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# **NUMBER SYSTEM**

## **DIVISIBILITY OF A NUMBER**

<b><i>Divisibility Tests</i></b>	<b><i>Example</i></b>
number is divisible by 2, if the last digit is 0, 2, 4, 6 or	168 is divisible by 2 since the last digit is 8.
number is divisible by 3, if the sum of the digits is divisible by 3.	168 is divisible by 3 since the sum of the digits is 15 +6+8=15), and 15 is divisible by 3.
number is divisible by 4, if the number formed by the last two digits is divisible by 4.	316 is divisible by 4 since 16 is divisible by 4.
number is divisible by 5, if the last digit is either 0 or 5.	195 is divisible by 5 since the last digit is 5.
number is divisible by 6, if it is divisible by 2 <b>AND</b> it is divisible by 3.	168 is divisible by 6 since it is divisible by 2 <b>AND</b> it is divisible by 3.
number is divisible by 8, if the number formed by the last three digits is divisible by 8.	7,120 is divisible by 8 since 120 is divisible by 8.
number is divisible by 9, if the sum of the digits is divisible by 9.	549 is divisible by 9 since the sum of the digits is 18 +4+9=18), and 18 is divisible by 9.
number is divisible by 10, if the last digit is 0.	1,470 is divisible by 10 since the last digit is 0.

### **Divisibility Rule for 7**

Subtract 2 times the last digit from remaining truncated number. Repeat the step as necessary. If the result is divisible by 7, the original number is also divisible by 7.

For example : **945**

$94 - (2 \times 5) = 84$ . Since 84 is divisible by 7, the original no. 945 is also divisible

### **Divisibility Rule for 11**

For a test of divisibility by 11 start from the right and add every second digit. Now subtract from that total the sum of the remaining digits. The resulting number is divisible by 11 if and only if the number you started with is divisible by 11.

For example consider **678234**.

$$(4 + 2 + 7) - (3 + 8 + 6) = 13 - 17 = -4$$

which is not divisible by 11 so **678234 is not divisible by 11**.

Now, try **908193**

$(3 + 1 + 0) - (9 + 8 + 9) = -22$  which is divisible by 11. So, **908193 is divisible by 11**.

### **Divisibility Rule for 13**

Add 4 times the last digit to the remaining truncated number. Repeat the step as necessary. If the result is divisible by 13, the original number is also divisible by 13.

For example: **3146**

$314 + (4 \times 6) = 338$  ::  $33 + (4 \times 8) = 65$ . Since 65 is divisible by 13, the original no. 3146 is also divisible

### **Divisibility Rule for 17**

Subtract 5 times the last digit from remaining truncated number. Repeat the step as necessary. If the result is divisible by 17, the original number is also divisible by 17

For example : **2278**

$227 - (5 \times 8) = 187$ . Since 187 is divisible by 17, the original number 2278 is also divisible.

### **Divisibility Rule for 19**

Add 2 times the last digit to the remaining truncated number. Repeat the step as necessary. If the result is divisible by 19, the

original number is also divisible by 19

For example : **11343**

$1134 + (23) = 1140$ . (Ignore the 0):  $11 + (24) = 19$ . Since 19 is divisible by 19, original no. 11343 is also divisible

### LCM and HCF

#### Important Terms:

- 1) **Factors:** Factor is a number which exactly divides other number.
- 2) **Multiple:** A number is said to be multiple of another number, when it is exactly divisible by other number.
- 3) **Common multiple:** A common multiple of two or more numbers is a number which is exactly divisible by each of them.
- 4) **Highest Common Factor (HCF) or Greatest Common Factor (GCF) :** HCF of two or more numbers is the greatest number which divides each number exactly.
- 5) **Lowest Common Multiple (LCM):** The least number exactly divisible by each one of the given numbers is called least common multiple.

#### Tips and Tricks:

##### 1) *H.C.F. and L.C.M. of Fractions*

$$\text{H.C.F.} = \frac{\text{H.C.F. of Numerator}}{\text{L.C.M. of Denominator}}$$

$$\text{L.C.M.} = \frac{\text{L.C.M. of Numerator}}{\text{H.C.F. of Denominator}}$$

##### 2) **Product of two numbers = Product of their H.C.F. and L.C.M.**

This condition is only true for two given numbers. If H.C.F. and L.C.M. of three or more numbers are given, then this rule is not applicable.

#### *Method to Find H.C.F. of Given Numbers*

##### **Prime Factorization Method**

Steps to follow :

- 1) Express the given numbers as product of their prime factors.
- 2) Check for common prime factors and find least index of each common prime factor
- 3) The product of all common prime factors with the respective least indices is H.C.F of given numbers.

Example : H.C.F. of 12, 36, 48

Prime Factors of 12, 36, 48

$$12 = 2 \times 3 \times 2 = 3 \times 2^2$$

$$36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$$

$$48 = 2 \times 2 \times 2 \times 2 \times 3 = 2^4 \times 3$$

2 & 3 are common factors.  $2^2$  & 3 have least indices.

H.C.F. of 12, 36, 48 = Product of common prime factors with least indices.

$$\text{H.C.F. of 12, 36, 48} = 2^2 \times 3 = 12$$

$$\text{H.C.F. of 12, 36, 48} = 12$$

### Division Method

Steps to follow:

- 1) Draw a table as shown and arrange the given numbers horizontally.
- 2) Divide the numbers with their common factors.
- 3) Divide till the given numbers have no common factors.
- 4) Finally multiply the common factors on left hand side of the table to find the H.C.F.

Example: H.C.F. of 12, 36, 48

2	12	36	48
2	6	18	24
3	3	9	12
	1	3	4

$$\text{H.C.F or G.C.F} = 2 \times 2 \times 3 = 12$$

$$\text{H.C.F of 12, 36, 48} = 12$$

### FACTORS OF A NUMBER

Given an integer N, there is a simple way to find the total number of its factors. The main tool for the feat is the **prime number decomposition theorem**.

These are certain basic formulas pertaining to factors of a number N, such that,

$$N = p^a \times q^b \times r^c$$

Where, p, q and r are the prime factors of the number N. a, b and c are non-negative powers/ exponents.

1. Number of factors of N =  $(a+1)(b+1)(c+1)$
2. Number of odd factors of N = product of only odd numbers power increased by 1.
3. Number of even factors of N = Total factors – odd factors
4. Number of prime factors of N = addition of powers= $a+b+c$ .
5. Product of factors of N =  $N^{\text{No. of factors}/2}$
6. Sum of factors of N =  $(p^0 + p^1 + \dots + p^a)(q^0 + q^1 + \dots + q^b)(r^0 + r^1 + \dots + r^c)$

**Example-** Consider the number 120. Find the following for n:

1. Sum of factors.
2. Number of factors.
3. Product of factors.
4. Odd factors.
5. Even factors.
6. Prime factors.

**Solution-** The prime factorization of 120 is  $2^3 \times 3^1 \times 5^1$ . By applying the formulae,

1. **Sum of factors** =  $[(2^0+2^1+2^2+2^3)(3^0+3^1)(5^0+5^1)] = 1560$

2. **Number of factors** =  $(3+1)(1+1)(1+1) = 16$

3. **Product of factors** =  $120(16/2) = 12084$ .

4. **Odd factors** =  $(1+1) \times (1+1) = 4$

5. **Even factors** =  $16 - 4 = 12$

6. **Prime Factors** =  $3 + 1 + 1 = 5$

## FACTORIALS

The factorial function (symbol “!”) means to multiply a series of descending natural numbers.

An older notation for the factorial is

$n$

$N! = N(N-1)(N-2) \dots 1$ .

$4! = 4 \times 3 \times 2 \times 1 = 24$

Note-  $0! = 1$  and  $1! = 1$ .

### Trailing zeros or ending zeros in $N!$

For example,  $5! = 120$ . So, it has only one zero in end.

**Rule for finding trailing zeros-** Divide the given number by the powers of 5 till it is divisible by powers of 5. It means numerator is greater or equal to denominator.

$N/5 + N/5^2 + N/5^3 + \dots N \geq 5^n$

Here we take only quotient of it.

**Example-** Find the trailing zeros in  $102!$

$102/5 + 102/25 = 20 + 4 = 24$  (Here  $100/125$  is not possible, so divide by 5's powers till it is less or equal to number) So,  $102!$  has 24 zeros.

### Highest power of a number in a factorial or in a product

**Highest power of  $p$  (prime number) in  $N!$  is**  $[N/p] + [N/p^2] + [N/p^3] + \dots [N/p^n]$  till  $N \geq p^n$ . Take only quotient of these divisions.

**Example 1-** Highest power of 2 in  $50!$ ?

$$\begin{aligned} & 50/2 + 50/4 + 50/8 + 50/16 + 50/32 \\ & = 25 + 12 + 6 + 3 + 1 = 47 \end{aligned}$$

**Example 2-** Highest power of 6 in  $20!$ ?

6 is a composite number. To find the highest power of composite number write it into prime factorization, i.e.,  $6 = 2 \times 3$ . Now, find the highest power of 2 and 3 in  $20!$ .

Highest power of 2 is  $= 20/2 + 20/4 + 20/8 + 20/16$   
 $= 10 + 5 + 2 + 1 = 18$

Highest power of 3 is  $= 20/3 + 20/9 = 6 + 2 = 8$

Highest power of 6 is the least value which of individual highest powers. Here values are 18 and 8. So, the highest power of 6 is 8.

## REMAINDER

**Remainder Theorem:-** Dividend = Divisor  $\times$  Quotient + Remainder When dividend is of the form  $a^n + b^n$  or  $a^n - b^n$ :

Theorem 1:  $a^n + b^n$  is divisible by  $a + b$  when  $n$  is **ODD**.

Theorem 2:  $a^n - b^n$  is divisible by  $a + b$  when  $n$  is **EVEN**.

Theorem 3:  $a^n - b^n$  is ALWAYS divisible by  $a - b$ .

When  $f(x) = a + bx + cx^2 + dx^3 + \dots$  is divided by  $x - a$

The remainder when  $f(x) = a + bx + cx^2 + dx^3 + \dots$  is divided by  $x - a$  is  $f(a)$ .

So, If  $f(a) = 0$ ,  $(x - a)$  is a factor of  $f(x)$ .

**Example:-** What is the remainder when the product  $1998 \times 1999 \times 2000$  is divided by 7?

Find the individual remainders of 1998, 1999, and 2000 are divided by 7 are 3, 4, and 5 respectively. Hence, the final remainder is the remainder when the product  $3 \times 4 \times 5 = 60$  is divided by 7. So, the final remainder is 4.

### Fermat's theorem-

This theorem is stated in the following form: if  $p$  is a prime and  $a$  is an integer co-prime to  $p$ , then  $a^{(p-1)} - 1$  will be evenly divisible by  $p$ . In other words,  $[a^{(p-1)}]/p$  gives remainder 1.

**Example:-** Find the remainder when  $72^{40}$  divide by 41?

**Answer:** So here we see that 41 is a prime number, so we will target Fermat's little theorem instead of Euler's theorem.

Again 72 and 41 are co-prime. so we can apply our little theorem in this problem easily.

→ remainder  $[72^{40}/41] = 1$ .

### Wilson's Theorem-

This theorem states that for a prime number  $p$ ,  $(p-1)!$  Divide by  $p$ , then the remainder is  $p-1$ .

**Example:-** Find the remainder when  $16!$  is divided by  $17$ .  $16! = (16! + 1) - 1 = (16! + 1) + 16 - 17$

Every term except  $16$  is divisible by  $17$  in the above expression.

Hence the remainder = the remainder obtained when  $16$  is divided by  $17 = \text{Rem}(16)$ .

### UNIT DIGIT

**Unit digit of product-** Multiply last digits of each number.

**Example:-**  $121 \times 76 \times 528 \times 172 = 1 \times 6 \times 8 \times 2 = 96 = 6$  is unit digit here.

**Unit digit of powers-** Either use cyclicity of number or use simple method.

2	3	4	5	6	7	8	9
$2^1=2$	$3^1=3$	$4^1=4$	$5^1=5$	$6^1=6$	$7^1=7$	$8^1=8$	$9^1=9$
$2^2=4$	$3^2=9$	<b><math>4^2=6</math></b>	$5^2=5$	$6^2=6$	$7^2=9$	$8^2=4$	<b><math>9^2=1</math></b>
$2^3=8$	$3^3=7$	$4^3=4$	$5^3=5$	$6^3=6$	$7^3=3$	$8^3=2$	$9^3=9$
$2^4=6$	$3^4=1$	$4^4=6$	$5^4=5$	$6^4=6$	$7^4=1$	$8^4=6$	$9^4=1$
<b><math>2^5=2</math></b>	<b><math>3^5=3</math></b>	$4^5=4$	$5^5=5$	$6^5=6$	<b><math>7^5=7</math></b>	<b><math>8^5=8</math></b>	$9^5=9$
$2^6=4$	$3^6=9$	$4^6=6$	$5^6=5$	$6^6=6$	$7^6=9$	$8^6=4$	$9^6=1$
$2^7=8$	$3^7=7$	$4^7=4$	$5^7=5$	$6^7=6$	$7^7=3$	$8^7=8$	$9^7=9$

**Example:-** Find the unit digit in  $2^{49}$ ?

We know in case of 2, it repeats itself after a cycle of 4. We will divide 49 by 4 remainder is 1

We write it as  $2^{49} = 2^1 = 2$ . That means the unit digit in the  $2^{49}$  is 2.

### **Rule for numbers ending in digits 0 or 1 or 5 or 6 :-**

Unit digits of those numbers are same as their last digits ending in 0 or 1 or 5 or 6 whatever the power is.

**Eg.-**  $(235)^{27} = \text{unit digit } 5$   $(126)^{344} = \text{unit digit } 6$

### **Rule for numbers ending in digits 2,3,4,7,8 and 9 :-**

Divide the power by 4 find the remainder. Make that remainder to the power of last digit of the number will give us the unit digit.

**Note-** if remainder is 0 (power completely divisible by 4) take remainder as 4 not 0.

**Example.1-**  $(327)^{2222}/4 = \text{Rem}(2)$

Last digit is 7. Make remainder 2 to power of 7 =  $7^2 = 49$  So, 9 is a unit digit.

**Example.2-**  $(28)^{36}$

$36/4 = \text{Rem}(0)$ . Here take remainder as 4.

Last digit is 8. Then,  $8^4 = 64 \times 64 = 4 \times 4 = 16$ . So, unit digit is 6.

## ARITHMETIC & GEOMETRIC PROGRESSION

An Arithmetic Progression (A.P.) is a sequence in which the difference between any two consecutive terms is constant. Let  $a$  = first term,  $d$  = common difference

Then,  $n$ th term  $a_n = a + (n-1)d$

The sum of  $n$  terms of an A.P. whose first term is  $a$  and common difference is  $d$ , is given by

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

The sum of  $n$  terms of an A.P. whose first term is  $a$  and last term is  $l$  is given by the formula:

$$S_n = \frac{n}{2} [a + l]$$

**AM (Arithmetic mean):** If  $a, b, c$  are in AP then the arithmetic mean is given by  $b = (a+c)/2$

To insert  $k$  means between  $a$  and  $b$  the formula for common difference is given by  $d = (b-a)/(k+1)$

**For Example:** Insert 4 AM's between 4 and 34  $d = (34-4)/(4+1) = 30/5 = 6$

$\therefore$  The 4 AM are  $4+6=10, 10+6=16, 16+6=22, 22+6=28$

**Geometric Progression:** Geometric sequences are powers  $r^k$  of a fixed number  $r$ , such as  $2^k$  and  $3^k$ . The general form of a geometric sequence is

The  $n$ -th term of a geometric sequence with initial value  $a$  and common ratio  $r$  is given by

$$a_n = ar^{n-1}.$$

Such a geometric sequence also follows the recursive relation

$$a_n = r a_{n-1} \text{ for every integer } n \geq 1.$$

**Sum of G.P.**  $= a(1-r^n)/(1-r)$

**GM (Geometric mean):** If  $a, b, c$  are in GP Then the GM is given by  $b = \sqrt{ac}$

Note: 1.  $AM > GM > HM$  2.  $GM^2 = AM * HM$

**Inserting GM:** To insert  $k$  means between  $a$  and  $b$  the formula for common ratio is given by  $r = (b/a)^{1/(k+1)}$

For example: Insert 4 GM's between 2 and 486  $r = (486/2)^{1/(4+1)} = (243)^{1/5} = 3$

$\therefore$  The 4 GM are  $2 \times 3 = 6, 6 \times 3 = 18, 18 \times 3 = 54, 54 \times 3 = 162$ .

## General Questions on Number System

- For the product  $n*(n+1)*(2n+1)$ , where  $n$  is a natural number. Which one of the following is not necessarily true?  
(a) It is even. (b) Divisible by 3 (c) Divisible by 6 (d) Never divisible by 12
- If two digit integers  $M$  and  $N$  are positive and have same digits, but in reverse order, which of the following cannot be the sum of  $M$  and  $N$ ?  
(a) 181 (b) 165 (c) 121 (d) 99
- What is the value of  $(x-a)(x-b)(x-c) \dots (x-z)$ ?  
(a) 1 (b) 3 (c) 2 (d) 0
- If you write first 252 natural numbers in a straight line, how many times do you write the digit 4?  
(a) 55 (b) 53 (c) 50 (d) 48
- There are three consecutive natural numbers such that the square of the second minus twelve times the first is three less than twice the third. What is the largest of the three numbers?  
(a) 14 (b) 13 (c) 15 (d) 18
- Which one of the following is the minimum value of the sum of two integers whose product is 36?

