1. Number System

Numbers

In Decimal number system, there are ten symbols namely 0,1,2,3,4,5,6,7,8 and 9 called digits. A number is denoted by group of these digits called as numerals.

Face Value

Face value of a digit in a numeral is value of the digit itself. For example in 321, face value of 1 is 1, face value of 2 is 2 and face value of 3 is 3.

Place Value

Place value of a digit in a numeral is value of the digit multiplied by 10^n where n starts from 0. For example in 321:

- Place value of $1 = 1 \times 10^0 = 1 \times 1 = 1$
- Place value of $2 = 2 \times 10^1 = 2 \times 10 = 20$
- Place value of $3 = 3 \times 10^2 = 3 \times 100 = 300$
  0th position digit is called unit digit and is the most commonly used topic in aptitude tests.

Types of Numbers

1. **Natural Numbers** - n > 0 where n is counting number; [1,2,3...]

2. **Whole Numbers** - n ≥ 0 where n is counting number; [0,1,2,3...].

   0 is the only whole number which is not a natural number.

   Every natural number is a whole number.

3. **Integers** - n ≥ 0 or n ≤ 0 where n is counting number;...,-3,-2,-1,0,1,2,3... are integers.

   - **Positive Integers** - n > 0; [1,2,3...]
   - **Negative Integers** - n < 0; [-1,-2,-3...]
   - **Non-Positive Integers** - n ≤ 0; [0,-1,-2,-3...]
   - **Non-Negative Integers** - n ≥ 0; [0,1,2,3...]

   0 is neither positive nor negative integer.

4. **Even Numbers** - n / 2 = 0 where n is counting number; [0,2,4,...]

5. **Odd Numbers** - n / 2 ≠ 0 where n is counting number; [1,3,5,...]

6. **Prime Numbers** - Numbers which is divisible by themselves only apart from 1.

   1 is not a prime number.

   To test a number p to be prime, find a whole number k such that k > $\sqrt{p}$. Get all prime numbers less than or equal to k and divide p with each of these prime numbers. If no number divides p exactly then p is a prime number otherwise it is not a prime number.

   Example: 191 is prime number or not?
   Solution:
   Step 1 - 14 > $\sqrt{191}$
   Step 2 - Prime numbers less than 14 are 2,3,5,7,11 and 13.
   Step 3 - 191 is not divisible by any above prime number.
   Result - 191 is a prime number.

   Example: 187 is prime number or not?
   Solution:
   Step 1 - 14 > $\sqrt{187}$
   Step 2 - Prime numbers less than 14 are 2,3,5,7,11 and 13.
   Step 3 - 187 is divisible by 11.
   Result - 187 is not a prime number.

7. **Composite Numbers** - Non-prime numbers > 1. For example, 4,6,8,9 etc.

   1 is neither a prime number nor a composite number.

   2 is the only even prime number.

8. **Co-Primes Numbers** - Two natural numbers are co-primes if their H.C.F. is 1. For example, (2,3), (4,5) are co-primes.

Divisibility

Following are tips to check divisibility of numbers.

1. **Divisibility by 2** - A number is divisible by 2 if its unit digit is 0,2,4,6 or 8.

   Example: 64578 is divisible by 2 or not?
   Solution:
   Step 1 - Unit digit is 8.
   Result - 64578 is divisible by 2.

   Example: 64575 is divisible by 2 or not?
   Solution:
   Step 1 - Unit digit is 5.
   Result - 64575 is not divisible by 2.

2. **Divisibility by 3** - A number is divisible by 3 if sum of its digits is completely divisible by 3.

Example: 64578 is divisible by 3 or not?
Solution:
Step 1 - Sum of its digits is $6 + 4 + 5 + 7 + 8 = 30$
which is divisible by 3.
Result - 64578 is divisible by 3.

Example: 64576 is divisible by 3 or not?
Solution:
Step 1 - Sum of its digits is $6 + 4 + 5 + 7 + 6 = 28$
which is not divisible by 3.
Result - 64576 is not divisible by 3.

3. **Divisibility by 4** - A number is divisible by 4 if number formed using its last two digits is completely divisible by 4.

Example: 64578 is divisible by 4 or not?
Solution:
Step 1 - number formed using its last two digits is 78
which is not divisible by 4.
Result - 64578 is not divisible by 4.

Example: 64580 is divisible by 4 or not?
Solution:
Step 1 - number formed using its last two digits is 80
which is divisible by 4.
Result - 64580 is divisible by 4.

4. **Divisibility by 5** - A number is divisible by 5 if its unit digit is 0 or 5.

Example: 64578 is divisible by 5 or not?
Solution:
Step 1 - Unit digit is 8.
Result - 64578 is not divisible by 5.

Example: 64575 is divisible by 5 or not?
Solution:
Step 1 - Unit digit is 5.
Result - 64575 is divisible by 5.

