476 = 9147 - 2(6) = 9147 - 12$$

$$= 9135, \text{ which is divisible by } 7.$$

For 2, since last digit is even number, hence it is divisible by 2.

For 8, 91476 \rightarrow 476 is not divisible by 8.

Hence, 91476 is not divisible by 8.

12. (a) By option (a),

We have, 585, divisible by 5 because unit digit is 5.

Now, sum of digits = $5 + 8 + 5 = 18$, which is divisible by 9.

\therefore 585 is divisible by both 5 and 9.

13. (b) We know that,

Number is divisible by 5, if last digit is 5 or 0.

And divisible by 25, if last two digits is divisible by 25.

Hence, 5125 is only number divisible by 5 and 25 also.

14. (c) \therefore Sum of digits = $1 + 5 + 7 + x + 2 + 3 + 4$
 $= 22 + x$

This addition is divisible by 3, if 2 is at the place of x,

$$\text{i.e. } 22 + x = 22 + 2 = 24$$

$$\Rightarrow (2 + 4 = 6)$$

24, divisible by 3.

15. (c) The number 31K2 is divisible by 6, it mean it is divisible by 2 and 3 both.

Here, unit digit is 2 (even), so this number is divisible by 2.

Now, for 3 first we have to add all the digits.

$\therefore 3 + 1 + K + 2 = 6 + K = 6 + 3 = 9$, for $K = 3$, it is divisible by 3. Hence, $K = 3$.

16. (b) We know that if any number divisible by 90, i.e. divisible by 9 and 10.

So, to make number 573xy divisible by 10, we have to put $y = 0$ to make unit digit 0.

Now, to also make 573x0 divisible by 9.

Its sum must be divisible by 9.

$$5 + 7 + 3 + x + 0 = 15 + x$$

Put $x = 3$

i.e. $15 + 3 = 18$ (which is divisible by 9)

$$\therefore x + y = 3 + 0 = 3$$

17. (a) 25)1365(54

$$\begin{array}{r} 125 \\ 115 \\ \hline 100 \\ 15 \end{array}$$

\therefore Required number = 15.

18. (a) We know that,

Dividend = Divisor \times Quotient + Remainder

$$\Rightarrow 64 = \text{Divisor} \times 5 + 4$$

$$\Rightarrow \text{Divisor} = \frac{(64 - 4)}{5}$$

\therefore Divisor = 12

19. (a) We have, $\frac{3}{4} \times \frac{2}{5} \times \frac{25}{3} = \frac{1}{2} \times \frac{1}{5} \times 25 = \frac{5}{2}$

20. (c) $8\frac{1}{4} + 8\frac{1}{2} + ? = 20\frac{1}{8}$

$$\begin{aligned} \Rightarrow ? &= 20\frac{1}{8} - 8\frac{1}{4} - 8\frac{1}{2} \\ &= (20 - 8 - 8) + \left(\frac{1}{8} - \frac{1}{4} - \frac{1}{2}\right) \\ &= 4 + \frac{1 - 2 - 4}{8} = 4 + \frac{-5}{8} = 3\frac{3}{8} \end{aligned}$$

21. (c) We have, $\frac{5 - [4 - \{3 - (3 - 6)\}]}{2}$

$$\begin{aligned} &= \frac{5 - [4 - \{3 - (-6)\}]}{2} \\ &= \frac{5 - [4 - \{3 + 6\}]}{2} = \frac{5 - [4 - 9]}{2} \\ &= \frac{5 - [-5]}{2} = \frac{5 + 5}{2} = \frac{10}{2} = 5 \end{aligned}$$

22. (b) We have, $2\frac{4}{5} \div 3\frac{1}{2}$ of $\frac{4}{5}$

$$= \frac{14}{5} \div \frac{7}{2} \times \frac{4}{5} = \frac{14}{5} \div \frac{14}{5} = 1$$

23. (a) We know that,

$$A + A + A = 3A$$

$$\text{For } A = 5, 3A = 15$$

$$\text{But } A + A + A = BA$$

(given)

$$\therefore A = 5 \text{ and } B = 1$$

Which satisfies option (a).