- (a) 37                      (b) 20                      (c) 15                      (d) 12
7. Four digits of the number 29138576 are omitted so that the result is as large as possible. The largest omitted digit is?  
 (a) 5                      (b) 6                      (c) 7                      (d) 8
8. A boy writes all the numbers from 100 to 999. The number of zeroes that he uses is 'a', the number of 5's that he uses is 'b' and the number of 8's he uses is 'c'. What is the value of  $b + c - a$ ?  
 (a) 280                      (b) 380                      (c) 180                      (d) 80
9. The product of 4 consecutive even numbers is always divisible by?  
 (a) 600                      (b) 768                      (c) 864                      (d) 384
10. A set has exactly five consecutive positive integers starting with 1. What is the percentage decrease in the average of the numbers when the greatest one of the numbers is removed from the set?  
 (a) 8.54                      (b) 12.56                      (c) 15.25                      (d) 16.66

### **Questions on Rules of Divisibility**

11. What least value should be assigned to \* so that the number  $451*603$  is exactly divisible by 9?  
 (a) 2                      (b) 5                      (c) 8                      (d) 7
12. What least value should be assigned to \* so that the number  $63576*2$  is divisible by 8?  
 (a) 2                      (b) 1                      (c) 4                      (d) 3
13. If  $256X561$  is divisible by 11, then what can be the value of 'X'?  
 (a) 3                      (b) 0                      (c) 6                      (d) 8
14. If  $ABC0$  is a 4 digit number divisible by 4, then how many such 4 digit numbers exist?  
 (a) 360                      (b) 400                      (c) 450                      (d) 500
15. If a number  $968A96B$  is to be divisible by 72, the respective values of A and B can be?  
 (a) 7 and 8                      (b) 7 and 0                      (c) 5 and 8                      (d) 0 and 8
16. The number  $(6n^2 + 6n)$  for any natural number n is always divisible by which maximum number?  
 (a) 6                      (b) 24                      (c) 12                      (d) 18
17. It is given that  $(2^{32} + 1)$  is exactly divisible by a certain number. Which of the following is also definitely divisible by the same number?  
 (a)  $(2^{16} + 1)$                       (b)  $(2^8 + 1)$                       (c)  $(2^{16} - 1)$                       (d)  $(2^{96} + 1)$

### **Lowest Common Multiple (LCM) & Highest Common Factor (HCF)**

18. The LCM of 5, 8, 12, 20 will not be a multiple of?  
 (a) 3                      (b) 9                      (c) 8                      (d) 5
19. Find L.C.M. of 1.05 and 2.1?  
 (a) 1.3                      (b) 1.25                      (c) 2.1                      (d) 4.30
20. How many numbers between 200 and 600 are divisible by 4, 5 and 6?  
 (a) 5                      (b) 6                      (c) 7                      (d) 8
21. For how many values of k the L.C.M of  $6^6$ ,  $8^8$  and k is  $12^{12}$  (k is a natural number)?  
 (a) 1                      (b) 24                      (c) 25                      (d) Infinite
22. Three bells toll at intervals of 9, 12 and 15 minutes respectively. All three begins to toll at 8 a.m. At what time will they first toll together again?  
 (a) 11 a.m.                      (b) 8:30 a.m.                      (c) 10 a.m.                      (d) 10:30 a.m.
23. A person has to completely put each of the three liquids i.e. 403 liters of petrol, 465 litres of



- diesel and 496 liters of Mobil oil in bottles of equal size without mixing any of the three types of liquids such that each bottle is completely filled. What is the least possible number of bottles required?
- (a) 44 (b) 34 (c) 31 (d) None of these
24. Five bells begin to toll together at intervals of 9 s, 6 s, 4 s, 10 s and 8 s, respectively. How many times will they toll together in the span of one hour (excluding the toll at the start)?
- (a) 5 (b) 8 (c) 10 (d) None of these
25. The least perfect square number which is divisible by 3, 4, 5, 6 and 8, is?
- (a) 900 (b) 1200 (c) 2500 (d) 3600
26. Monica, Veronica and Rachat begin to jog around a circular stadium. They complete their revolutions in 42s, 56s and 63s, respectively. After how many seconds will they be together at the starting point?
- (a) 366 (b) 252 (c) 504 (d) Cannot be determined
27. In a meet, persons from five different places have assembled in Bangalore High School. From the five places the persons come to represent are 42, 60, 210, 90 and 84. What is the minimum number of rooms that would be required to accommodate so that each room has the same number of occupants and occupants are all from the same places?
- (a) 44 (b) 62 (c) 81 (d) 96
28. The product of two numbers is 12960 and their HCF is 36. How many pairs of such numbers can be formed?
- (a) 3 (b) 4 (c) 5 (d) 2
29. Calculate H.C.F. of  $\frac{2}{3}$ ,  $\frac{16}{81}$  and  $\frac{8}{9}$ ?
- (a)  $\frac{2}{9}$  (b)  $\frac{8}{3}$  (c)  $\frac{2}{81}$  (d)  $\frac{3}{16}$
30. H.C.F. of two numbers is 13. If these two numbers are in the ratio of 15: 11, then find the numbers?
- (a) 230, 140 (b) 215, 130 (c) 195, 143 (d) 155, 115
31. The L.C.M. of two numbers is 2310 and their H.C.F. is 30. If one of these numbers is 210, the second number is?
- (a) 330 (b) 1470 (c) 2100 (d) 16170

### **Factors & Factorials**

32. Find the following for the number 84?  
I. Number of odd factors. II. Number of even factors.
- (a) 4,8 (b) 5,5 (c) 8,12 (d) 7,9
33. How many factors of 1200 are odd integers?
- (a) 6 (b) 8 (c) 12 (d) 22
34. Find the total no of prime factors in  $4^{11} \times 7^5 \times 11$ ?
- (a) 17 (b) 27 (c) 28 (d) 30
35. Find the sum of factors of 18?
- (a) 6 (b) 13 (c) 39 (d) 35
36. Find the number of factors of  $6!$ ?
- (a) 25 (b) 30 (c) 35 (d) 32
37. Find the number of trailing zeroes in the expansion of  $23!$ ?
- (a) 5 (b) 4 (c) 20 (d) 21
38. Find the number of trailing zeroes in the expansion of  $1000!$ ?
- (a) 250 (b) 300 (c) 249 (d) 245
39. Find the number of zeros in  $2*3*4*5*.....*125$ ?
- (a) 30 (b) 35 (c) 38 (d) 31
40. Find the highest power of 24 in  $150!$ ?

- (a) 48                      (b) 72                      (c) 58                      (d) 45
41. Find the highest power of 30 in 40!?
- (a) 12                      (b) 10                      (c) 8                      (d) 9
42. pqr is a three digit natural number such that  $pqr = p! + q! + r!$ . What is the value of  $(q+r)*p$ ?
- (a) 1296                      (b) 3125                      (c) 19683                      (d) 9

### **Remainders**

43. A number when divided by 54 leaves a remainder of 31. Find the remainder when the same number is divided by 27?
- (a) 4                      (b) 23                      (c) 15                      (d) (a) or (b)
44. Find the remainder when  $2^{93}$  is divided by 7?
- (a) 1                      (b) 2                      (c) 4                      (d) 6
45. Find the remainder when  $24^5$  is divided by 5?
- (a) 0                      (b) 1                      (c) 4                      (d) None of these
46. The remainder, when  $(15^{23} + 23^{23})$  is divided by 19, is?
- (a) 4                      (b) 15                      (c) 0                      (d) 18
47. What is the remainder when  $4^{96}$  is divided by 6?
- (a) 0                      (b) 2                      (c) 3                      (d) 4
48.  $(7^{4n} - 6^{4n})$ , where n is an integer  $> 0$ , is divisible by?
- (a) 13                      (b) 5                      (c) 17                      (d) All of these
49. Find the remainder when n is divided by 12 where  $N = 1821 \times 1823 \times 1827$ ?
- (a) 9                      (b) 12                      (c) 15                      (d) 18
50. A number when divided by 5, leaves 3 as remainder. What will be the remainder when the square of this number is divided by 5?
- (a) 0                      (b) 1                      (c) 2                      (d) 4
51. In a division sum, the remainder is 6 and the divisor is 5 times the quotient and is obtained by adding 2 to the thrice of the remainder. The dividend is?
- (a) 40                      (b) 42                      (c) 80                      (d) 86

### **UNIT DIGIT**

52. If the unit's digit in the product of  $(47 \times 729 \times 345 \times 343)$  is 5, then how many values that a can take?
- (a) 9                      (b) 3                      (c) 7                      (d) 5
53. The rightmost non - zero digit of the number  $30^{2720}$  is?
- (a) 1                      (b) 3                      (c) 7                      (d) 9
54. What is the unit digit in  $2^9$ ?
- (a) 1                      (b) 3                      (c) 2                      (d) 4
55. What is the unit's digit of the number  $(6^{256} - 4^{256})$ ?
- (a) 0                      (b) 1                      (c) 4                      (d) 7
56. Find the unit digit in the product  $(243 \times 397 \times 2497 \times 3913)$ ?
- (a) 4                      (b) 3                      (c) 7                      (d) 1
57. What are the respective digits in the unit's place in the expansions of  $7^7$  and  $17^7$ ?
- (a) 2, 6                      (b) 3, 3                      (c) 1, 4                      (d) 9, 9
58. Find the unit's digit in  $(264^{102} + 264^{103})$ ?

- (a) 0 (b) 2 (c) 4 (d) 6
59. Which digits should come in place of @ and # if the number 62684@# is divisible by both 8 and 5?
- (a) 4,0 (b) 0,4 (c) 4,4 (d) 1,1
60. What will be the last digit of the multiplication  $3^{153} \times 7^{162}$ ?
- (a) 5 (b) 9 (c) 7 (d) 6
61. The digit in the unit place of the number  $7^{295} \times 3^{158}$  is?
- (a) 7 (b) 2 (c) 6 (d) 4
62. Find the unit digit of  $(23)^{251}$ ?
- (a) 0 (b) 2 (c) 3 (d) 1
63. The unit digit of  $(137^{13})^{47}$  is?
- (a) 1 (b) 3 (c) 5 (d) 7
64. The unit digit of  $35^{87} + 93^{46}$  is?
- (a) 2 (b) 4 (c) 6 (d) 8
65. The unit digit of  $44^{91} \times 73^{37}$  is?
- (a) 2 (b) 4 (c) 6 (d) 8
66. The unit digit of  $12^{34} - 5^9$  is?
- (a) -1 (b) 1 (c) 9 (d) None of these
67. Find the unit digit of given product  $(2^{34} \times 14^{832} \times 17^{21})$ ?
- (a) 6 (b) 8 (c) 2 (d) 7

### **Arithmetic Progression & Geometric Progression**

68. Find the number of terms in the series 8, 12, 16, ... 72?
- (a) 10 (b) 12 (c) 17 (d) 16
69. The sum of third and ninth term of an A.P is 8. Find the sum of the first 11 terms of the progression?
- (a) 44 (b) 22 (c) 19 (d) None of the above
70. Find  $4 + 7 + 10 + 13 + 16 + \dots$  up to 20 terms?
- (a) 600 (b) 650 (c) 540 (d) 454
71. Find 5<sup>th</sup> term in the series 5, 15, 45, ..... ?
- (a) 405 (b) 345 (c) 450 (d) 340
72. Given  $A = 2^{65}$  and  $B = (2^{64} + 2^{63} + 2^{62} + \dots + 2^0)$ . Which one is correct option?
- (a)  $B = 2^{64} + A$  (b)  $A = B$  (c)  $B = A + 1$  (d)  $A = B + 1$
73. If  $\log 2$ ,  $\log(2^x - 1)$  and  $\log(2^x + 3)$  are in A.P, then x is equal to...?
- (a) 5252 (b)  $\log_2 5$  (c)  $\log_3 2$  (d) 32
74. Which term of the A.P. 3, 8, 13 ..... is 78?
- (a) 16<sup>th</sup> (b) 17<sup>th</sup> (c) 20<sup>th</sup> (d) 25<sup>th</sup>
75. Is (-150) a term of the series 11, 8, 5, 2, ...?
- (a) Yes (b) No (c) Can't be determined (d) Data Insufficient
76. Find the 31st term of an A.P. whose 11th term is 38 and the 16th term is 73.
- (a) 162 (b) 175 (c) 178 (d) 180
77. Which term of the A.P. 3, 15, 27, 39 ... will be 132 more than its 54th term?
- (a) 82<sup>nd</sup> (b) 75<sup>th</sup> (c) 60<sup>th</sup> (d) 65<sup>th</sup>
78. Write down the 8th term in the Geometric Progression 1, 3, 9, ...
- (a) 2187 (b) 2185 (c) 2287 (d) 2021
79. Find the number of terms in the geometric progression 6, 12, 24, ... 1536

- (a) 10                      (b) 9                      (c) 15                      (d) 13
80. The sum of  $n$  terms of an A.P. is  $3n^2 + n$ , find the  $n$ th term.
- (a)  $6n - 4$                       (b)  $4n - 4$                       (c)  $6n - 2$                       (d)  $4n - 2$
81. Find the sum of the following series:  $3 + 7 + 11 + 15 + \dots$  to 30 terms.
- (a) 1830                      (b) 1840                      (c) 1800                      (d) 1940
82. Find the position of 62 in the following series 2, 5, 8, ..... ?
- (a) 26                      (b) 21                      (c) 23                      (d) 20
83. If you save 1 paise today, 2 paise next day and 3 paise the succeeding day and so on, what will be your savings in 365 days?
- (a) 666.75                      (b) 665.35                      (c) 668.85                      (d) 667.95

### Practice Set-1

1. D	2. A	3. D	4. A	5. A	6. D	7. A
8. B	9. D	10. D	11. C	12. D	13. A	14. C
15. B	16. C	17. D	18. B	19. C	20. B	21. C
22. C	23. C	24. C	25. D	26. C	27. C	28. D
29. C	30. C	31. A	32. A	33. A	34. C	35. C
36. B	37. B	38. C	39. D	40. A	41. A	42. D
43. A	44. A	45. C	46. C	47. D	48. D	49. A
50. D	51. D	52. D	53. A	54. C	55. A	56. D
57. B	58. A	59. A	60. C	61. A	62. D	63. B
64. B	65. A	66. C	67. B	68. C	69. A	70. B
71. A	72. D	73. B	74. A	75. B	76. C	77. D
78. A	79. B	80. C	81. A	82. B	83. D	

### **AVERAGE**

The result obtained by adding several quantities together and then dividing this total by the number of quantities is called

Average.

**Average = Sum of quantities / Number of Quantities**

An average is the mean value of a set of numbers or values. It is given by:-

**Average =  $(x_1 + x_2 + x_3 + \dots + x_n)/n$**

**Example:** If the ages of 4 students are 20 years, 22 years, 18 years and 24 years, then what is the average age of the students?

**Solution:** Average Age =  $(20 + 22 + 18 + 24)/4$

## *Important Points to Remember*

1. If all the numbers are increased by 'a' then their average is also increased by 'a'.
2. If all the numbers are decreased by 'a' then their average is also decreased by 'a'.
3. If all the numbers are multiplied by 'a' then their average is also multiplied by 'a'.
4. If all the numbers are divided by 'a' then their average is also divided by 'a'.

## *Age and Average*

1. If the average age of n persons decreases by x years. Then, the total age of n persons decreases by  $(n \times x)$  yr
2. If the average age of n persons increases by x years. Then, the total age of n persons increases by  $(n \times x)$  yr

**Example:** The average age of 6 persons is increased by 2 years when one of them, whose age is 26 years is replaced by a new man. What is the age of the new person?

**Solution:** Total age increased =  $6 \times 2 = 12$  year  
Age of new persons =  $(26 + 12) = 38$  year

The increase in the total age of 6 persons is due to the replacement of a person aged 26 year with a person who is 12 years older to him.

## *Average of Some Important Series of Numbers*

The average of odd numbers from 1 to n,  
=  $(\text{Last odd number} + 1)/2$  ( $n = \text{Last odd number}$ )

The average of even numbers from 2 to n,  
=  $(\text{Last even number} + 2)/2$  ( $n = \text{Last even number}$ )

## *Important Points*

1. Average of first 'n' natural numbers =  $(n+1)/2$
2. The average of first 'n' consecutive even numbers =  $(n+1)$
3. The average of first 'n' consecutive odd numbers =  $n$

4. The average of consecutive numbers =  $(\text{First Number} + \text{Last Number})/2$
5. The average of 1 to 'n' odd numbers =  $(\text{Last Odd Number} + 1)/2$
6. The average of 1 to 'n' even numbers =  $(\text{Last Even Number} + 2)/2$
7. The average of square of natural numbers till n =  $[(n+1)(2n+1)]/6$
8. The average of cubes of natural numbers till n =  $[n(n+1)^2]/4$
9. Correct Sum = Wrong Sum - Wrong Value + Right Value
10. The average of squares of 1st n consecutive even no's =  $[2(n+1)(2n+1)]/3$
11. The average of squares of consecutive even no's from 1 to n =  $[(n+1)(n+2)]/3$
12. The average of squares of consecutive odd no's from 1 to n =  $[n(n+2)]/3$
13. If the average of n1 observation is a1 and n2 observation is a2. Then, the average of all the observations is:-  

$$A = \frac{n_1 a_1 + n_2 a_2 + n_3 a_3 + \dots}{n_1 + n_2 + n_3 + \dots}$$
14. If the average of 'm' observations is 'a' and average of 'n' observations taken out of 'm' is 'b'. Then, Average of rest of the observations =  $(ma - nb)/(m - n)$

## Average Speed

### 1. Average Speed = Total Distance / Total Time

Let the distance between two points A and B is d and speed in travelling from point A to B is x km/hr and from point B to A is y km/hr.

Then, **average speed** =  $(2xy) / (x+y)$

**Example:** If a person travels two equal distances at 10 km/hr. and 30 km/hr. What is the average speed for the entire journey?

**Solution:** Average Speed =  $2xy / (x+y)$

$$= (2 \times 30 \times 10) / (30 + 10) \\ = 600 / 40 = 15 \text{ km/hr.}$$

**2.** If a person covers three equal distances at a speed of A km/hr, B Km/hr and C Km/hr. Then, the average speed for the whole journey will be =  $3ABC / (AB + BC + CA)$

**3.** If a person covers 'P' part of his total distance with a speed of 'x', 'Q' part of his total distance with a speed of 'y', 'R' part of his total distance with a speed of 'z'. Then,

$$\text{Average Speed} = \frac{x \cdot y \cdot z}{Pyz + Qxz + Rxy}$$

# Average

## Type 1 - Averages and Numbers

- Q1.** Find the average of the following set of scores 216,463,154,605,446,336?  
A. 370                      B. 560                      C. 360                      D. 520
- Q2.** The average of four consecutive even numbers A, B, C and D is 55. What is the product of A and C?  
A. 2812                      B. 2912                      C. 2512                      D. 2069
- Q3.** Average of 4 consecutive odd numbers is 106. What is the third number in the ascending order?  
A. 109                      B. 107                      C. 110                      D. 120
- Q4.** The average of 5 positive integers is 55.8. If the average of first two integers is 40 and the average of fourth and fifth integers is 69.5. Then, find the third integer?  
A. 42                      B. 60                      C. 72                      D. 45

## Type 2 - Partial Average

- Q5.** In a college, 16 girls have the average age as 18 years and 14 boys have the average age as 17 years. What would be the average age of the entire college?  
A. 18.64                      B. 17.54                      C. 20.84                      D. 16.34
- Q6.** The average salary of 25 employees in a company per month is Rs.6000. If the manager's salary is also added then the average increases by Rs.500. What would be the salary of the manager?  
A. 17,000                      B. 19,000                      C. 21,000                      D. 25,000
- Q7.** The average wages of a worker during a fortnight comprising 15 consecutive working days was Rs.90 per day. During first 7 days, his average wages was Rs.87 per day. And the average wages during the last 7 days was Rs.92 per day. What was his wage on the 8th day?  
A. 67                      B. 79                      C. 97                      D. 98
- Q8.** 40% of the employees in a factory are workers. All the remaining employees are executive. The annual income of each worker is Rs.390. The annual income of each executive is Rs.420. What is the average annual income of all the employees in the factory together?  
A. 480                      B. 580                      C. 408                      D. 690
- Q9.** The average annual income of Ramesh and Suresh is Rs.3800. The average annual income of Suresh and Pratap was Rs.4800. The average annual income of Pratap and Ramesh was Rs.5800. What is the average of the incomes of three?  
A. 3600                      B. 4800                      C. 5200                      D. 4600
- Q10.** On a School's annual day sweets were to be distributed amongst 112 children. But on that particular day, 32 children were absent. Thus, the remaining children got extra 6 sweets. How many sweets did each child originally supposed to get?  
A. 15                      B. 25                      C. 30                      D. 45
- Q11.** Arithmetic mean of the scores of a group of students in a test was 52. The brightest 20% of them secured a mean score of 80 and the duller 25% a mean score of 31. The mean of remaining 55% is?  
A. 52.5%                      B. 51.4%                      C. 62.5%                      D. 72.7%

### **Type 3 - With/Without Replacement**

**Q12.** When a student weighing 45 kg left a class, the average weight of the remaining 59 students increased by 200 grams. What is the average weight of the remaining 59 students?

- A. 50                                      B. 57                                      C. 65                                      D. 80

**Q13.** There were 35 students in a hostel. Due to the admission of 7 new students the expenses of the mess were increased by Rs.42 per day while the average expenditure per head diminished by Re.1. What was the original expenditure of the mess?