5. **Divisibility by 6** - A number is divisible by 6 if the number is divisible by both 2 and 3.

Example: 64578 is divisible by 6 or not?
Solution:
Step 1 - Unit digit is 8. Number is divisible by 2.
Step 2 - Sum of its digits is $6 + 4 + 5 + 7 + 8 = 30$
which is divisible by 3.
Result - 64578 is divisible by 6.

Example: 64576 is divisible by 6 or not?
Solution:

Step 1 - Unit digit is 8. Number is divisible by 2.
Step 2 - Sum of its digits is 6 + 4 + 5 + 7 + 6 = 28
which is not divisible by 3.
Result - 64576 is not divisible by 6.

6. **Divisibility by 8** - A number is divisible by 8 if number formed using its last three digits is completely divisible by 8.

Example: 64578 is divisible by 8 or not?
Solution:
Step 1 - number formed using its last three digits is 578
which is not divisible by 8.
Result - 64578 is not divisible by 8.

Example: 64576 is divisible by 8 or not?
Solution:
Step 1 - number formed using its last three digits is 576
which is divisible by 8.
Result - 64576 is divisible by 8.

7. **Divisibility by 9** - A number is divisible by 9 if sum of its digits is completely divisible by 9.

Example: 64579 is divisible by 9 or not?
Solution:
Step 1 - Sum of its digits is 6 + 4 + 5 + 7 + 9 = 31
which is not divisible by 9.
Result - 64579 is not divisible by 9.

Example: 64575 is divisible by 9 or not?
Solution:
Step 1 - Sum of its digits is 6 + 4 + 5 + 7 + 5 = 27
which is divisible by 9.
Result - 64575 is divisible by 9.

8. **Divisibility by 10** - A number is divisible by 10 if its unit digit is 0.

Example: 64575 is divisible by 10 or not?
Solution:
Step 1 - Unit digit is 5.
Result - 64578 is not divisible by 10.

Example: 64570 is divisible by 10 or not?
Solution:
Step 1 - Unit digit is 0.
Result - 64570 is divisible by 10.

9. **Divisibility by 11** - A number is divisible by 11 if difference between sum of digits at odd places and sum of digits at even places is either 0 or is divisible by 11.

Example: 64575 is divisible by 11 or not?

Solution:
Step 1 - difference between sum of digits at odd places
and sum of digits at even places = (6+5+5) - (4+7) = 5
which is not divisible by 11.
Result - 64575 is not divisible by 11.

Example: 64075 is divisible by 11 or not?
Solution:
Step 1 - difference between sum of digits at odd places
and sum of digits at even places = (6+0+5) - (4+7) = 0.
Result - 64075 is divisible by 11.

Tips on Division

1. If a number n is divisible by two co-primes numbers a, b then n is divisible by ab.

2. (a-b) always divides (a^n - b^n) if n is a natural number.

3. (a+b) always divides (a^n - b^n) if n is an even number.

4. (a+b) always divides (a^n + b^n) if n is an odd number.

Division Algorithm

When a number is divided by another number then

Dividend = (Divisor x Quotient) + Reminder

Series

Following are formulaes for basic number series:

1. $(1+2+3+...+n) = (1/2)n(n+1)$

2. $(1^2+2^2+3^2+...+n^2) = (1/6)n(n+1)(2n+1)$

3. $(1^3+2^3+3^3+...+n^3) = (1/4)n^2(n+1)^2$

Basic Formulaes

These are the basic formulae:

$(a + b)^2 = a^2 + b^2 + 2ab$

$(a - b)^2 = a^2 + b^2 - 2ab$

$(a + b)^2 - (a - b)^2 = 4ab$

$(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$

$(a^2 - b^2) = (a + b)(a - b)$

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$

$(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$

$(a^3 + b^3 + c^3 - 3abc) = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

Practice Questions

PART-A

Question: 1

How many of the integers between 110 and 120 are prime numbers?

(A) 1

(B) 2

(C) 3

(D) 4

Question: 2

The number of prime numbers between 0 and 50 is

(A) 14

(B) 15

(C) 16

(D) 17

Question: 3

Which one of the following numbers is divisible by 3?

(A) 2345678

(B) 2876423

(C) 4006020

(D) 9566003

Question: 5

The number of prime numbers between 301 and 320 are

(A) 3

(B) 4

(C) 5

(D) 6

Question: 6

What is the minimum number of four digits formed by using the digit 2, 3, 0, 7?

(A) 2047

(B) 2247

(C) 2407

(D) 2470

Question: 7

The sum of the greatest and smallest number of five digits is

(A) 10,999

(B) 109,999

(C) 11,110

(D) 111,110

38649 – 1624 – 4483 = ?

(A) 32425

(B) 32452

(C) 34522

(D) 32542

587 x 999 = ?