- A. 240                                      B. 440                                      C. 420                                      D. 540

**Q14.** The average age of 40 students of a class is 18 years. When 20 new students are admitted to the same class the average age of the class is increased by 6 months. The average age of the newly admitted students is?

- A. 19 Years 6 months                      B. 19 years                                      C. 18 Years                                      D. 20 years 2 months

### **Type 4 - Mistaken Average**

**Q15.** The average of 8 observations was 25.5. It was noticed later that two of those observations were wrongly taken. One observation was 14 more than the original value and the other observation was wrongly taken as 31 instead of 13. What will be the correct average of those 8 observations?

- A. 22.5                                      B. 21.5                                      C. 25                                      D. 24.5

**Q16.** The Arithmetic mean of 100 numbers was computed as 89.05. It was later found that two numbers 92 and 83 have been misread as 192 and 33 respectively. What is the correct Arithmetic Mean of the numbers?

- A. 88.66                                      B. 88.55                                      C. 77.02                                      D. 90.54

**Q17.** In an examination, the average marks of all the students calculated to be 58 marks. It was later found that marks of 60 students were wrongly written as 70 instead of 50. If the corrected average is 55, find the total number of students who took the exam?

- A. 500                                      B. 450                                      C. 400                                      D. 420

### **Type 5 – Problems on Cricket**

**Q18.** A cricketer has completed 10 innings and his average is 21.5 runs. How many runs must he make in his next innings so as to raise his average to 24?

- A. 50                                      B. 24                                      C. 49                                      D. 52

**Q19.** A cricketer had a certain average of runs for his 64th innings. In his 65th innings, he is bowled out for no score on his part. This brings down his average by 2 runs. His new average of run is?

- A. 135 Runs                                      B. 128 Runs                                      C. 150 Runs                                      D. 132 Runs

**Q20.** The batting average of a cricket player for 64 innings is 62 runs. His highest score exceeds his lowest score by 180 runs. Excluding these two innings, the average of the remaining innings becomes 60 runs. His highest score is?

- A. 212 Runs                                      B. 220 Runs                                      C. 214 Runs                                      D. 241 Runs



Practice set- 2

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

## Competition Level

- What is the relationship between the fractions  $\frac{14}{15}$  and  $\frac{37}{40}$ ? [AMCAT-2015]  
 (a)  $\frac{14}{15} = \frac{37}{40}$  (b)  $\frac{14}{15} > \frac{37}{40}$   
 (c)  $\frac{14}{15} < \frac{37}{40}$  (d) Cannot be determined
- $c = \frac{a}{b}$ ;  $a - 1 = c$  What is the relation between a & b ?  
 (a)  $a = \frac{1}{b} + 1$  (b)  $a = \frac{1}{b} - 1$   
 (c)  $a = 1 - b$  (d)  $a = \frac{b}{(b-1)}$
- Find approx. value of  $39.987/0.8102 + 1.987 \times 18.02$   
 (a) 72 (b) 56 (c) 86 (d) 44
- Find the value of  $16\frac{1}{4} \times 125\frac{1}{3} \times 27\frac{1}{3}$   
 (a)  $5\frac{1}{3}$  (b)  $4\frac{1}{3}$   
 (c)  $2\frac{3}{4}$  (d)  $3\frac{1}{3}$
- Sara has 400 marbles. If she gives  $\frac{1}{5}$ th of her marbles to Sam and Sam gives  $\frac{3}{4}$ th of his marbles to David, then how many marbles does Sam have left? [AMCAT-2015]  
 (a) 80 (b) 20 (c) 60 (d) 200
- A company rented a machine for Rs.700/- a month. Five years later the treasurer calculated that if the company had purchased the machine and paid Rs.100/- monthly maintenance charge, the company would have saved Rs.2000/-. What was the purchase price of the machine?[AMCAT-2015]  
 (a) Rs.24000 (b) Rs.34000  
 (c) Rs.36000 (d) Rs.40000
- There are 3 societies a, b, c. a lent tractor to b and c as many as they had. After some time, b gave as many tractors to a and c as many as they have. After sometime c did the same thing. At the end of this transaction each one of them had 24. Find the tractors each initially had.  
 (a) a had 35, b had 14, c had 21  
 (b) a had 39, b had 21, c had 12  
 (c) a had 14, b had 35, c had 45  
 (d) a had 13, b had 26, c had 39
- $10^{10} / (10^4)(10^2)$   
 (a)  $10^4$  (b)  $10^6$   
 (c)  $10^2$  (d) None of these
- Find the number which is nearest to 4207 and is exactly divisible by 23?  
 (a) 4786 (b) 4205  
 (c) 4209 (d) 4228

10. Which number should be added to 113257 so that it can be divisible by 9?  
 (a) 4 (b) 6  
 (c) 8 (d) 10
11. Which of the following numbers is divisible by 3x4?  
 (a) 946 (b) 947  
 (c) 948 (d) 949
12. If the number 357x25x is divisible by both 3 and 5, then the missing digits in the units place and the thousandth place respectively are:  
 (a) 0,6 (b) 5,6  
 (c) 5,4 (d) None of these
13. Find the least number which is divisible by all the numbers 1, 2, 3, 4, 5, ..... up to 12  
 (a) 28820 (b) 26620  
 (c) 27720 (d) 27620
14. Find the numbers lying between 1 and 1000 which are divisible by each of 6, 7 and 15  
 (a) 200,400,600,800 (b) 210,420,630,840  
 (c) 230,460,690,920 (d) 220,440,660,880
15. Three friends divided some bullets equally. After all of them shot 4 bullets the total number of remaining bullets is equal to that of has after division. Find the original number divided.  
 (a) 18 (b) 24 (c) 12 (d) 16
16. At 6'o clock ticks 6 times. The time difference between first and last ticks was 30sec. What is the time difference between first and last ticks at 12'o clock?  
 (a) 54 sec (b) 60 sec  
 (c) 66 sec (d) 360 sec
17. The least possible number of 3 digits when successively divided by 2,5,4,3 gives respective remainders of 1,1,3,1 is  
 a)372 (b) 275 (c) 273 (d) 193
18. Three wheels make 36, 24, 60 rev/min. Each has a black mark on it. It is aligned at the start of the qn. When does it align again for the first time?  
 (a) 14 sec (b) 6 min  
 (c) 360 min (d) 5 sec
19. A number when divided successively by 6, 7, 8, it leaves the respective remainders of 3, 5 and 4, what will be the last remainder when such a least possible number is divided successively by 8, 7, 6?  
 (a) 2 (b) 3 (c) 4 (d) 5
20. What is the largest integer that divides all three numbers 23400, 272304, 205248 without leaving a remainder?(TCS- 2015)  
 (a) 48 (b) 24 (c) 96 (d) 72
21. There are 65 decorative, flowering and fruit trees and small plants in a garden. There are twice as many decorative plants and four times as many flowering plants as fruit trees. There is only one decorative tree and only two fruit plants. There are 21 trees of which 13 are flowering trees. How many decorative plants and trees are there? (Capgemini- 2015)  
 (a) 11 (b) 12 (c) 15 (d) 17
22. What least number must be subtracted from 1936 so that the remainder when divided by 9, 10 and 15 will leave in each case the same remainder 7?  
 (a) 32 (b) 53 (c) 46 (d) 39

23. The greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5 respectively, is  
(a) 123 (b) 127 (c) 235 (d) 305
24. If the sum of two numbers is 55 and the H.C.F. and L.C.M. of these numbers are 5 and 120 respectively, then the sum of the reciprocals of the numbers is equal to:  
(a)  $11/120$  (b)  $601/55$   
(c)  $55/601$  (d)  $120/11$
25. The numbers 2272 and 875 are divided by a three digit number giving same remainders. The sum of the digits of this three digit number is,  
(a) 12 (b) 13 (c) 10 (d) 11
26. In a group of 15 persons, the average weight is 63.25 kg. A new person joined the group and the average weight decreased to 62.875 kg. Find the weight of the new person.  
(a) 56.25kg (b) 58.5 kg  
(c) 57.25kg (d) 58.65kg
27. The sum of six consecutive odd nos. is 888. What is the average of the nos.?  
(a) 147 (b) 148 (c) 149 (d) 146
28. An investor in shares makes a profit of Rs.920 in his fifth investment, thereby increasing his average profit of first four investments by Rs.14. His average profit over the first four investments is  
a) 21 (b) 11 (c) 13 (d) None of these
29. The average of certain number of terms is equal to 18. When the number 100 is added to the terms, the average becomes 20. Find the initial number of terms.  
a) 60 (b) 50 (c) 40 (d) 80
30. Find the average of the first 97 natural numbers  
(a)47 (b)37 (c)48 (d)49
31. The average monthly income of P and Q is \$5050. The average monthly income of Q and R is \$6250 and the average monthly income of P and R is \$5200. The monthly income of P is:  
a)\$3500 b)\$4000 c)\$4050 d)\$ 5000
32. A housewife has to pick one watermelon from the vegetable cart containing a dozen watermelons with an average weight of 2.5 kg per watermelon. If it is known that the lightest of the watermelons weighs not less than 1 kg and the heaviest not more than 6 kg, then which of the following could not be the average weight of the watermelon (all in kg) in the cart after the house wife has taken her pick?  
(a) 2.24(b) 2.31 (c) 2.8 (d) 2.19
33. There were 35 students in a hostel. If the number of students increases by 7, the expenses of mess increase by Rs 42 per day while the average expenditure per head diminishes by Re 1. Find the original expenditure of the mess  
(a) Rs 320 (b) Rs 420 (c) Rs 160 (d) Rs 158
34. The batting average for 40 innings of a cricket player is 50 runs. His highest score exceeds his lowest score by 172 runs. If these two innings are excluded, the average of the remaining 38 innings is 48 runs. The highest score of the player is:  
(a) 170 runs (b) 174 runs  
(c) 172 runs (d) 165 runs
35. The average of n numbers is 32. If  $\frac{3}{4}$  of the numbers are increased by 4 each and the remaining is decreased by 6 each, then what is the new average?  
(a) 32 (b) 32.5 (c) 33.5 (d) 34.5

1.b	2.d	3.c	4.d	5.b
6.b	7.b	8.a	9.d	10.c
11.c	12.b	13.c	14.b	15.a
16.c	17.d	18.d	19.b	20.b
21.c	22.d	23.b	24.a	25.c
26.c	27.b	28.d	29.c	30.d
31.b	32.c	33.b	34.b	35.c

## **COMPANY SPECIFIC**

36. The LCM of 2 numbers is 2516 and the square root of their HCF is 2. Find the product of two numbers. (**Capgemini**)  
a. 5032    b. 7548    **c. 10064**    d. 12580
37. What is the highest power of 5 contained in 200!?( **Infosys**)  
a. 40    **b. 49**    c. 50    d. 57
38. Which number should be multiplied by 43 so that it will have 3 prime factors? (**Bosch**)  
a. 2    b. 3    **c. 6**    d. 8
39. The largest measuring cylinder that can accurately fill 3 tanks of capacity 98, 182 and 266 litres each, is of capacity: (Bosch)  
a. 2 litres    b. 7 litres    **c. 14 litres**    d. 98 litres
40. What is the highest power of 2 in the following expression?  $1800 \times 25 \times 4^8 \times 21^2 \times 45^{-2}$  (**Infosys**)  
**a) 19**    b) 21    c) 20    d) 18 e) 17
41. If the difference of two numbers is 8 and the difference of their squares is 160, then the numbers are(**Josh**)  
a) 18,10    b) 8,16    **c) 6,14**    d) None of the above
42. Find the least number which upon being divided by 2,3,4,5,6 leaves in each case a remainder of 1, but when divided by 7 leaves no remainder. (**CoCubes**)  
(a) 501    **(b) 301**    (c) 465    (d) 630
43. Read the information given below and answer the questions that follow  
 $(x \text{ ? } y) = (x + y)/2$   
 $(x \& y) = (x^2 - y^2)$   
 $(x \$ y) = (x - y)/2$   
Determine the value of  $[(52 \$ 2) \& (24 \text{ ? } 16)]$  (**Josh**)  
(a) 125    (b) 25    **(c) 225**    (d) None of these
44. Which least number must be subtracted from 1936 so that the remainder when divided by 9, 10, 15 will leave 7 in each case the same remainder? (**CoCubes**)  
(a) 75    (b) 16    (c) 48    **(d) 39**
45. The number 567xy is completely divisible by 30. the possible of x and y can be(**Accenture**)  
**(a) 0 and 0**    (b) 1 and 0    (c) 2 and 0    (d) 0 and 1
46. If a three digit number 'abc' has 2 factors (where a, b, c are digits), how many factors does the 6-digit number 'abcabc' have? (**Capgemini**)  
**(a) 16**    (b) 24    (c) 18    (d) 30

47. Which one of the following fractions is arranged in ascending order? (**Sapient**)  
 (a)  $\frac{9}{11}, \frac{7}{9}, \frac{11}{13}, \frac{13}{14}$  (b)  $\frac{7}{8}, \frac{9}{11}, \frac{11}{13}, \frac{13}{14}$   
 (c)  **$\frac{9}{11}, \frac{11}{13}, \frac{7}{8}, \frac{13}{14}$**  (d) None
48. Sameer plants 7225 plants, so that there are as many rows as there are trees in a row. How many trees are there in a row? (**Capgemini**)  
 (a) 75 (b) 95 (c) **85** (d) 65
49. Anita had to multiply two positive integers. Instead of taking 35 as one of the multipliers, she incorrectly took 53. As a result, the product went up by 540. What is the new product? (**Sapient**)  
 (a) 1050 (b) 540 (c) 1440 (d) **1590**
50. The citizens of planet nigiet have developed their decimal system in base 7. A certain street in nigiet contains 1000 (in base 7) buildings numbered 1 to 1000. How many 3s are used in numbering these buildings? (**Bosch**)  
 (a) 135 (b) 147 (c) 200 (d) **192**
51. The square of a two digit number is divided by half the number. After 36 is added to the quotient, this sum is then divided by 2. The digits of the resulting number are the same as those in the original number, but they are in reverse order. The ten's place of the original number is equal to twice the difference between its digits. What is the number? (**eLitmus**)  
 (a) 44 (b) 45 (c) **46** (d) None of these
52. Three friends divided some bullets equally. After all of them shot 4 bullets the total number of remaining bullets is equal to that of has after division. Find the original number divided. (**CoCubes**)  
 (a) **18** (b) 24 (c) 12 (d) 16
53. Find the number of factors of  $12!$   
 (a) 264 (b) 528 (c) **792** (d) 2112
54. Find the last digit of  $222^{888} + 888^{222}$   
 (a) 1 (b) 2 (c) 3 (d) **0**
55. What is the remainder of  $1421 * 1423 * 1425$  when divided by 12? (**Josh**)  
 (a) 1 (b) 2 (c) **3** (d) 4

# PERCENTAGE

## PERCENT

When we say "Percent" we mean "per 100"

One percent (1%) means 1 per 100.



**50%** means 50 per 100  
(50% of this box is green)



**25%** means 25 per 100  
(25% of this box is green)

**Remember:  $x\%$  of  $y = y\%$  of  $x = xy/100$**

**Example: Find 8% of 50.**

8% of 50 is the same as 50% of 8

And 50% of 8 is 4

So, 8% of 50 is 4



Decimals, Fractions & Percentages are just different ways of showing the same value:

*A Half can be written as:*



### *Common Fractions with Decimal and Percent Equivalents*

Here is a table of commonly used values shown in Percent, Decimal and Fraction form:


Fraction	Decimal	Percent
$\frac{1}{2}$	0.5	50%
$\frac{1}{3}$	0.333...	33.333...%
$\frac{2}{3}$	0.666...	66.666...%
$\frac{1}{4}$	0.25	25%
$\frac{3}{4}$	0.75	75%
$\frac{1}{5}$	0.2	20%
$\frac{2}{5}$	0.4	40%
$\frac{3}{5}$	0.6	60%
$\frac{4}{5}$	0.8	80%
$\frac{1}{6}$	0.1666...	16.666...%
$\frac{5}{6}$	0.8333...	83.333...%
$\frac{1}{8}$	0.125	12.50%
$\frac{3}{8}$	0.375	37.50%
$\frac{5}{8}$	0.625	62.50%
$\frac{7}{8}$	0.875	87.50%
$\frac{1}{9}$	0.111...	11.111...%
$\frac{2}{9}$	0.222...	22.222...%
$\frac{4}{9}$	0.444...	44.444...%
$\frac{5}{9}$	0.555...	55.555...%
$\frac{7}{9}$	0.777...	77.777...%
$\frac{8}{9}$	0.888...	88.888...%
$\frac{1}{10}$	0.1	10%
$\frac{1}{12}$	0.08333...	8.333...%
$\frac{1}{16}$	0.0625	6.25%
$\frac{1}{32}$	0.03125	3.13%

**LET'S PRACTICE THE CONVERSIONS NOW -**

**A. FROM PERCENT TO DECIMAL:**

To [convert from percent to decimal](#) : divide by 100, and remove the "%" sign.

The easiest way to divide by 100 is to **move the decimal point 2 places to the left:**

From Percent	To Decimal	
75%		0.75 move the decimal point <b>2 places to the left</b> , and remove the "%" sign.

**B. FROM DECIMAL TO PERCENT:**

To [convert from decimal to percent](#) : multiply by 100, and add a "%" sign.

The easiest way to multiply by 100 is to **move the decimal point 2 places to the right:**

From Decimal	To Percent	
0.125		12.5% move the decimal point <b>2 places to the right</b> , and add the "%" sign.

Or you can simply multiply 0.125 with 100 and add the % sign to get 12.5%.

**C. FROM FRACTION TO DECIMAL:**

The easiest way to [convert a fraction to a decimal](#) is to divide the top number by the bottom number (divide the numerator by the denominator in mathematical language)

**Example: Convert  $\frac{2}{5}$  to a decimal.**

Divide 2 by 5:  $2 \div 5 = 0.4$

Answer:  $\frac{2}{5} = 0.4$

**D. FROM DECIMAL TO FRACTION:**

To [convert a decimal to a fraction](#) , remove the decimal by adding the denominator with appropriate number of zeroes and then simplify the fraction.



### Example: To convert 0.75 to a fraction

Remove the decimal  $\Rightarrow 0.75 = 75/100$

Simplify the fraction  $\Rightarrow 75/100 = 3/4$

Answer:  $\frac{3}{4} = 0.75$

#### E. FROM FRACTION TO PERCENTAGE:

The easiest way to [convert a fraction to a percentage](#) form and add the "%" sign.

is to multiply the fraction by 100 and reduce it to decimal

### Example: Convert $\frac{3}{8}$ to a percentage

Multiply  $\frac{3}{8}$  by 100: 37.5

Add the "%" sign: 37.5%

Answer:  $\frac{3}{8} = 37.5\%$

#### F. FROM PERCENTAGE TO FRACTION:

To [convert a percentage to a fraction](#), first convert to a decimal (divide by 100), then use the steps for converting decimal to fractions (like above).

**ATTENTION PLEASE!!!**

**REMEMBER THAT THE BASE TAKEN IS ALWAYS THE ORIGINAL QUANTITY!!!**

## Practice Set 1

### Type 1 – Basic Questions

**Q1.** A person who spends 66  $\frac{2}{3}\%$  of his income is able to save Rs. 1,200 per month. His monthly expense is?

- A. 1,200                      B. 2,400                      C. 3,000                      D. 3,200

**Q2.** If 80% of A = 50% of B and B = X% of A, then the value of X is?

- A. 400                      B. 300                      C. 160                      D. 150

**Q3.** If x is 80% of y, what percent of x is y?

- A. 75%                      B. 80%                      C. 100%                      D. 125%

**Q4.** If 50% of (x-y) = 30% of (x+y) then what percent of x is y?

- A. 33%                      B. 30%                      C. 25%                      D. 23%

**Q5.** A is twice B and B is 200% more than C. By what percent is A more than C?

- A. 50%                      B. 30%                      C. 500%                      D. 600%

**Q6.** Arun got 30% of the maximum marks in an examination and failed by 10 marks. However, Sujith who took the same examination got 40% of the total marks and got 15 marks more than the passing marks. What were the passing marks in the examination?

- A. 90                      B. 250                      C. 75                      D. 85

**Q7.** P is six times as large as Q. The per cent that Q is less than P is?

- A.  $83\frac{1}{3}\%$                       B.  $16\frac{2}{3}\%$                       C. 90%                      D. 60%

**Q8.** Dipin's score is 15% more than that of Rafi. Rafi's score is 10% less than that of Chandar. If the difference between the scores of Dipin and Chandar is 14, what is the score of Rafi?

- A. 180                      B. 360                      C. 120                      D. 480

**Q9.** A student multiplied a number by  $\frac{3}{5}$  instead of  $\frac{5}{3}$ . What is the percentage error in the calculation?

- A. 34%                      B. 44%                      C. 54%                      D. 64%

**Q10.** Ritesh and Co. generated revenue of Rs. 1,250 in 2006. This was 12.5% of its gross revenue. In 2007, the gross revenue grew by Rs. 2,500. What is the percentage increase in the revenue in 2007?

- A. 12.5%                      B. 20%                      C. 25%                      D. 50%

### **Type 2 – Successive Changes**

**Q11.** If the price of article is decreased by 10%, then increased by 10%, the net effect on the price of the item is?

- A. 1%                      B. -1%                      C. 0%                      D. 1.5%

**Q12** A person salary is decreased by steps of 20%, 15% and 10%. What will be the percentage decrease, if the salary is decreased in a single shot?

- A. 38%                      B. 38.8%                      C. 39%                      D. 40%

**Q13.** The price of a shirt is increased by 15% and then reduced by 15%. The final price of the shirt is?

- A. 1.25% increases    B. 1.25% decreases    C. 2.25% increases    D. 2.25% decreases

**Q14.** A's salary increased by 12% over last year and has become Rs. 6720. What will be his next year salary if it increases by 20% over last year's salary?

- A. Rs. 8000                      B. Rs. 8064    C. Rs. 7500                      D. Rs. 7200

### **Type 3 – Expenditure and Consumption**

**Q15.** Price of sugar rises by 20%. By how much percent should the consumption of sugar be reduced so that the expenditure does not change?

- A. 20                      B. 10                      C.  $16\frac{2}{3}$                       D. 15

**Q16.** The price of an article is cut by 30%. To restore it to the former value the new price must be increased by?

- A. 30%                      B.  $300/13\%$                       C.  $300\frac{1}{13}\%$                       D.  $300/7\%$

**Q17.** A reduction of 20% in the price of sugar enables a housewife to purchase 6 kg more for Rs. 240. What is original price per kg of sugar?

- A. Rs.10/kg      B. Rs.8/kg      C. Rs.6/kg      D. Rs.5/kg

**Q18.** A 10% hike in the price of rice forces a person to purchase 2 kg less for rupees 110. Find the actual price per kg of rice?

- A. Rs.5/kg      B. Rs.5.5/kg      C. Rs.6/kg      D. None of these

### **Type 4 – Venn Diagram and Miscellaneous**

**Q19.** 30% of the men are more than 25 years old and 80% of the men are less than or equal to 50 years old. 20% of all men play football. If 20% of the men above the age of 50 play football, what percentage of the football players are less than or equal to 50 years?

- A. 15%      B. 20%      C. 80%      D. 70%

**Q20.** A bag contains 600 coins of 25p denomination and 1200 coins of 50p denomination. If 12% of 25p coins and 24% of 50p coins are removed, the percentage of money removed from the bag is nearly?

- A. 21.6      B. 22.5      C. 20.6      D. 12.6

**Q21.** In an election contested by two parties, Party D secured 12% of the total votes more than Party R. If party R got 132,000 votes and there are no invalid votes, by how many votes did it lose the election?

- A. 300000      B. 168000      C. 36000      D. 24000

**Q22.** In a game show, the percentage of participants qualified to the number of participants participated from team A is 60%. In team B, the number of participants participated is 40% more than the participants participated from team A and the number of participants qualified from team B is 40% more than the participants qualified from team A. What is the percentage of participants qualified to the number of participants participated from team B?

- A. 20%      B. 40%      C. 60%      D. 80%

**Q23.** A student has to secure 40% marks to pass. He gets 178 marks and fails by 22 marks. What are the maximum marks?

- A. 500      B. 450      C. 560      D. 600

**Q24.** Forty percent of the employees of a company are men, and 75 percent of the men earn more than Rs.25,000 per year. If 45 percent of the company's employees earn more than Rs.25,000 per year, what fraction of the women employed by the company earn Rs.25,000 per year or less?

- A.  $\frac{2}{11}$       B.  $\frac{1}{4}$       C.  $\frac{1}{3}$       D.  $\frac{3}{4}$

**Q25.** In a library, 20% of the books are in Hindi. 50% of the remaining are in English and 30% of the remaining are in French. The remaining 6,300 books are in regional languages. What is the total number of books in library?

A. 19,500

B. 20,500

C. 21,500

D. 22,500

**Practice Set- 1**

1. B	2. C	3. D	4. C	5. C
6. D	7. A	8. B	9. D	10. C
11. B	12. B	13. D	14. B	15. C
16. D	17. A	18. B	19. C	20. A
21. C	22. C	23. A	24. D	25. D

**Competition Level**

- A district has 64000 inhabitants. If the population increases at the rate of  $2 \frac{1}{2} \%$  per annum, then the number of inhabitants at the end of 3 years will be :  
A. 65380      B. 68921      C. 70987      D. 68721
- In a competitive examination in State A, 6% candidates got selected from the total appeared candidates. State B had an equal number of candidates appeared and 7% candidates got selected with 80 more candidates got selected than A. What was the number of candidates appeared from each State ?  
A. 4000      B. 8000      C. 12000      D. 16000
- An agent, gets a commission of 2.5% on the sales of cloth. If on a certain day, he gets Rs. 12.50 as commission, the cloth sold through him on that day is worth  
A. 300      B. 500      C. 700      D. 900
- A man lost half of its initial amount in the gambling after playing 3 rounds. The rule of gambling is that if he wins he will receive Rs. 100, but he has to give 50% of the total amount after each round. Luckily he won all the three rounds. The initial amount with which he had started the gambling was :  
A.  $500/3$       B.  $700/3$       C. 300      D. 400
- The average of a set of whole numbers is 27.2. when the 20% of the elements are eliminated from the set of numbers then the average become 34. The number of elements in the new set of numbers can be  
A. 27      B. 35      C. 52      D. 63
- The cost price of goods with a bankrupt is Rs. 25500 and if the goods had realised in their full value, his creditors would have received 85 paise in the rupee. But  $\frac{2}{5}$  of the goods were sold at 17% and the remainder at 22% below their cost price. How many paise in a rupee was received by the creditors?  
A. 72 paise      (b) 68 paise      (c) 55 paise      (d) 52 paise      (e) None of these
- A report consists of 20 sheets each of 55 lines and each such line consists of 65 characters. This report is reduced onto sheets each of 65 lines such that each line consists of 70 characters. The percentage reduction in number of sheets is closest to:  
(a) 20%      (b) 5%      (c) 30%      (d) 35%

8. The number of votes not cast for the PNC Party increased by 25% in the National General Election over those not cast for it in the previous Assembly Polls, and the PNC Party lost by a majority twice as large as that by which it had won the Assembly Polls. If a total 2,60,000 people voted each time, how many voted for the PNC Party in the previous Assembly Polls?  
(a) 1,10,000                      (b) 1,50,000                      (c) 1,40,000                      (d) 1,20,000
9.  $\frac{2}{5}$ th of the voters promise to vote for A and the rest promised to vote for B. Of these, on the last day 15% of the voters went back of their promise to vote for A and 25% of voters went back of their promise to vote for B, and A lost by 200 votes. Then, the total number of voters is:  
(a) 10000                      (b) 11000                      (c) 9000                      (d) 9500
10. A person who has a certain amount with him goes to market. He can buy 50 oranges or 40 mangoes. He retains 10% of the amount for taxi fares and buys 20 mangoes and of the balance, he purchases oranges. Number of oranges he can purchase is:  
(a) 36                      (b) 40                      (c) 15                      (d) 20
11. Forty per cent of the employees of a certain company are men and 75% of the men earn more than Rs. 25,000 per year. If 45% of the company's employees earn more than Rs. 25,000 per year, what fraction of the women employed by the company earn Rs. 25,000 or less per year?  
(a)  $\frac{2}{11}$                       (b)  $\frac{1}{4}$                       (c)  $\frac{1}{3}$                       (d)  $\frac{3}{4}$
12. A Shopkeeper undertakes to supply 2000 tables at Rs. 1725 each. He estimates that if 10% are defective which will be sold at 50%, then the profit will be 15% on his whole outlay. When the tables were supplied, 70% of the tables were found defective. What loss did the Shopkeeper incur?  
(a) Rs. 607500                      (b) Rs. 557500                      (c) Rs. 550500                      (d) Rs. 80680                      (e) None of these
13. Sweta invested Rs. 10,000 in a scheme exactly three years ago. The value of the investment increased by 10% during the first year, increased by 5% during the second year, and decreased by 10% during the third year. What is the value of the investment today?  
(a) Rs. 10,500                      (b) Rs. 10,395                      (c) Rs. 10,342                      (d) Rs. 10,230                      (e) None of these
14. In Mumbai, 60% of the registered voters are BJP-supporters and the rest are Congress-supporters. In a mayoral race, if 75% of the registered voters who are BJP-supporters and 20% of the registered voters who are Congress-supporters are expected to vote for candidate X, what percent of the registered voters are expected to vote for candidate X?  
(a) 53%                      (b) 55%                      (c) 57%                      (d) 59%                      (e) None of these
15. A pharmaceutical company received Rs. 3 million in royalties on the first Rs. 20 million in sales of the generic equivalent of one of its products and then Rs.9 million in royalties on the next Rs. 108 million in sales. By approximately what percent did the ratio of royalties to sales decrease from the first Rs. 20 million in sales to the next Rs. 108 million in sales?  
(a) 10.27%                      (b) 20.63%                      (c) 38.6%                      (d) 44.44%                      (e) None of these

16. In Jamshedpur, only two newspapers Dainik Jagran and Prabhat Khabar are published. It is known that 25% of the city population reads Dainik Jagran and 20% reads Prabhat Khabar while 8% reads both the newspapers. It is also known that 30% of those who read Dainik Jagran but not Prabhat Khabar look into advertisement and 40% of those who read Prabhat Khabar but not Dainik Jagran look into advertisement while 50% of those who read both the newspapers look into advertisements. What is the percentage of the population who read an advertisement?  
 (a) 13.9% (b) 15.8% (c) 17.2% (d) 21.4% (e) None of these
17. In my office, at least 50% of the people read an e-newspaper. Among those who read an e-newspaper, at most 25% read more than one e-paper. Only one of the following statements follows from the statements given below. Which one is it?  
 (a) At the most 37.5% read exactly one e-paper.  
 (b) At least 37.5% read exactly one e-paper.  
 (c) At the most 19.8% read exactly one e-paper.  
 (d) At least 19.8% read exactly one e-paper.  
 (e) none of these
18. In Convent Model School, 60% of the students are boys. In an aptitude test, 80% of the girls scored more than 40 marks (out of a maximum possible 150 marks). If 60% of the total students scored more than 40 marks in the same test, find the fraction of the boys who scored 40 marks or less?  
 (a)  $\frac{3}{5}$  (b)  $\frac{6}{7}$  (c)  $\frac{5}{7}$  (d)  $\frac{7}{15}$  (e) None of these
19. In a recent opinion poll held during April, 60% of the respondents favoured India Against Corruption (IAC) while the rest favoured Indian political parties (IPP). It was found in May polls that 10% of IAC supporters switched their preference to IPP, while the same percentage of IPP's supporters also switched their preference to IAC. What percentage of the electorate should now switch their preference from IAC to IPP so that they are at par?  
 (a) 14% (b) 19% (c) 24% (d) 29% (e) None of these
20. Suman's project report on 'Development with dignity', consists of 25 pages each of 60 lines with 75 characters on each line. In case the number of lines is reduced to 55 but the number of characters is increased to 90 per lines, what is the percentage change in the number of pages. (Assume the number of pages to be a whole number.)  
 (a) - 8% (b) + 8% (c) + 12% (d) 80% (e) None of these
21. Visions Pvt. Ltd. Appoints a sales representative on the basic salary of Rs. 1200 per month and the condition that for every sales of Rs. 10000 above Rs.10000, he will get 50% of basic salary and 10% of the sales as a reward. There is no incentive for the first Rs. 10000 of sales. What should be the value of sales if the sales representative wants to earn Rs. 7600 in a particular month?  
 (a) Rs. 120000 (b) Rs. 50000 (c) Rs. 80000 (d) Rs. 45000 (e) None of these

22. Neha has a watch which gain 2% per hour when the temperature is in the range of  $40^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  and it loses at the same rate when the temperature is in the range of  $20^{\circ}$  to  $30^{\circ}\text{C}$ . The watch runs on time in all other temperature ranges. On a sunny day, the temperature started soaring up from 8 a.m. in the morning at the uniform rate of  $2^{\circ}\text{C}$  per hour and during the afternoon it started coming down at the same rate. Find what time will it be by the watch at 7 p.m. if at 8 a.m. the temperature was  $32^{\circ}\text{C}$  and at 4 p.m, it was  $40^{\circ}\text{C}$ ?  
 (a) 5 : 12 : 42 p.m. (b) 6 : 28 : 33 p.m. (c) 7 : 04 : 48 p.m. (d) None of these
23. In laptop market, only three competitors (Lenovo, Apple and Samsung) exist. Last year the sales of apple laptops were 10% more than Lenovo. In year, both the firms Lenovo and Apple increased their respective sales by 20%. This year, the sales of the firm Apple are five times that of Samsung. How much were the sales of the firm (approx.) Samsung last year, if the total sales remained constant over the two years period?  
 (a) 25% (b) 32% (c) 38% (d) 41% (e) None of these
24. Two jars contain equal quantities of 40% alcohol. Swati changed the concentration of the first jar to 50% by adding extra quantity of pure alcohol. Sonali changed the concentration of the second jar to 50% replacing a certain quantity of the solution with pure alcohol. By what percentage is the quantity of alcohol added by Swati more than that replaced by Sonali?  
 (a) 10% (b) 20% (c) 30% (d) 40% (e) None of these
25. For admission in a post graduate program of Calcutta University, 90% of the candidates who appeared for the written test were males and the rest were females, 60% of the males and 80% of the females passed in the written test. What is the total number of students who appeared for the written test, if the total number of passed candidates was 1240?  
 (a) 1380 (b) 1560 (c) 2000 (d) 2500 (e) None of these
26. In a gram panchayat meeting, 1000 people voted on a resolution with 10% of the votes being invalid. After some discussion 1000 people voted again. This time there were 20% invalid votes. The opponents were increased by 50% while the motion was now rejected by a majority, which is 300% more than it was formerly passed by. How many people voted against the resolution before the discussion?  
 (a) 700 (b) 600 (c) 500 (d) 400 (e) None of these
27. An index of 12 shares contains, among others, the shares of Vision Power, Vision Infra and Vision Communication with weightage of 7%, 13% and 15% respectively. What is the increase in the prices of other shares, if these three rise by 9%, 10% and 4% respectively, while the index rises by 6%?  
 (a) 5.34% (b) 5.94% (c) 6.23% (d) Can't be determine (e) None of these
28. A, B and C start a business by investing Rs. 70000 that earns them a profit of Rs. 42000 at the end of the year. A invests his share in the profit in a scheme that gives her 10% interest compounded annually and B invests his share in a scheme that gives her 20% interest compounded annually. A gets Rs. 2520 as interest at the end of 2 years and B gets an interest of Rs. 4200 at the end of one year. Find C's investment in the business?  
 (a) Rs. 10000 (b) Rs. 15000 (c) Rs. 20000 (d) Rs. 25000 (e) None of these

29. Sashi has Rs. 90000 with him. He purchases a mobile, an i-pad and a laptop for Rs. 15000, Rs. 13000 and Rs. 35000 respectively and puts the remaining money in his bank account which pays 15% per annum compound interest. After 2 years he sells off the three items at 80% of their original price and also withdraws his entire money from the bank by closing the account. What is the total change in his asset?  
 (a) 5.31%      (b) 4.31%      (c) 4.32%      (d) – 4.32%      (e) None of these
30. Ram gets 20% marks more than Girish. Girish gets 20% more than Sanjay. Sanjay gets 20% less than Aditya. If Ram got 576 marks and total marks were 800 then what marks did Aditya get?  
 (a) 600      (b) 480      (c) 500      (d) 600      (e) None of these

1.b	2.b	3.b	4.b	5.c
6.b	7.a	8.c	9.a	10.d
11.d	12.a	13.b	14.a	15.d
16.a	17.b	18.d	19.a	20.a
21.b	22.c	23.a	24.b	25.c
26.d	27.a	28.b	29.d	30.c



# **PROFIT AND LOSS**

## Basic Terminology

**Cost Price:** C.P. is the price at which one buys anything.

**Selling Price:** S.P. is the price at which one sells anything.

**Profit/Loss:** This is the difference between the selling price and the cost price. If the difference is positive it is called the profit and if negative it is called as loss.

**Profit/Loss %:** This is the profit/loss as a percentage of the C.P.

**Margin:** Normally is in % terms only. This is the profit as a percentage of S.P.

**Marked Price:** This is the price of the product as displayed on the label.

**Discount:** This is the reduction given on the marked price before selling it to a customer. If the trader wants to make a loss he can offer a discount on the cost price as well

**Mark-up:** This is the increment on the cost price before being sold to a customer.

It is also known as list price or Tag price which is written on the item. The markup price written is always greater than the actual C.P of the item and the percentage rise in the mark-up price is on the C.P of the item.