(A) 586413

(B) 587523

(C) 614823

(D) 615173

The sum of the first four primes is

(A) 10

(B) 11

(C) 16

(D) 17

Q 1 - Which of the following is a prime number?

A - 187

B - 811

C - 341

D - 437

Q 2 - Which of the following is the output of 6894 x 99 ?

A - 685506

B - 682506

C - 683506

D - 684506

Q 3 - Which of the following is the output of 685798 x 125 ?

A - 8224750

B - 8225750

C - 8225950

D - 8224760

Q 4 - Which of the following is the output of 43986 x 625 ?

A - 27491450

B - 27491350

C - 27491250

D - 27491750

Q 5 - Which of the following is the output of 869 x 738 + 869 x 262 ?

A - 262000

B - 738000

C - 969000

D - 869000

Q 6 - Which of the following is the output of 936 x 587 - 936 x 487 ?

A - 93600

B - 58700

C - 48700

D - 100

Q 7 - Which of the following is the output of 1496 x 1496 ?

A - 3338016

B - 2238016

C - 2248016

D - 2258016

Q 8 - Which of the following is the output of 1607 x 1607 ?

A - 2581449

B - 2583449

C - 2582449

D - 2584449

Q 9 - Which of the following is the output of 596 x 596 - 104 x 104 ?

A - 377700

B - 366600

C - 355500

D - 344400

Q 10 - Which of the following is the output of 57 x 57 + 43 x 43 + 2 x 57 x 43 ?

A - 10000

B - 5700

C - 4300

D - 1000

.Q 11 - Which of the following is the output of 93 x 93 + 73 x 73 - 2 x 93 x 73 ?

A - 200

B - 400

C - 300

D - 100

Q 12 - Which of the following is the output of (578 x 578 x 578 + 432 x 432 x 432) / (578 x 578 - 578 x 432 + 432 x 432) ?

A - 2000

B - 4000

C - 3000

D - 1000

Q 13 - Which of the following is the output of (141 x 141 x 141 - 58 x 58 x 58) / (141 x 141 + 141 x 58 + 58 x 58) ?

A - 83

B - 100

C - 90

D - 73

Q 14 - Which of the following is the output of 213 x 213 + 187 x 187 ?

A - 50338

B - 80338

C - 90338

D - 70338

Q 15 - Which of the following is the output of $((637 + 478)^2 - (637 - 478)^2) / (637 \times 478)$?

A - 4

B - 6

C - 8

D - 24

Q 16 - Which of the following is the output of $((964 + 578)^2 + (964 - 578)^2) / (964 \times 964 + 578 \times 578)$?

A - 4

B - 6

C - 8

D - 2

17 - On dividing a number by 342, 47 is the remainder. What will be remainder if same number is divided by 18?

A - 11

B - 6

C - 8

D - 2

Q 18 - What will be unit digit in $(3157)^{754}$?

A - 8

B - 9

C - 7

D - 6

Q 19 - What will be unit digit in 658 x 539 x 436 x 312?

A - 8

B - 9

C - 4

D - 6

Q 20 - What will be unit digit in 3^{57} x 6^{41} x 7^{63}?

A - 8

B - 9

C - 4

D - 6

Answers for Part-B

1. Answer – B
2. Answer – B
3. Answer – A
4. Answer – C
5. Answer – D
6. Answer – A
7. Answer – B
8. Answer - C
9. Answer – D
10. Answer – A
11. Answer – B
12. Answer – D
13. Answer – A
14. Answer – B
15. Answer – C
16. Answer – D
17. Answer – A
18. Answer – B
19. Answer – C
20. Answer - C

Q 1 - What is the result of the following?

$$4 + 44 + 444 + 4.44$$

A - 486.44

B - 444

C - 496.44

D - 44

Q 2 - Which of the following numbers is completely divisible by 45?

A - 32765

B - 20000

C - 2025

D - 20280

Q 3 - The difference between a positive proper fraction and its reciprocal is $\frac{9}{20}$. The fraction is?

A - $\frac{5}{3}$

B - $\frac{3}{5}$

C - $\frac{1}{5}$

D - $\frac{4}{5}$

Q 4 - The sum of all two digit numbers divisible by 7 is?

A - 215

B - 535

C - 735

D - none of these

Q 5 - The largest three digit multiple of 32?

A - 999

B - 992

C - 994

D - 978

Q 6 - What is the unit digit in in 7^{105}?

A - 5

B - 7

C - 9

D - 1

Q 7 - 9548 + 7314 = 8362 + x. What is x?

A - 8230

B - 8410

C - 8500

D - 8600

Q 8 - 217 x 217 + 183 x 183 = y. What is y?

A - 79698

B - 80578

C - 80698

D - 81238

Q 9 - Which of the following is the smallest 3 digit prime number?

A - 103

B - 107

C - 109

D - 101

Q 10 - $(6n^2 + 6n)$ is always divisible by?

A - 6 only

B - 6 and 12 both

C - 18 only