Percentage increase in the Mark-up price =  $(MP - CP) / CP \times 100$

Profit and Loss Terminologies	Meaning	Formulas
Profit or Gain	The selling price of the object > than its cost price	Profit = Selling price(SP) – Cost Price(CP)
Loss	The cost price of the object > than its selling price	Loss = Cost Price(CP) – Selling Price(SP)
Selling Price	The price for which a commodity is sold is said to be the selling price for that particular item denoted as SP.	$SP = \left( \frac{100 + \text{Profit}\%}{100} \right) \times CP$ OR $SP = \left( \frac{100 - \text{Loss}\%}{100} \right) \times CP$
Cost Price	The expense at which an object is bought is termed as the cost price for that object, abbreviated as C.P.	$CP = \left( \frac{100}{100 + \text{Profit}\%} \right) \times SP$ OR $CP = \left( \frac{100}{100 - \text{Loss}\%} \right) \times SP$
Discount	To manage the competitors in the industry and promote the sale of goods, vendors offer discounts to consumers.	Discount = MP – SP (Marked Price – Selling Price)

Profit and Loss Terminologies	Formulas in Percentage
Profit percentage(%)	$\text{Profit} = (\text{SP}) - (\text{CP})$ $\text{Profit percentage}\% = \left( \frac{\text{Profit}}{\text{Cost Price}} \right) \times 100$
Loss percentage(%)	$\text{Loss} = (\text{CP}) - (\text{SP})$ $\text{Loss percentage}\% = \left( \frac{\text{Loss}}{\text{Cost Price}} \right) \times 100$
Discount (%)	$\left( \frac{\text{Discount}}{\text{Marked Price}} \right) \times 100$
Markup (%)	$\left( \frac{\text{markup}}{\text{cost price}} \right) \times 100$ Where Markup = Selling Price – Cost

## **Practice Set 2**

### **Type 1 – Profit & Loss Percentage**

- Q1.** If the cost price is 96% of selling price then what is the profit %?  
 A. 3.13                                      B. 2.45                                      C. 2.34                                      D. 4.17
- Q2.** Monika purchased a pressure cooker at 9/10th of its selling price and sold it at 8% more than its S.P. Find her gain percent?  
 A. 20%                                      B. 10%                                      C. 15%                                      D. 30%
- Q3.** A vendor bought bananas at 6 for Rs.10 and sold them at 4 for Rs.6 .What is the gain/ loss percent?  
 A. 12% profit                                      B. 20% loss                                      C. 10% loss                                      D. 15% profit
- Q4.** A vendor bought toffees at 6 for a rupee. How many for a rupee must he sell to gain 20%?  
 A. 10                                      B. 5                                      C. 15                                      D. 22
- Q5.** A shopkeeper buys scientific calculators in bulk for Rs. 15 each. He sells them for Rs. 40 each. Calculate the profit on each calculator as percentage of the cost price.  
 A. 166.67%                                      B. 150%                                      C. 66.67%                                      D. 123%
- Q6.** If the cost price of a book is Rs. 150 and selling price is 137.50, then calculate the percentage loss on the book?  
 A. 12.33%                                      B. 8.33%                                      C. 10%                                      D. 15%
- Q7.** What is the loss percent if a man loses Rs.10 on selling an article for Rs.100?  
 A. 120/13                                      B. 111/12                                      C. 100/11                                      D. 120/11
- Q8.** If selling price is doubled, the profit triples. Find the profit percent?

- A. 300%                      B. 200%                      C. 150%                      D. 100%

### **Type 2 – Cost Price in Terms of Selling Price**

- Q9.** The cost price of 21 articles is equal to selling price of 18 articles. Find gain or loss %?  
 A. 50/3% gain                      B. 60/3% gain                      C. 70/3% loss                      D. 80/3% loss
- Q10.** A man sells 320 mangoes at the cost price of 400 mangoes. His gain percent is?  
 A. 25%                      B. 30%                      C. 35%                      D. 15%
- Q11.** If the cost of 30 articles is equal to the selling of 20 articles, find the profit percent?  
 A. 40                      B. 50                      C. 45                      D. 55

### **Type 3 – Error in Weight and Dishonest Dealer**

- Q12.** A dishonest dealer professes to sell his goods at cost price but uses a weight of 900 grams for a kg weight. Find his gain percent.  
 A. 11.11                      B. 33.33                      C. 12                      D. Cannot be determined
- Q13.** A shopkeeper claims that he is selling sugar at Rs 23/kg which cost him Rs 25/kg but he is giving 800gm instead of 1000gm. What is his percentage profit or loss?  
 A. 15% profit                      B. 15% loss                      C. no profit no loss                      D. Cannot be determined
- Q14.** Lalit marks up his goods by 40% and gives a discount of 10%. Apart from this, he uses a faulty balance also, which reads 1000 gm for 800 gm. What is his net profit percentage?  
 A. 57.5% loss                      B. 57.5% profit                      C. 60% profit                      D. Cannot be determined
- Q15.** A shopkeeper sells rice to a customer, using false weights and gains 100/8 % on his cost. What weight has he substituted for a kilogram?  
 A. 750 gms                      B. 800 gms                      C. 880 gms                      D. 888.89 gms

### **Type 4 – When SP is Same for Two Items**

- Q16.** A man sells 2 flats for Rs 675958 each. On one he gains 16% while on the other he loses 16%. How much does his gain/loss in the whole transaction?  
 A. 3.56% loss                      B. 3.56% gain                      C. 2.56% gain                      D. 2.56% loss
- Q17.** If a shopkeeper sells two items at the same price. If he sells one of them at a profit of 10% and the other at a loss of 10%, find his profit/loss percentage?  
 A. 1% profit                      B. 1% loss                      C. No profit no loss                      D. None of these

### **Type 5 – Single and Successive Discounts**

- Q18.** A shopkeeper marks the price of the article at Rs.80. Find the cost if after allowing a discount of 10%, he still gains 20% on the cost price?

A. 60

B. 40

C. 29

D. 39

**Q19.** An article was sold for Rs. Y after giving a discount of x%. Then, its list price is\_\_\_\_\_?

A.  $100y/(100-x)$

B.  $(100-x)/y$

C.  $(100-x)/90y$

D.  $x/(100-y)$

**Q20.** Find the single discount equivalent to successive discounts of 40% and 20%.

A. 52%

B. 45%

C. 46%

D. 48%

**Q21.** An article is listed at Rs. 65. A customer bought this article for Rs. 56.16 and got two successive discounts of which the first one is 10%. What was the other rate of discount of this scheme that was allowed by the shopkeeper?

A. 3%

B. 4%

C. 6%

D. 2%

**Q22.** Tarun got 30% concession on the labelled price of an article and sold it for Rs. 8750 with 25% profit on the price he bought. What was the labelled price?

A. 10000

B. 12000

C. 13000

D. 14000

### **Type 6 – Goods Passing Through Successive Hands**

**Q23.** Peter bought an item at 20% discount on its original price. He sold it with 40% increase on the price he bought it. The new sale price is by what percentage more than the original price?

A. 12%

B. 13%

C. 15%

D. 17%

**Q24.** A man bought an article and sold it at a gain of 5 %. If he had bought it at 5% less and sold it for Re 1 less, he would have made a profit of 10%. The C.P. of the article was?

A. Rs. 100

B. Rs. 150

C. Rs. 200

D. Rs. 250

**Q25.** A trader sold an article at a loss of 5% but when he increased the selling price by Rs.65 he gained 3.33% on the cost price. If he sells the same article at Rs. 936, what is the profit percentage?

A. 15%

B. 16.66 %

C. 20 %

D. Data

Insufficient

**Q26.** A person incurs a loss of 5% by selling a watch for Rs. 1140. At what price should the watch be sold to earn 5% profit?

A. Rs.1200

B. Rs.1230

C. Rs.1260

D. Rs.1290

**Q27.** The marked price of an article is increased by 25% and the selling price is increased by 16.66%, then the amount of profit doubles. If the original marked price be Rs. 400 which is greater than the corresponding cost price by 33.33%, what is the increased selling price?

A. 240

B. 360

C. 420

D. 600

**Q28.** Bhajan Singh purchased 120 reams of paper at Rs 80 per ream. He spent Rs 280 on transportation, paid octroi at the rate of 40 paise per ream and paid Rs 72 to the coolie. If he wants to have a gain of 8 %, what must be the selling price per ream?

A. 90

B. 89

C. 87.48

D. 86

**Q29.** If the manufacturer gains 10 %, the wholesale dealer 15 % and the retailer 25 %, then find the cost of production of a table if the retail price was Rs 1265

A. Rs. 750

B. Rs. 800

C. Rs. 850

D. Rs. 900

### Practice Set- 2

1. D	2. A	3. C	4. B	5. A
6. B	7. C	8. D	9. A	10. A
11. B	12. A	13. A	14. B	15. D
16. D	17. B	18. A	19. A	20. A
21. B	22. A	23. A	24. C	25. C
26. C	27. C	28. A	29. B	

## Competition Level

1. A person buys 860 articles at Rs. 1900 due to some reason  $\frac{2}{11}$  part of total articles be destroyed , he sold 66.66% of all articles at 18.18% profit. At what profit or loss % he should sell remaining articles, so that finally he will got neither profit nor loss?

a)35% loss

b)40% profit

c)20% profit

d)37.5% profit

2. person buys 1365 articles at Rs.24150. if he sells637 articles at 30% profit .37.5% of remaining article he sells at x% loss and remaining articles sells at 20% profit .the total SP of all articles is Rs.28175, then find the value x?

a)16.66

b)30

c)25

d)20

3. CP of 15articles is equal to SP of 12 articles. While the discount on 8 articles is equal to the profit earn on 6 articles. Find the difference between % of profit and discount?

a)22(1/23)%

b)11(22/23)%

c)13(12/23)%

d)12.95%

4. CP of 12 oranges is equal to the SP of 9 oranges and the discount on 10 oranges is equal to the profit on 5 oranges .what is the % difference between the profit % and discount%?

a)20

b)22.22

c)16.66

d)15

5.. CP of 3 Motorcycle is same. One is sold at a profit of 15% and the other for Rs19550 more than the 1st and the 3rd for Rs12650 more than the 2nd. If the net profit is 30%. Find the SP of 2nd motorcycle.

a)151800

b)115000

c)132250

d)150000

6. Two tables were purchased at the same price . first was sold at a profit of 46.66% and the second was sold at a price ,which is Rs. 5370 less than the price at which the first one was sold. If the overall profit earned by selling both the tables was 9.375%, what is the cost price of one table?

a)Rs.7200

b)Rs.8400

c)Rs.6000

d)Rs.9600

7. SP of an article is Rs272. If value of its profit% is 3 times of CP , then find the CP?  
a)60                                      b)80                                      c)70                                      d)90
8. SP of a book is Rs168. If value of its profit % is 3 times of CP then the CP?  
a)70                                      b)40                                      c)90                                      d)60
9. A bought certain no. of items at 1 for Rs3. He sold all the items to B at 4 for Rs15. Later on B sold all the items back to A at 5 for Rs12.if A got a profit of 135 in whole transaction then find the total CP of all the items for A?  
a)Rs..400                                      b)Rs.240                                      c)Rs.450                                      d)Rs.300
10. A man purchases some pencils at 6 for Rs20 and the same quantity at 10 for Rs30. If he sells at the all pencils at 6 for Rs25 then find his profit % on SP?  
a)20%                                      b)21(1/19) %                                      c)24%                                      d)25%
11. Profit on selling 10 candles equals SP of 3 bulbs while loss on selling 10 bulb is equals SP of 4 candles. Also profit % equals to the loss % and cost of candles is half of the cost of bulb. What is the ratio of SP of candle to the SP of bulb?  
a)5:4                                      b)3:2                                      c)4:5                                      d)3:4
12. A and B purchased one camera each at the same prices. Later on C purchased both cameras at equal prices form A and B. But the profit % of A was P while the same of B was Q since B calculated his profit on the SP. Thus  $Q = 41\frac{2}{3}\%$  of P. If C sells one of the camera to D at P% profit then what is the CP for D, while C purchased each of the camera at Rs240?  
a)Rs676                                      b)Rs500                                      c)Rs576                                      d)None
13. A shopkeeper professes to sell his goods at cost price but uses a weight of 800 gm instead of kilogram weight. Thus, he makes a profit of :  
A. 20%                                      B. 16                                      C. 25%                                      D. None of these
14. A shopkeeper cheats to the extent of 10% while buying as well as selling, by using false weights. His total gain if he is claiming to sell these at cost price :  
A. 10%                                      B. 11.11%                                      C. 20%                                      D. 22.22%
15. A grocer sells rice at a profit of 10% and uses weights which are 20% less than the market weight. The total gain earned by him will be :  
A. 30%                                      B. 35%                                      C. 37.5%                                      D. None of these
16. A dishonest dealer pretends to sell at the cost price but earns a profit of 25% by under weighing. What weight must he be using for 1 kg?  
a)750 gm                                      b)800 gm                                      c)500 gm                                      d)875 gm
17. If SP of a book is 6 times to the discount offered and discount % is equal to the profit % .then find the ratio of discount offered to CP?  
a)8:21                                      b)4:21                                      c)3:21                                      d)4:42

18. A person purchased 3500 books for Rs350000. He gives 500 books free while selling. He still gives 25% discount on MP and he further give one book free on every 29 books sold. Find profit or loss if the MP of one book is 160?

- a)Rs.3000loss                      b) Rs.2000 profit                      c) Rs.2000 loss                      d) Rs.1000 profit

19. If Fatima sells 60 identical toys at a 40% discount on the printed price, then she makes 20% profit. Ten of these toys are destroyed in fire. While selling the rest, how much discount should be given on the printed price so that she can make the same amount of profit?

- a)30%                                      b)25%                                      c)24%                                      d)28%

20. An auto driver earns profits of 20% in every trip when he carry 3 passengers and the price of petrol is Rs30/L. find the % of profit for the same journey if he carry 4 passengers and the revenue per passengers is the same in both cases and the price of petrol is now reduced to 24Rs/L?

- a)80%                                      b)100%                                      c)120%                                      d)75%

21. A dealer marks articles at a price that gives him a profit of 30%. 6% of the consignment of goods was lost in a fire in his premises, 24% was soiled and had to be sold at half the cost price. If the remainder was sold at marked price, what % profit or loss did the dealer make on that consignment?

- a)2%                                      b)2.5%                                      c)3%                                      d)6.2%

22. On giving 3 pencils free with every 5 pens bought, a shopkeeper makes a profit of 20% and on giving 6 pencils free with every 2 pens bought, he suffers a loss of 25%. Find the approx. profit % made by the shopkeeper when he gives 4 pencils free with every 6 pens bought, if the SP of 1 pen remains the same. (assume that the pencils are identical and the same applies to the pens) ?

- a)18%                                      b)20%                                      c)24%                                      d)16%

23. Mohit goes to furniture shop to buy a sofa set and a center table. He bargains for a 10% discount on the center table and 25% discount on sofa set. However the shopkeeper, by mistake, interchanged the discount % figures while making the bill and Mohit paid accordingly. When compared to what he should pay for his purchases, what % did Mohit pay extra given that the center the table costs 40% as much as the sofa set?

- a)12.3%                                      b)7.2%                                      c)8.1%                                      d)6.3%

24. A shopkeeper sold an item for Rs1510 after giving discount of  $24\frac{1}{2}\%$  and there by incurred a loss of 10%. Had he sold the item without discount, his net profit would have been?

- a)Rs641                                      b)Rs322( $\frac{1}{9}$ )                                      c)Rs422( $\frac{2}{9}$ )                                      d)Rs322( $\frac{2}{9}$ )

25. The MP of watch is Rs1840. The shopkeeper gives successive discount of 15% and x% to the customer. If the customer pays Rs1173 for the watch. Find the value of x?

- a)15                                      b)20                                      c)25                                      d)30

26. A bookseller marks his books at an advance of 69% on the actual cost of production. He allows a discount of 15% and also a copy free for every dozen sold at a time. What rate %

profit does the bookseller make, if books are sold in lots of 12?

- a)32.6                      b)47.5                      c)24.9                      d)31.8

27. A shopkeeper gives 3 articles free on the purchase of 13 articles and he also allows an additional discount of 14.28% to customer and still gains  $8\frac{1}{3}\%$  profit . Find the ratio of MP to CP?

- a)14:9                      b)9:5                      c)7:5                      d)21:16

28. Rotomac produces very fine quality of writing pens. Company knows that on an average 10% of the produced. Pens are always defective so are rejected before packing. Company promises to deliver 7200 pens to its whole seller at Rs10 each. It estimates the overall profit on all the manufactured pens to be 25%.what is the manufacturing cost of each pens?

- a)Rs6                      b)Rs7.2                      c)Rs5.6                      d)Rs8

29. A sold his car to B at a profit of 20% and B sold it to C at a profit of 10%. C sold it to D at a loss of 9.09%. D spent 10% of his purchasing price and then sold it at a profit of 8.33% to A once again. What is the loss of A?

- a)23%                      b)29%                      c)50%                      d)43%

30. A shopkeeper purchases a packet of 50 pens at Rs10 per pen. He sells a part of the packet at a profit of 30%. On the remaining part, he incurs a loss of 10%. If his overall profit on the whole packet is 10%, find the number of pens he sold at a profit?

- a)25                      b)30                      c)20                      d)15

1.b	2.d	3.b	4.b	5.a	6.a	7.b	8.d	9.d	10.c
11.b	12.c	13.c	14.d	15.c	16.b	17.b	18.c	19.d	20.b
21.c	22.a	23.c	24.d	25.c	26.d	27.a	28.b	29.a	30.a



# **INTEREST**

## **SIMPLE INTEREST**

If the interest on a sum borrowed for certain period is calculated uniformly, it is called **simple interest (SI)**. Simple interest is a quick method of calculating the interest charge on a loan.

**Principal:** The amount borrowed or invested.

**Loan period or duration:** Is the time that the principal amount is either borrowed or invested. It is usually given in years, but in some cases, it may be quoted in months or even days.

**Interest:** Is the extra money paid by the borrower to the owner (lender) as a form of compensation for the use of the money borrowed.

The statement "**rate of interest 10% per annum**" means that the interest for one year on a sum of **Rs.100** is **Rs.10**. If not stated explicitly, rate of interest is assumed to be for one year.

**SIMPLE INTEREST = PRINCIPAL\*RATE OF INTEREST\*TIME**

## **Formula**

100

**Example:** Calculate the simple interest on Rs. 1000 at the rate of 5% per annum for a time period of 2 years.

**Solution:** Principal=1000

Rate of interest=5% p.a. Time= 2 years

$$\text{SIMPLE INTEREST} = \frac{P \times R \times T}{100} = \frac{1000 \times 5 \times 2}{100} = \text{Rs.100}$$

## **COMPOUND INTEREST**

**Compound Interest** is the interest calculated on a sum of money which includes principal and interest calculated for the previous year.

**Example:** Calculate the interest if compounded annually for an amount of Rs. 100 for a time period of 3 years at the rate of 10 % per annum.

**Solution:** Here, Principal =Rs. 100 Time Period=3 years

Rate of interest =10% per annum

**compounding is regular addition of interest**

**100** interest for 1st year **110** interest for 2nd year **121** interest for 3rd year **133.31**  
 at 10% p.a. is 10 at 10% p.a. is 11 at 10% p.a. is 12.1

Amount 110 is the principal for the 2nd year, amount 121 is the principal for the 3rd year, and amount 133.1 is the principal for the 4th year.

Under compound interest, Amount is found by the formula given below:

Time (in years)	Amount	Interest
1	$P(1 + R/100)$	$\frac{PR}{100}$
2	$P(1 + \frac{R}{100})^2$	$P(1 + \frac{R}{100})^2 - P$
3	$P(1 + \frac{R}{100})^3$	$P(1 + \frac{R}{100})^3 - P$
4	$P(1 + \frac{R}{100})^4$	$P(1 + \frac{R}{100})^4 - P$
n	$P(1 + \frac{R}{100})^n$	$P(1 + \frac{R}{100})^n - P$

### Practice set 3

#### Type 1 – Simple Interest

**Q1.** A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 945 in 5 years. The sum is?

- A. 650 B. 690 C. 620 D. 700

**Q2.** How much time will it take for an amount of Rs. 450 to yield Rs. 81 as interest at 4.5% per annum of simple interest?

- A. 3.5 years B. 4 years C. 4.5 years D. 5 years

**Q3.** A sum of Rs. 12,500 amounts to Rs. 15,500 in 4 years at the rate of simple interest. What is the rate of interest?

- A. 3% B. 4% C. 5% D. 6%

**Q4.** What will be the ratio of simple interest earned by certain amount at the same rate of interest for 6 years and that for 9 years?

- A. 1: 3 B. 1: 4 C. 2: 3 D. Data inadequate

**Q5.** A person borrows Rs. 5000 for 2 years at 4% p.a. simple interest. He immediately lends it to another person at  $6\frac{1}{4}\%$  per annum for 2 years. Find his gain in the transaction per year?

- A. Rs. 112.50                      B. Rs. 125                      C. Rs. 150                      D. Rs. 167.50

**Q6.** A father left a will of Rs.35 lakhs between his two daughters aged 8.5 and 16 such that they may get equal amounts when each of them reach the age of 21 years. The original amount of Rs.35 lakhs has been instructed to be invested at 10% p.a. simple interest. How much did the elder daughter get at the time of the will?

- A. 17.5 lakhs                      B. 21 lakhs                      C. 15 lakhs                      D. 20 lakhs

**Q7.** At what rate percent per annum will a sum of money double in 8 years?

- A. 12.5%                      B. 13.5%                      C. 11.5%                      D. 14.5%

**Q8.** A sum of Rs. 725 is lent in the beginning of a year at a certain rate of interest. After 8 months, a sum of Rs.362.50 more is lent but at the rate twice the former. At the end of the year, Rs. 33.50 is earned as interest from both the loans. What was the original rate of interest?

- A. 3.46%                      B. 5%                      C. 4.5%                      D. 6%

### **Type 2 – Compound Interest**

**Q9.** The compound interest on Rs. 30,000 at 7% per annum is Rs. 4347. The period (in years) is?

- A. 2                      B. 2.5                      C. 3                      D. 4

**Q10.** The Compound interest on Rs. 20,480 at  $6\frac{1}{4}\%$  per annum for 2 years 73 days is?

- A. Rs. 2929                      B. Rs. 2219                      C. Rs. 3021                      D. Rs. 3049

**Q11.** A man invests Rs.5000 for 3 years at 5% p.a. compound interest reckoned yearly. Income tax at the rate of 20% on the interest earned is deducted at the end of each year. Find the amount at the end of the third year?

- A. Rs. 5624.32                      B. Rs. 5423                      C. Rs. 5634                      D. Rs. 5976

**Q12.** The population of a town was 3600 three years back. It is 4800 right now. What will be the population three years down the line, if the rate of growth of population has been constant over the years and has been compounding annually?

- A. Rs. 600                      B. Rs. 6400                      C. Rs. 6500                      D. Rs. 6600

**Q13.** A tree increases annually by  $\frac{1}{5}$ th of its height. If its height today is 50 cm, what will be the height after 2 years?

- A. 64 cm                      B. 72 cm                      C. 66 cm                      D. 84 cm

**Q14.** The compound interest on Rs. 30,000 at 7% per annum is Rs. 4347. The period (in years) is?

- A. 1                      B. 2                      C. 3                      D. 3.5

**Q15.** A sum amounts to Rs. 882 in 2 years at 5% compound interest. The sum is?

- A. Rs. 800                      B. Rs. 822                      C. Rs. 840                      D. Rs. 816

**Q16.** What annual payment will discharge a debt of Rs. 1025 due in 2 years at the rate of 5% compound interest?

- A. Rs. 560                      B. Rs. 560.75                      C. Rs. 551.25                      D. Rs. 550

**Q17.** The present worth of Rs. 242 due in 2 years at 10% per annum compound interest is?

- A. Rs. 180                      B. Rs. 240                      C. Rs. 220                      D. Rs. 200

**Q18.** If in a certain number of years Rs. 10000 amounts to Rs. 160000 at compound interest, in half that time Rs.10000 will amount to?

- A. Rs. 50000                      B. Rs. 40000                      C. Rs. 80000                      D. Rs. 60000

**Q19.** The compound interest on Rs. 30,000 at 7% per annum is Rs. 4347. The period (in years) is?

- A. 1                      B. 2                      C. 3                      D. 3.5

### Practice Set- 3

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

## Competition Level

- A man deposited Rs.1850 in a bank at 7% per annum and Rs.2150 in another bank at 9% per annum. Find the rate of interest for the whole sum:  
a)8.133%                      b)8.075%                      c)8.25%                      d)8.375%
- Rs. 9600 is invested in two parts, one part at rate of 11% per annum and remaining part at 15% simple interest. If the simple interest received after four years is Rs.5088. Then find the difference between both parts?  
a) Rs.1200                      b) Rs.1000                      c)Rs.1600                      d)Rs.800
- A man borrowed a total amount of Rs.45000, one part of it at rate of 10%per annum simple interest and remaining part on 12% per annum. If at the end of three years, he paid in all Rs.59940. To settle the loan amount. What was the amount borrowed at 12% per annum?  
a)Rs.21000                      b)Rs.18000                      c)Rs.24000                      d)Rs.27000
- A person invested a sum of Rs. 90000 in 3 Schemes A, B & C at the rate of 16%, 19% & 31% per annum respectively. The amount invested in scheme C is 50% more than the amount invested in scheme A. Find the total amount invested in scheme B, if he gets a total amount of Rs.150300 in three years.  
a)30000                      b)40000                      c)50000                      d)35000

5. The rate of simple interest for first 3 years is 8%, for next 4 years it is 8.5% and the period beyond 7 years it is 7.5% per annum. If the total simple interest at the end of 13 years is Rs.9270. Find the initial investment.  
a)Rs.8100                      b)Rs.9600                      c)Rs.9000                      d)Rs.10000
6. The rate of S.I. on a certain sum of money is 6.5% per annum for first four years, 9% per annum for next 7 years, and 10% per annum for the period beyond 11 years. If the Amount received at the end of 19 years is Rs.43040. Find the sum.  
a)14000                      b)16000`                      c)20000                      d)18000
7. A person deposited certain money at the starting of each year, if rate of interest is 13% per annum. At the end of 3<sup>rd</sup> year, the total amount is Rs.24948. Then find how much money he deposited each year.  
a)Rs.6400                      b)Rs.6600                      c)Rs.6200                      d)Rs.6300
8. A person invested five-twelfth of total principal at 9% per annum, 2/9 part at 11% per annum and remaining part at 16% per annum simple interest. If the total simple interest in one year is Rs.38790. Find the total investment.  
a)Rs.324000                      b)Rs.288000                      c)Rs.360000                      d)Rs.252000
9. If a man receives on 1/4th of his capital 7.2% simple interest, 5.3% of the remaining 2/5th capital and on the remaining capital 5.8%. The total amount received by man after three years is Rs.82600. Then find total principal?  
a)Rs.65000                      b)Rs.60000                      c)Rs.72000                      d)Rs.70000
10. A person deposited some money in bank. Bank gives 6(2/3)% per annum simple interest. After 4 years he withdraws Rs.2550. Bank gives 12.5% per annum simple interest on remaining amount. At the end of fifth year, total amount is Rs.15300. Find the initial investment.  
(a)Rs.12750                      (b)Rs.15750                      (c) Rs.11250                      (d)Rs.12000
11. A person deposited some money in a scheme. Scheme gives 6.25% per annum simple interest. After 5 years he invests Rs. 1650 more. After that he receives 9(1/11)% per annum simple interest for three years, now he withdraws rupees Rs.800 from his amount and on remaining amount Scheme gives 5% simple interest for next two years. At the end of tenth year, he received total amount of Rs.17600. Find the initial investment.  
a)Rs.8800                      b)Rs.8400                      c)Rs.8000                      d)Rs.10400
12. A person borrowed a sum at 18% per annum and return Rs. 13800 after 1 year. Now the rate of becomes 15% per annum on rest of the amount. If the interest of the 2nd year is 19/32 of the 1st year. Find the amount borrowed?  
a)Rs.52000                      b)Rs. 60000                      c)Rs. 48000                      d)Rs.44000
13. A certain sum of money is invested in two parts in such a way that the S.I. from first part at rate of 16% per annum for 18 years is equal to the simple interest on second part at the rate of 22% per annum for 15 yrs. Find the sum of money, if difference between both investments is Rs.4200.  
a)56650                      b)67800                      c)72100                      d)61800
14. Rs.11400 is invested in three parts in such a way that the rate of interest is 4%, 5 (1/4)% & 7(1/2)% per annum for 12years, 10 years and 8 year respectively. If simple interest on each part is equal. Find the difference between maximum and minimum invested parts?

- a)Rs.840                      b)Rs.360                      c)Rs.460                      d)Rs.920
15. A sum of Rs. 7,930 is divided into three parts and given on loan at 5% simple interest to A. B and C for 2, 3 and 4 years respectively. If the amounts of all three are equal after their respective periods of loan, then A received a loan of  
 (a) Rs. 3,050                      (b) Rs. 2,760                      (c) Rs. 2,750                      (d) Rs. 2,800
16. Rs. 18210 is invested in three Schemes-A, B and C for 5 years, 8 years and 4 years respectively. If these three Schemes give a simple interest of 12%, 10% and 12.5% respectively. After completion of each scheme a person gets amount in the ratio 3:7:4 from these schemes. Then find the sum of money invested in Scheme C?  
 a)Rs.4320                      b)Rs.5760                      b)Rs.5880                      c)Rs.5120
17. A certain sum of money becomes 2.25 times of itself in 2 years. Then find the rate of interest if compounded annually.  
 a)25%                      b)50%                      c)15%                      d)75%
18. A certain sum of money becomes 512/162 times of itself in 4 years. Then find the rate of interest if compounded annually.  
 a)33.33%                      b)22.22%                      c)25%                      d)27.5%
19. If the amount received at the end of 2nd and 3rd year at compound interest on a certain Principal is Rs. 9,600 and Rs.10,272 respectively, what is the rate of interest (in %)?  
 (a) 7                      (b) 8                      (c) 6                      (d)5
20. A certain sum of money becomes Rs.54000 in 4 years and it becomes Rs.59582 in 7 years. Find the rate of interest, if compounded annually.  
 a)5%                      b)3%                      c)3(1/3)%                      d)6(2/3)%
21. A sum of money becomes 13.824 times of itself in 30 years then in how many years it was 2.4 times of itself?  
 (a)15 years                      (b)10 years                      (c)20 years                      (d)5 years
22. A sum of money becomes Rs.625 in 2019 when Rs.1 was given on compound interest in 1939. What was its worth in 1999?  
 a) Rs.312.5                      b) Rs.225                      c) Rs.125                      d) Rs.500
23. If a sum of money Rs.48600 becomes Rs.115200 in 4.5 years. Then in 7.5 years it will become how much if it is given at compound interest annually?  
 a)Rs.159600                      b)Rs.204800                      c)Rs.230400                      d)Rs.172800
24. An investor invested his saving in the stock market. The value of his investments increased 12% and 9% in the first year and the second year respectively. If the value of his investments after two years became Rs 97,664 then how much had he invested (in Rs)?  
 (a) 81000                      (b) 75000                      (c) 80000                      (d) 72000
25. Compound interest on a certain sum for 1 year at 14% per annum compounded half yearly is Rs.289.8. the simple interest at the same rate of interest for one year would be  
 a)Rs.140                      b)Rs.300                      c)Rs.280                      d)Rs.299

26. A sum of money becomes Rs.64800 at compound interest. If rate of interest in three years is 12.5%,  $6\frac{2}{3}\%$  and 9.09% respectively. Find the C.I.  
 a) Rs.14700                      b) Rs.16300                      c) Rs.13500                      d) Rs.15300
27. P=146000, Rate=10% per annum compounded annually and Time = 2 years 25 days. Find amount.  
 a)Rs.177870                      b)Rs.142286                      c)Rs.152280                      c)Rs.163460
28. Giri invested Rs.10000 at rate of interest 20% per annum. The interest was compounded yearly for the first two years and in the third year it was compounded half yearly. What will be the total interest earned at the end of the third year?  
 a) Rs.7224                      b)Rs.7324                      c)Rs.7424                      d)Rs.7524
29. P=6750, Rate= $6\frac{2}{3}\%$  per annum compounded annually and Time = 2 years. Find difference between C.I and S.I.  
 a)Rs.32                      b)Rs.30                      c)Rs.27                      d)Rs.45
30. Find the difference between C.I and S.I. for three years. If the principal is 15625 and rate of interest compounded annually is 12%.  
 a) Rs.640                      b) Rs.702                      c) Rs.720                      d) Rs.625

1.b	2.a	3.c	4.b	5.c	6.b	7.d	8.a	9.d	10.a
11.a	12.c	13.d	14.a	15.b	16.b	17.b	18.a	19.a	20.c
21.b	22.c	23.b	24.c	25.c	26.d	27.a	28.c	29.b	30.b

## COMPANY SPECIFIC

1. In an election, the winning candidate won by 15% votes. If a total of 5000 votes were cast of which only 86% were eligible, then how many votes did the winning candidate get? (**Sapient**)  
 a. 2,000                      b. 1,800                      c. 4,000                      d. 4,300                      **e. 2,300**
2. A machine worth Rs 1,80,000 depreciates at the rate of 18% of the value of the machine per annum. The value of the machine in 18 months from now will be(**Capgemini**)  
 a) Rs 2,31,516                      **b) Rs 1,34,316**                      c) Rs 1,50,000                      d) Rs 1,00,000
3. When the price of a shoes is decreased by 10%. The number of pairs sold increased by 20%. What is the net effect on sales?  
 a) 8% decrease                      b) 10% decrease                      c) 10% increase                      **d) 8% increase**

4. Kumar spends 30 % of his monthly income on food, 40% of the remaining on clothes and transport and saves 50% of the remaining. If Kumar's monthly salary is Rs. 18,400, then how much is his monthly savings?
- (a) Rs. 4,160                      **(b) Rs. 3,864**                      (c) Rs. 2,896                      (d) Rs. 3,299
5. If the price of cooking gas is increased by 10%, by how much percentage a house-wife must reduce the consumption of cooking gas so as not to increase or decrease the expenditure on cooking gas?  
**(CoCubes)**
- a) 10 %                      b) 11.11%                      **c) 9.09%**                      d) None of these
6. The weight of the empty bucket is 25% of the weight of the bucket when filled with some liquid. Some of the liquid has been removed. Then the bucket along with the remaining liquid, weighed  $\frac{3}{5}$ th of the original weight. What fractional part of the liquid has been removed?**(Wipro- 2020)**
- a)  $\frac{2}{5}$                       **b)  $\frac{8}{15}$**                       c)  $\frac{7}{13}$                       d)  $\frac{5}{8}$
7. A shopkeeper offers 'Buy 1, Get 1 Free' offer on a t-shirt marked at Rs. 2,400. If after a sale, the shopkeeper earns a profit of 33.33% then what is the actual price of the t-shirt? **(Sapient)**
- a. Rs. 900**      b. Rs. 800      c. Rs. 1,200      d. Rs. 1,000      e. Rs. 1,500
8. Every year before the festive season, a shopkeeper increases the price of the products by 35% and then introduces two successive discount of 10% and 15% respectively. What is his percentage loss or gain?
- a. 3.27% loss   **b. 3.27 % gain**   c. No profit, no lose      d. 8.875% loss   e. 8.875% gain
9. three successive discounts of 6%,10%,15% are equal to single discount of **(Sapient)**
- a) 25%                      b) 28.90%                      c) 30%                      d) 31%                      **e) 28.09%**
10. In a certain store, the profit is 320% of the cost. If the cost increase by 25 % but the selling price remains constant, approximately what percentage of the selling price is the profit? **(Cognizant)**
- (a) 250%    (b) 100%                      **(c) 70%**                      (d) 30%
11. A shopkeeper offers his customer a 20 percent discount and still makes a profit of 20 percent. What is the actual cost of an article marked at Rs 300? **(Capgemini)**
- a)Rs.100                      b) Rs.300                      c) Rs.1000                      **d) Rs.200**
12. The maximum retail price (MRP) of a product is 55% above its manufacturing cost. The product is sold through a retailer, who earns 23% profit on his purchase price. What is the profit percentage for the manufacturer who sells his product to the retailer? The retailer gives 10% discount on MRP.
- a) 15.7%                      **b) 13.4%**                      c) 16.9%                      d) 18.1%
13. Mr.Sharma bought 200 dozen mangoes at Rs.10 per dozen. He spent Rs.500 on transportation. He sold them at Rs.1 each. Find the profit or loss%.**(CoCubes)**



a) 4%                      b) 6%                      c) 5%                      d) None

14. Riya earns Rs. 30,000 p.m. She spends 10% of her income on taxes. Of the remaining, she spends one-third on rent, half on petrol, one third on electricity and the rest goes in the savings. What percentage of Riya's income is she able to save?

a) 5%      (b) 10%      (c) 15%      **(d) 20%**

15. Swapna bought 15 apples for Rs.10 and sold them at the rate of 12 apples for Rs.12. What is the percentage of profit made by her? **(Sapient)**

a) 100%    b) 150%              c) 125%              **d) None of these**

16. A person sells walkmans at Rs.1134 each after giving a discount of 19% on the marked price. Had he not given the discount, he would have earned a profit of 40% on the cost price. The C.P. of each walkman is **(CoCubes)**

**a) Rs.1000**      b) Rs.1200      c) Rs.1400      d) None

17. The marked prices of two articles are in the ratio of 1:2, their discount percentages are also in the ratio of 1:2 and the profit they get is also in the ratio of 1:2. What is the ratio of their cost Price

a)1:2      b) 5:8      c) 2:5              **d) Can't be determined**

18. A cycle dealer sells a bicycle at gain of 8% had he sold it for 75 less he would have lost 2%. Find cost price of bicycle? **(CoCubes)**

a) 850      b) 350      **c) 750**              d) 450

19. A dealer professes to sell his goods at cost price and uses an 880gm weight instead of a kg.

What is his percentage of gain? **(Accenture)**

a)13.13%      b) 13.33%      c) 13.36%              **d) 13.63%**

20. The price of soap is collectively decided by five factors: research, raw materials, labour, advertisements and transportation. If there are respective changes of 10%, 20%, -20%, 25% and 50% in the five factors, then find the change in the price of soap. **(Accenture)**

a) 97%              b) 95%              **c) 98%**              d) Can't be determined

21. A trader buys 150 pens for Rs.1000 and he marks each of them at Rs.10. He gives a discount of 20% on each pen and he gives 1 pen free on bulk purchases of 9 pens. What is his minimum possible overall percentage of profit?

**a)8%**              b) 10%              c) 20%              d) 5%

22. Rahul went to purchase a Nokia mobile handset, the shopkeeper told him to pay 20% of the tax if he asked the bill. Rahul manages to get the discount of 5% on the actual sale price of the mobile and he paid the shopkeeper Rs. 3325 without tax. Besides he manages to avoid to pay 20% tax on the already discounted price, what is the amount of discount that he has gotten?**(TCS)**

a) 750              b) 375              **c) 875**              d) 525

23. If 1kg of tea and 4kg of sugar cost Rs 35, but if sugar rises by 50% and 10% they would cost 42.50, what is the price per kg of sugar?  
a) Rs. 5    b) Rs.4    **c) Rs.2.5**    d) None of these
24. An investment earns 4 pais per rupee invested. If at the end of the year, the interest earned by an investment is Rs 100. then the investment is equal to: **(Infineon)**  
a) Rs 2,000    b) Rs 2,200    c) Rs 1,000    **d) Rs 2,500**    e) Rs 4,000
25. Simple interest on a certain sum is  $\frac{16}{25}$  of the sum. If both the rate of interest and time are same. Then what is the rate of interest? **(TCS)**  
A) 12%    B) 10%    **C) 8%**    D) 13%
26. A person took some amount with some interest for 3 years, but increase the interest will be increase From 7% to 9%. He paid Rs. 240 extra, then how much amount he took?  
A) Rs.7000/-    **B) Rs.4000/-**    C) Rs.5500/-    D) Rs.6000/-
27. Find the principal of the interest compounded at the rate of 10% per annum for the two years is Rs. 420.  
**A. Rs. 2000**    B. Rs. 2200    C. Rs. 1000    D. Rs. 1100
28. An amount of \$1,500 is invested for 5 years at the rates of 2% for the first two years, 5% for the third year and 6% for the fourth and fifth years all compounded continuously. What is the total amount at the end of the 5 years? **(Wipro)**  
**A) 1850.51**    B) 1860.45    C) 1560.25    D) 1650.25
29. A sum of money doubles itself in 5 years. In how many years will it become four fold (if interest is compounded) **(Infosys)**  
A. 15    **B. 10**    C. 20    D. 12
30. Rs.100 doubled in 5 years when compounded annually. How many more years will it take to get another Rs.200 compound interest? **(Josh)**  
**A) 5**    B) 6    C) 8    D) 10
31. Out of a sum of Rs 850, a part was lent at 6% SI and the other at 12% SI. If the interest on the first part after 2 years is equal to the interest on the second part after 4 years, then the second sum is **(Infosys)**  
A) Rs350    B) Rs280    **C) Rs170**    D) Rs220

## **NUMBER SERIES**

### ***Series completion***

In this type of questions, some numbers and/or alphabetical letters are given. They all form a series and the series changes in certain order.

The series may also have one or more numbers/letters missing.

The candidates are required to observe that specific order in which the series changes and then complete the series.

Similarly, the candidates have to decide about the missing letter or number that would suit for the blank space if they continue to change in some order. Some common types are explained in the following slides.

### ***Types of Series:***

Number Series Alpha series Letter series

Number and letter Analogy

### ***Tricks to solve series completion***

**Step 1:** Observe are there any familiar numbers in the given series like primes numbers, perfect squares, cubes and so on which are easy to identify.

**Step 2:** Calculate the differences between the numbers. Observe the pattern in the differences.

If the differences are growing rapidly it might be a square series, cube series or multiplicative series. If the numbers are growing slowly, then it is an addition or subtraction series.

If the differences are not having any pattern then,

1. It might be a double or triple series. Here every alternate number or every 3rd number forms series
2. It might be a sum or average series. Here sum of two consecutive numbers gives 3rd number or average of first two numbers give next number.

**Step 3:** Sometimes number will be multiplied and will be added another number.

### ***Types of number series:***

#### **I. Prime number Series:**

Example: 2, 3, 5, 7, 11, 13,

Solution: The given series is prime number series. The next prime number is 17.

Example: 2, 5, 11, 17, 23, 41.

Solution: The prime numbers are written alternately.

#### **II. Difference Series:**

Example: 2, 5, 8, 11, 14, 17... 23.

Answer: The difference between the numbers is 3. ( $17+3=20$ )

Example: 45, 38, 31, 24, 17... 3.

Answer: The difference between the numbers is 7. ( $17-7=10$ ).

### **III.        *Multiplication Series:***

Example: 2, 6, 18, 54, 162... 1458.

Answer: The numbers are multiplied by 3 to get next number. ( $162 \times 3 = 486$ ).

### **IV.        *$n^2$ Series:***

Example: 1, 4, 9, 16, 25, ..... , 49

Answer: The series is  $1^2, 2^2, 3^2, 4^2, 5^2, \dots$  The next number is  $6^2=36$ ;

Example : 0, 4, 16, 36, 64, ..... 144.

Answer: The series is  $0^2, 2^2, 4^2, 6^2$ , etc. The next number is  $10^2=100$ .

### **V.         *$n^2-1$ Series :***

Example : 0, 3, 8, 15, 24, 35, 48, ..... ,

Answer : The series is  $1^2-1, 2^2-1, 3^2-1$  etc. The next number is  $8^2-1=63$ .

**Another logic :** Difference between numbers is 3, 5, 7, 9, 11, 13 etc. The next number is ( $48+15=63$ ).

### **VI. *$n^2+1$ Series :***

Example: 2, 5, 10, 17, 26, 37, ..... , 65.

Answer: The series is  $1^2+1, 2^2+1, 3^2+1$  etc. The next number is  $7^2+1=50$ .

Example: 3, 12, 48, 192, ..... , 3072.

Answer : The numbers are multiplied by 4 to get the next number. ( $192 \times 4 = 768$ ).

### **VII.       *Division Series:***

Example : 720, 120, 24, ..... , 2, 1

Answer:  $720/6=120, 120/5=24, 24/4=6, 6/3=2, 2/2=1$ . \*\*

Example : 32, 48, 72, 108, ..... , 243.

Answer: . Number  $\times 3/2 =$  next number.  $32 \times 3/2=48, 48 \times 3/2=72, 72 \times 3/2=108, 108 \times 3/2=162$ .

### **VIII.       *$n^2+n$ Series (or) $n^2-n$ Series :***

Example : 2, 6, 12, 20, ..... , 42.

Answer : The series is  $1^2+1, 2^2+2, 3^2+3, 4^2+4$  etc. The next number =  $5^2+5=30$ .

**Another Logic :** The series is  $1 \times 2, 2 \times 3, 3 \times 4, 4 \times 5$ . The next number is  $5 \times 6=30$ .

**Another Logic :** The series is  $2^2-2, 3^2-3, 4^2-4, 5^2-5$ . The next number is  $6^2-6=30$ .

### **IX.         *$n^3$ Series :***

Example : 1, 8, 27, 64, 125, 216, ..... .

Answer : The series is  $1^3, 2^3, 3^3$ , etc. The missing number is  $7^3=343$ .

### **X.          *$n^3+1$ Series :***

Example : 2, 9, 28, 65, 126, 217, 344, ..... .

Answer : The series is  $1^3+1, 2^3+1, 3^3+1$ , etc. The missing number is  $8^3+1=513$ .

**XI.  $n^3-1$  Series :**

Example : 0, 7, 26, 63, 124, ..... , 342.

Answer: The series is  $1^3-1, 2^3-1, 3^3-1$  etc. The missing number is  $6^3-1=215$ .

**XII.  $n^3+n$  Series :**

Example : 2, 10, 30, 68, 130, ..... , 350.

Answer : The series is  $1^3+1, 2^3+2, 3^3+3$  etc .The missing number is  $6^3+6=222$ .

**XIII.  $n^3-n$  Series :**

Example :0, 6, 24, 60, 120, 210, .....,

Answer : The series is  $1^3-1, 2^3-2, 3^3-3$ , etc. The missing number is  $7^3-7=336$ .

**Another Logic :** The series is  $0 \times 1 \times 2, 1 \times 2 \times 3, 2 \times 3 \times 4$ , etc. The missing number is  $6 \times 7 \times 8=336$ .

**XIV.  $n^3+n^2$  Series :**

Example : 2, 12, 36, 80, 150, ..... ,

Answer: The series is  $1^3+1^2, 2^3+2^2, 3^3+3^2$  etc. The missing number is  $6^3+6^2=252$

**XV.  $n^3-n^2$  Series**

Example: 0,4,18,48,100, .....,

Answer : The series is  $1^3-1^2, 2^3-2^2, 3^3-3^2$  etc. The missing number is  $6^3-6^2=180$

**XVI.  $xy, x+y$  Series:**

Example: 48,12,76,13,54,9,32, .....,

Answer :  $4+8=12, 7+6=13, 5+4=9, 3+2=5$ .

**XVII. Factorial Series:**

Example: 1,1,2,6,24,120, .....,

Answer :  $0!=1, 1!=1, 2!=2, 3!=6, 4!=24, 5!=120, 6!=7$

**PRACTICE Set 1**

**Q1.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 1, 4, 9, 16, 25, x

**A. 35** **B. 36** **C. 48** **D. 49**

**Q2.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 1, 6, 13, 22, 33,

**A. 44** **B. 45** **C. 46** **D. 47**

**Q3.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 19, 2, 38, 3, 114, 4,

**A. 228** **B. 256** **C. 352** **D. 456**

**Q4.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 4, 5, 9, 18, 34, (.....)

**A. 43** **B. 49** **C. 50** **D. 59**

**Q5.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 2, 1, 2, 4, 4, 5, 6, 7, 8, 8, 10, 11,

- A. 9**                                      **B. 10**                                      **C. 11**                                      **D. 12**

**Q6.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 11, 10, (.....), 100, 1001, 1000, 10001

- A. 101**                                      **B. 110**                                      **C. 111**                                      **D. None of these**

**Q7.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 123456147, 12345614, 2345614, 234561,

- A. 3456**                                      **B. 2345**                                      **C. 23456**                                      **D. 34561**

**Q8.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: In the Series 3, 9, 15, ... what will be the 21st term ?

- A. 117**                                      **B. 121**                                      **C. 123**                                      **D. 129**

**Q9.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: Which term of the series 5, 8, 11, 14, ... is 320 ?

- A. 104th**                                      **B. 105th**                                      **C. 106th**                                      **D. 64<sup>th</sup>**

**Q10.** In following questions, one term in number series is incorrect. : Find out the incorrect number 24, 27, 31, 33, 36

- A. 24**      **B. 27**      **C. 31**      **D. 33**

## Practice Set- 1

1. B	2. C	3. D	4. D	5. B
6. A	7. D	8. C	9. C	10. C

## **Coding Decoding**

A	B	C	D	E	F	G	H	I		J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

To remember them use the Code- **EJOTY (5, 10, 15, 20, 25)**

**A-Z , B-Y .....are opposite to each other. The sum of two opposite letters is 27. A=1 , Z=26 so A+Z=1+26=27.**

### **Number coding**

In this, either the numerals are assigned to the alphabets of the given code or the alphabets are assigned to the numerals. The candidate has to observe the direction of solving the problem.

### **Mixed coding**

In this, three or more complete messages are given. The procedure to solve is any two messages bearing the common word are picked up. Proceeding similarly, all possible combinations of two messages are analyzed.

### **Mixed number coding**

It is the same as mixed coding but instead of alphabetical codes numerical codes are given.

### **Decoding**

Conversion of the coded numbers or alphabets to the original text. The procedure to decode is the same as coding. That is, find the pattern that is followed in the given series.

### **SYMBOLS CODING**

In this type of coding, symbols like!, @, # and so on will be used for coding the numbers or alphabets.

## **PRACTICE Set 2**

**Q1.** If COURSE is coded as FRXUVH, how is RACE coded as?

- A.ABHF                      B.UDFH                      C.DUHF                      D.WQYF

**Q2.** In a certain code, MONKEY is written as XDJMNL. How is TIGER written in that code?

- A.QDFHS                      B.FHSQD                      C.DQSFH                      D.STFDQ

**Q3.** If BOMBAY is written as MYMYMY, how will TAMIL NADU be written in that code?

- A.YMNYMNYMN              B.ABHABHABH              C.ABCDABCD              D.MNUMNUMNU

**Q4.** In a certain code, TOGETHER is written as RQEGRJCT. In the same code, what will PAROLE be written as?

- A.PQJGNC                      B.CNGJPQ                      C.NCPQJG                      D.NCJQPG

**Q5.** If in a certain language, COUNSEL is coded as BITIRAK, how is GUIDANCE written in that code?

- A.OHYFZJBB                      B.OFHBZJYB                      C.BJZJBHFO                      D.FOYZJBB

**Q6.** If in a certain code, TWENTY is written as 863985 and ELEVEN is written as 323039, how is TWELVE written in that code?

- A.203863                      B.368302                      C.863203                      D.320368

**Q7.** In a certain code, if LOGIC is coded as 1512201824, how is PEARL coded as?

- A.112226915      B.113331596      C.112226571      D.113336734

**Q8.** If APPLE is written as 24991320, how is LOVELY coded as?

A.13101310130

B.1310320130

C.13101350140

D.13101340120

**Q9.** If ENGLAND is written as 1234526 and FRANCE is written as 785291, how is GREECE coded?

A.117186

B.381191

C.131871

D.112235

**Q10.** If **tee see pee** means **drink fruit juice**, **see kee lee** means **juice is sweet**, **lee ree mee** means **he is intelligent**, then which word means **sweet**?

A.See

B.Pee

C.Tee

D.Kee

**Q11.** If white is called blue, blue is called red, red is called yellow, yellow is called green, green is called black, black is called violet and violet is called orange, what would be the color of human blood?

A.Blue

B.Yellow

C.Black

D.Violet

**Q12.** If the animals which can walk are called swimmers, animals who crawl are called flying, those living in water are called snakes and those which fly in the sky are called hunters, then what will a lizard be called?

A.Flying

B.Swimmer

C.Snakes

D.Hunters

**Q13.** In a certain code language, 'col tip mot' means 'singing is appreciable', 'mot baj min' means 'dancing is good' and 'tip nop baj' means 'singing and dancing', then, which of the following means 'good' in that code language?

A.Mot

B.Bai

C.Min

D.Nop

**Q14.** In a certain code language, '851' means 'good sweet fruit', '783' means 'good red rose' and '341' means 'rose and fruit'. Which of the following digits stands for 'sweet' in that language?

A.2

B.3

C.4

D.5

**Q15.** In a certain code, 2 is coded as P, 3 as N, 9 as Q, 5 as R, 4 as A and as B. How is 599423 coded in that code?

A.QRQPAN

B.RQQAPN

C.AQPQRN

D.QRANPA

**Q16.** In a certain code language, '123' means 'hot filtered coffee'

, '356' means 'very hot day' and '589' means 'day and night'. Which digit stands for 'very'?

A.3

B.6

C.9

D.7

**Q17.** In a certain code, '256' means 'you are good'; '637' means 'we are bad' and '358' means 'good and bad'. Which of the following represents 'and' in that code?

A.5

B.6

C.7

D.8

**Q18.** If in a certain language NZTUJGZ is coded as MYSTIFY, how is OFNFTJT coded in that language?

A.REGULAR

B.MORNING

C.MINDFUL

D.NEMESIS

**Q19.** In a certain code, SQHOOKD is written as TRIPPLE. How CHRONRD is written in that code?

A.GLITTER

B.TROUSER

C.JANUARY

D.DISPOSE

**Q20.** If HUMJTK is coded as FRIEND, how is EDRIRL written in that code?

A.SUNDAY

B.MONDAY

C.BEAUTY

D.CANDLE



**Q21.** In a certain code language TUTDNES is written as STUDENT. How will SUORECS be written in that code language?

A. BATTERY

B. FASHION

C. SOURCES

D. LIMITED

**Q22.** ZA5, Y4B, XC6, W3D,

A. E7V

B. V2E

C. VE5

D. VE7

**Q23.** In a certain code 'TOME' is written as '@ \$ \* ?' and ARE is written as '• £ ?' How can 'REMOTE' be written in that code?

A. ?\*\$@? £

B. \*\$@? £?

C. £?\* \$@?

D. \*\$? £@?

**24.** In a certain code 'PALM' is coded as '!@? \$' and 'ARM' is written as '@\* \$', how can 'ALARM' be written in that code?

A. @!@? \$

B. @\$?!@

C. ?@@! \$

D. NONE OF THESE

## Practice Set- 2

1. B	2. A	3. D	4. C	5. D
6. C	7. A	8. B	9. B	10. D
11. B	12. A	13. C	14. D	15. B
16. B	17. D	18. D	19. D	20. D
21. C	22. D	23. C	24. D	

## **Decision Making**

**DIRECTIONS for questions 1 to 4:** Krishnapuram's town council has exactly three members: Arjun, Karn, and Bhim. During one week, the council members vote on exactly three bills: a recreation bill, a school bill, and a tax bill. Each council member votes either for or against each bill. The following is known:

Each member of the council votes for at least one of the bills and against at least one of the bills.  
Exactly two members of the council vote for the recreation bill.  
Exactly one member of the council votes for the school bill.  
Exactly one member of the council votes for the tax bill.  
Arjun votes for the recreation bill and against the school bill.  
Karn votes against the recreation bill.  
Bhim votes against the tax bill.

1. If the set of members of the council who vote against the school bill are the only ones who also vote against the tax bill, then which one of the following statements must be true?
  - a) Arjun votes for the tax bill.
  - b) Karn votes for the recreation bill.
  - c) Karn votes against the school bill.
  - d) Bhim votes against the recreation bill.
  - e) Bhim votes against the school bill.
2. If Karn votes for the tax bill, then which one of the following statements could be true?:
  - a) Arjun and Karn each vote for exactly one bill.
  - b) Karn and Bhim each vote for exactly one bill.
  - c) Arjun votes for exactly two bills.
  - d) Karn votes for the recreation bill.
  - e) Bhim votes against the recreation bill.
3. Karn votes for exactly two of the three bills, which one of the following statements must be true?
  - a) Arjun votes for the tax bill.
  - b) Karn votes for the recreation bill.
  - c) Karn votes for the school bill.
  - d) Karn votes against the tax bill.
  - e) Bhim votes for the school bill.
4. If one of the members of the council votes against exactly the same bills as does another member of the council, then which one of the following statements must be true?
  - a) Arjun votes for the tax bill
  - b) Kam votes for the recreation bill.
  - c) Kam votes against the school bill.
  - d) Kam votes for exactly one bill.
  - e) Bhim votes for exactly one bill.

**DIRECTIONS** for the question 5: The year 2004 was a great year for Top-Cloth cotton mill. Manufacturing towels for the export market employing more than 2000 workers, the company had an impressive growth in sales and profits. The Chairman felt that employees were entitled to a share in the profits and it was proposed that the employee mess be air-conditioned. The proposal was discussed in a meeting that was attended by, among other senior officials, the marketing director, the personnel director and the finance director. The proposal was based on the fact that the shop floor of the mill often had temperatures in excess of 40°C with a relative humidity of 99%. The air-conditioned mess would represent management's appreciation of the employee's hard work.

At the end of 2005, management reviewed the mill's performance. Profits were higher, and employee attrition was negligible. Chairman decided that employees deserved additional recognition for their fine work. Since the mess had already been air-conditioned, the chairman wanted to know if the employees appreciated this sort of action. In the course of discussion, the chairman asked the personnel director to send a questionnaire to a sample of fifty employees and obtain their reaction to the air-conditioned mess. The management agreed to decide only after obtaining the feedback from the employees.

The personnel director mailed a simple form to fifty employees asked them for the following information: "Please state your reaction to the air-conditioned mess."

Of the fifty forms mailed, forty-six were returned. The answers received were as follows:

<b>Reaction</b>	<b>Frequency</b>
"I did not know it was air-conditioned."	16
"I never eat there"	8
"If management can spend money like that, they should pay us more"	6
"I wish the entire mill was air-conditioned."	8
"The mess is for management employees."	4
"It is OK."	2
Miscellaneous comments	2

5. This decision-making situation best highlights
  - a) managerial short-sightedness in decision making
  - b) managerial benevolence in sharing profits among the workers
  - c) managerial incompetence in handling a negative feedback in employee survey
  - d) inefficient infrastructure management
  - e) None of the above

**DIRECTIONS for questions 6 to 7:** For each question, an answer (A) and a reason (R) has been given. Base your analysis on the information presented in the passage. Mark

The Society for Education in India (in short SEI) had been engaged in running primary schools in different parts of the country since 1950s. While attending a conference on employee selection, Mr. J Mehta, a senior member of the society learned that a leading school had recently employed a psychologist to perform employment functions, i.e. recruitment and selection of teachers. Within two months of his return, Mr. J Mehta contacted a reputed university and employed a graduating psychologist, Mr. Bibek Gupta. Mr. Bibek Gupta was employed by SEI with the single directive that he was to contribute to the selection of teachers. This task had previously been the prerogative of principals of each school. Mr. Gupta immediately notified each principal that in the future he was to be notified of the personnel needs and in return he would recruit, screen and select the teachers. At the end of his first year with SEI, Mr. Gupta realized that his efforts had resulted in failure. During

his first few months he encountered much opposition from several principals who had been managing schools for ten or more years. They did not believe in newer psychological techniques and preferred selecting people based on their own assessment. Other principals frequently refused to accept the teachers selected by Mr. Gupta. Finally, Mr. Gupta began to notice fewer and fewer principals notifying him of vacancies in their schools. Realizing that he was not making any effective contribution, Mr. Gupta submitted the suggestion to the society members that support and co-operation of the school principals should be a matter of executive order, or else his resignation should be considered.

6. What was the flaw in the decision of selecting a psychologist for selecting teachers that led to the final situation?

A: Mr. Mehta's decision was predominantly driven by the information about another school that had enlisted the services of a psychologist for recruitment and selection.

R: Both the administration of the school and managing teachers have been primary responsibilities of the principal of the school.

- a) if both A and R are based on information given in the passage and R is the correct explanation of A.
- b) if both A and R are based on information given in the passage but R is not the correct explanation of A.
- c) if A is based on information given in the passage but R is not based on the facts given.
- d) if A is not based on information given in the passage but R is based on the information given in the passage.
- e) if both A and R are not based on information given in the passage.

7. What responsibilities were shouldered by Mr. Bibek in his first year of employment?

A: Mr. Bibek had the responsibility of contributing his expertise to recruitment and selection of teachers.

R: The board members wanted to systematize the recruitment and selection of the entire organization.

- a) if both A and R are based on information given in the passage and R is the correct explanation of A.
- b) if both A and R are based on information given in the passage but R is not the correct explanation of A.
- c) if A is based on information given in the passage but R is not based on the facts given.
- d) if A is not based on information given in the passage but R is based on the information given in the passage.
- e) if both A and R are not based on information given in the passage.

**DIRECTIONS for questions 8 to 11:** A famous retail electronics showroom chain has six new mobile phone models - T, V, W, X, Y, and Z – each equipped with at least one of the following three options: digital camera, music player, and office document viewer. No mobile has any other option. The following conditions apply:

V features both a digital camera and an office document viewer.

W has digital camera and music player

W and Y have no options in common.

X has more options as compared to W

V and Z have exactly one option in common

T has fewer options as compared to Z.

8. For exactly how many of the six mobile phones is it possible to determine exactly which

option each one has?

- a) Two
- b) Three
- c) Four
- d) Five
- e) Six

9. Which one of the following must be false?

- a) Exactly five mobile phones feature a music player.
- b) Exactly five mobile phones feature a document viewer.
- c) Exactly four mobile phones feature a music player.
- d) Exactly four mobile phones feature a digital camera.
- e) Exactly four mobile phones feature a document viewer.

10. If Z has no option in common with T but has at least one option in common with every other mobile phone, then which one of the following must be false?

- a) T has digital camera
- b) Z has document viewer
- c) Exactly four of the six mobile phones have digital camera.
- d) Exactly four of the six mobile phones have document viewer.
- e) Exactly four of the six mobile phones have music player.

11. Suppose no two mobile phone models have exactly the same options as one another. In that case each of the following could be true EXCEPT:

- a) Exactly three of the six mobile phones have digital camera.
- b) Exactly four of the six mobile phones have digital camera.
- c) Exactly three of the six mobile phones have document viewer.
- d) Exactly four of the six mobile phones have document viewer.
- e) Exactly four of the six mobile phones have music player.

### Answer key & Explanations

#### Decision Making

1-4.

Bill	For	Against
Recreation Bill	Arjun, Bhim	Karn
School Bill	Karn / Bhim	Arjun and Either Karn or Bhim
Tax Bill	Karn / Arjun	Bhim and Either Karn or Arjun

1. We can modify the above table based on the additional information given in the question. Accordingly, Arjun and Bhim are the members who voted against the School Bill and Tax bill.

Bill	For	Against
Recreation Bill	Arjun, Bhim	Karn
School Bill	Karn	Arjun, Bhim
Tax Bill	Karn	Bhim, Arjun

By visual observation, it can be checked that Bhim votes against the school bill, thus option E is correct.

2. We can modify the above table based on the additional information given in the question as follows:

Bill	For	Against
Recreation Bill	Arjun, Bhim	Karn
School Bill	Bhim	Arjun, Karn
Tax Bill	Karn	Bhim, Arjun

Thus, it can be verified that Arjun and Karn each vote for exactly one bill. The other answer choices do not follow from the above table. Hence, option A is correct.

3. We can modify the above table based on the additional information given in the question as follows:

Bill	For	Against
Recreation Bill	Arjun, Bhim	Karn
School Bill	Karn	Arjun, Bhim
Tax Bill	Karn	Bhim, Arjun

Thus, it can be observed that Karn votes for the school bill.

4. We can modify the above table based on the additional information given in the question as follows:

Bill	For	Against
Recreation Bill	Arjun, Bhim	Karn
School Bill	Karn	Arjun, Bhim
Tax Bill	Karn	Arjun, Bhim

Thus, Bhim votes for exactly one bill and hence option E is correct.

5. opt 1 The situation highlights the management's short-sightedness.
6. opt 2 Both A and R are mentioned in the passage, but R is not the correct reason for A.
7. opt 3 A is mentioned in the passage while R is not.

8-11.

Mobile Phone   Digital Camera   Music Player   Office Document Viewer

T			
V	✓	✗	✓
W	✓	✓	
X	✓	✓	✓
Y	✗	✗	✓
Z		✓	

T may have any of three options.

Z may have Music Player and either Digital Camera or Office Document Viewer.

8. opt3 It is clear from the table that it is possible to determine the option(s) of phones V, W, X and Y.
9. opt1 Three or four mobile phones feature a music player.
10. opt5 Z must have the music player and the office document viewer while T must have the digital camera. So only 3 models have the music player and option 5 is false.
11. opt3 After assigning different features to the mobiles, it is seen that exactly four of the six mobiles have a document viewer. The best answer is option 3.

## Competition Level

1. 1 3 10 36 152 760 4632  
(a) 3  
(b) 36  
(c) 4632  
(d) 760  
(e) 152
  2. 2, 12, 18, 45, 180, 1170, ?  
(a) 12285  
(b) 10530  
(c) 11700  
(d) 12870  
(e) 9945
  3. 67, 1091, 835, 899, 883, ?  
(a) 889  
(b) 887  
(c) 883  
(d) 894  
(e) 896
  4. 12, 30, 120, 460, 1368, 2730  
16 (a) (b) (c) (d) (e)  
What will come in place of (d) ?  
(a) 1384  
(b) 2642  
(c) 2808  
(d) 1988  
(e) None of these
  5. 72, 74, 84, 110, 160, 244, 364  
(a) 364  
(b) 244  
(c) 160  
(d) 74  
(e) 72
  6. 30, 42, 48, 54, 65, 81, 126  
(a) 42  
(b) 48  
(c) 126  
(d) 30  
(e) 65
  7. 77, 78, 159, 472, 1889, 9446, 56677  
(a) 159  
(b) 472  
(c) 1889  
(d) 56677  
(e) 77
  8. 2159, 1967, 1782, 1611, 1461, 1339, 1254  
(a) 1967  
(b) 2159  
(c) 1461  
(d) 1254  
(e) 1611
  9. 854, 886, 923, 964, 1007, 1054, 1107  
(a) 923  
(b) 1007  
(c) 854  
(d) 1054  
(e) 1107
  10. 465, 633, 775, 897, 993, 1065, 1113  
(a) 465  
(b) 633  
(c) 993  
(d) 775  
(e) 1113
  11. 12, 12, 30, 120, 654, 4620  
(a) 12  
(b) 654  
(c) 30  
(d) 120  
(e) 4620
  12. 1174, 1275, 1445, 1671, 1961, 2323  
(a) 1174  
(b) 1275  
(c) 1671  
(d) 1961  
(e) 2323
  13. 9, 25, 58, 125, 260, 531, 1075  
(a) 9  
(b) 25  
(c) 260  
(d) 531  
(e) 1075
- Q29. 4866, 2432, 1218, 610, 306, 154, 78  
(a) 4866  
(b) 78  
(c) 2432  
(d) 154  
(e) 610
14. 4, 11, 39, 163, 823, 4947, 34639  
(a) 11  
(b) 4  
(c) 4947

- (d) 39  
(e) Series is correct
15. 19, 24, 33, 43, 55, 69, 85  
(a) 24  
(b) 19  
(c) 33  
(d) 55  
(e) 85
16. 36, 34, 22, -8, -64, -154, -286  
(a) 36  
(b) 22  
(c) -8  
(d) -64  
(e) Series are correct
17. 3, 8, 17, 36, 73, 146, 297  
(a) 3  
(b) 17  
(c) 297  
(d) 146  
(e) Series are correct
18. 0, 1, 9, 36, 81, 225, 441  
(a) 0  
(b) 1  
(c) 36  
(d) 81  
(e) Series are correct
19. 5, 9, 25, 59, 125, 225, 369  
(a) 59  
(b) 5  
(c) 25  
(d) 225  
(e) 369
20. 540, 550, 575, 585, 615, 620, 645  
(a) 540  
(b) 585  
(c) 615  
(d) 645  
(e) 575
21. 4, 11, 30, 67, 128, 221, 346  
(a) 346  
(b) 221  
(c) 128  
(d) 4  
(e) 11
22. 16, 4, 2, 1.5, 1.75, 1.875, 2.8125  
(a) 16
- (b) 1.875  
(c) 2.8125  
(d) 1.75  
(e) 2
23. 18, 30, 52, 79, 116, 148, 210  
(a) 148  
(b) 18  
(c) 116  
(d) 52  
(e) 79
24. 1, 3, 13, 53, 213, 853, 3413  
(a) 213  
(b) 3413  
(c) 1  
(d) 13  
(e) 853
25. 176, 166, 152, 128, 96, 56, 8  
(a) 166  
(b) 128  
(c) 8  
(d) 56  
(e) 96
26. 4, 2, 6, 0, 8, -4, 10  
(a) 2  
(b) 4  
(c) 0  
(d) 10  
(e) -4
27. 16, 17, 25, 52, 116, 244, 457, 800  
(a) 16  
(b) 244  
(c) 800  
(d) 52  
(e) 457
28. 6.8, 8.4, 12.2, 17.6, 24.8, 33.8, 44.6  
(a) 44.6  
(b) 6.8  
(c) 33.8  
(d) 24.8  
(e) 8.4
29. 32, 16, 24, 60, 210, 946, 5197.5  
(a) 16  
(b) 946  
(c) 5197.5  
(d) 32  
(e) 60



30. 4, 7, 12, 19, 31, 50, 81

- (a) 4
- (b) 7
- (c) 19
- (d) 81
- (e) 31

- 1. d
- 2. a
- 3. b
- 4. c
- 5. b
- 6. e
- 7. a
- 8. d
- 9. c
- 10. d
- 11. b
- 12. a
- 13. e
- 14. c
- 15. b
- 16. a
- 17. e
- 18. d
- 19. d
- 20. a
- 21. c
- 22. b
- 23. d
- 24. a
- 25. c
- 26. a
- 27. e
- 28. b
- 29. e
- 30. b
- 31. a

## COMPANY SPECIFIC

### (Capgemini, Cognizant, Wipro, Infosys, TCS, CoCubes, AMCAT)

1. 3, 5, 9, 17, 33 \_\_

a. 60    b. 62    **c. 65**    d. 64

2. 98 72 50 32 18 \_\_

a. 10    **b. 8**    c. 6    d. 12

3. 46, 60, 52, 54, 58, 48 \_\_

**a. 64**    b. 54    c. 66    d. 58

4. 20, 20, 19, 16, 17, 13, 14, 11 \_\_

a. 11, 13    b. 12, 12    **c. 10, 10**    d. 10, 12

5. 500, 356, 456, 392 \_\_

a. 400    b. 418    c. 430    **d. 428**

6. 41, 42, 41, 45, 37, 46, \_\_

a. 56    **b. 19**    c. 28    d. 62

7. 4, 6, 9, 14, 21, 32, \_\_

**a. 45**    b. 48    c. 51    d. 55

8. 3, 7, 17, 31, 53 \_\_

a. 71    b. 69    **c. 79**    d. 83

9. 6, 24, 96, 384, \_\_

a. 1568    b. 1563    c. 1655    **d. 1536**

10. 8, 17, 35, 71, 143, \_\_

**a. 287**    b. 299    c. 285    d. 286

11. 1, 2, 6, 21, 88, 445, \_\_

a. 2760    b. 2600    c. 2670    **d. 2676**

12. 10, 17, 26, 37, 50, \_\_

a.65    b.63    c.71    d.66

13. 20, 30, 42, 56, 72, \_\_

a.91    b.88    c.92    **d.90**

14. 56, 42, 30, 20, 12, \_\_

**a.6**    b.8    c.10    d.12

15. 65, 126, 217, 344, \_\_

a.516    b.315    **c.513**    d.520

16. 0, 7, 26, 63, 124, \_\_

**a.215** b.217 c.213 d.218

17. 64040, 27030, 8020, \_\_

a.1000 b.**1010** c.1800 d.1001

18. 0, 6, 24, 60, 120, \_\_

a.212 b.200 **c.210** d.212

19. 24, 12, 12, 18, 36, \_\_

a.42 b.44 **c.90** d.88

20. 5, 16, 49, 104, \_\_

a.**181** b. 180 c. 172 d. 176

21. WC RE NI KO ?

**a. JX** b. JW c. IX d. IW

22. AE CG EI GK ?

a. MI **b. IM** c. HM d. IL

23. AC FH KM PR ?

**a. UW** b. VX c. VW d. TV

24. AM CN DP FQ ?

a. GP **b. GS** c. HP d. HQ

25. AZB, DYE, HWI, MVN ?

a. STV b. RTT c. SUT **d. STT**

26. PQ PQ SO NV ?

**a. ZO** b. ZM c. OZ d. ZL

27. DG HG JI JM \_\_?

a. RK **b. QM** c. PK d. QM

28. MP LO JM GJ ?

a. CE        b. CH        **c. CF**        d. DF

29. AC DC EF IG ? TCS

a .MI        **b. IL**        c. IM        d. LI

30. A, B, D, H\_?

a. P        b. Q        c. K        **d. T**

31. In a certain code language FILES is written as GJMFT , How will SCOUT be written in that code ?

(a) TDOPV        **(b) TDPVU**        (c) DTPOU        (d) TDPOU        (e) None of these

32. In a certain code language NUMBER is written as MTLADQ , how will VIOLIN be written in that code ?

(a) VHKNHM        (b) WJNKMH        **(c) UHNKHM** (d) TDPOU        (e) None of these

33. In a certain code language HOUSE is written as GPTTD , how will BROAD be written in that code ?

(a) CQPBE        (b) ASNBD        (c) ASOBD        **(d) ASNBC** (e) None of these

34. In a certain code language DELHI is written as FGJNK , how will ALWAR be written in that code ?

(a) **CNYCT** (b) DMXCT (c) CNWCT (d) CNDTY (e) None of these

35. In a certain code language WALK is written as UYJI, how will TRIM be written in that code ?.

(a) RHGK (b) SGHK (c) **ROGK** (d) PQGK (e) None of these

36. In a certain code language GUEST is written as ISGQV , how will MONEY be written in that code ?

(a) ONPDA (b) KQPCA (c) **OMPCA** (d) OMPDA (e) None of these

37. In a certain code language HURDLE is written as BPNAJD , how will TRAGIC be written in that code ?

(a) **NMWDGB** (b) MNWDGB (c) NMWCGC (d) MNYDGC (e) None of these

38. In a certain code DESIGN is written as FCUGIL , how is REPORT written in that code ?

(a) TCRMPR (b) **TCRMTR** (c) TCTMPR (d) TCTNTR (e) None of these

39. In a certain code language CONSUMER is written as ERUMNSCO. How will TRIANGLE be written in that code language ?

(a) **LENGIATR** (b) ELNGIATR (c) LEGNIATR (d) LEGNAITR (e) None of these

40. In a certain code language WONDERFUL is written as OWNEDRFUL. How will CONFUSING be written in that code language

(a) OCNFUSNIG (b) OCNUFSNIG (c) ONCUFSNIG (d) ONCFUNSIG (e) **None of these**

# **RATIO AND PROPORTION**

## **RATIO**

Ratio is a comparison of two quantities by division. Ratio represents the relation that one quantity bears to the other. If **a** and **b** are two quantities of the same kind, then **a/b** is known as the ratio of **a** and **b**.

Denoted as **a: b**, where the first term of the ratio is called as **antecedent**, while the second term is called as **consequent**.

A "**ratio**" is just a comparison between two different things. The ratio between 30 kg and 50 kg is 3:5.

**Example:** In the park mentioned above, the ratio of ducks to geese is 16 to 9. How many of the 300 birds are geese?

**Solution:** The ratio tells that, out of every  $16 + 9 = 25$  birds, 9 are geese. That is,  $\frac{9}{25}$  of the birds are geese. Then there are  $(\frac{9}{25}) (300) = 108$  geese.

**Example:** In a school the ratio of number of boys and girls is 9:6. If there are present 180 boys. Find the total number of students in the school?

**Solution:** Let the number of boys and girls be  $9x$  and  $6x$ . Then  $9x = 180$ ,  $x = 20$   
Therefore, the total number of students  $= 15x$ , Thus,  $15(20) = 300$

## **Different Types of Ratios**

### **1. Duplicate Ratio:**

$a^2 : b^2$  is called duplicate ratio of  $a : b$

### **2. Triplicate Ratio:**

$a^3 : b^3$  is called triplicate ratio of  $a : b$

### **3. Compound Ratio:**

$ab : cd$  is the compound ratio of  $a : c$  and  $b : d$ . It is the ratio of the products of the antecedents to that of the consequents of the two or more given ratios.

## **PROPORTION**

The equality of two ratios is called as proportion.  $a, b, c$ , and  $d$  are said to be in proportion if,

$$a : b = c : d \quad \text{or} \quad a : b :: c : d$$

In a proportion, the first and fourth terms are known as extremes, while second and third terms are known as means.

**PRODUCT OF EXTREMES = PRODUCT OF MEANS**

$$a * d = b * c$$

## **Continued Proportion**

Four quantities:  $a, b, c$  and  $d$  are said to be in continued proportion, if  **$a:b=b:c=c:d$** .

Three quantities:  $a, b$  and  $c$  are said to be in continued proportion, if  **$a : b = b : c$**  or  **$ac = b^2$**

**b** is said to be the **mean proportional** between **a** and **c** and **c** is said to be a **Third proportional** to **a** and **b**.

**Example:** If 40,  $x, x, 40$  are in proportion, then find the value of  $x$ .

**Solution:** **Product of means = product of extremes**

$$x * x = 40 * 40$$

$$\Rightarrow \quad x^2 = 1600 \quad \Rightarrow \quad x = 40$$

**FOURTH Proportion** – If four quantities a, b, c and x are such that  $a : b :: c : x$ , then  $ax=bc$  and x is called fourth proportion of a, b and c.

**Example:** A can do a piece of work in 12 days, B is 60% more efficient than A. Find the number of days that B takes to do the same piece of work.

**Solution:** Ratio of efficiencies of A and B =  $100 : 160 = 5 : 8$

Since, **efficiency is inversely proportional to the number of days.**

Ratio of days taken to complete the job =  $8:5$  No. of days taken by B =  $\frac{5}{8} * 12 = 15/2$

## Variation

If two quantities are related in such a way that as quantity 'x' changes, it also brings a change in the second quantity 'y', then the two quantities are in variation. There are two types of variations:-

- 1. Direct Variation:** The quantity 'x' is in direct variation to 'y', if an increase in 'x' causes an increase in 'y' and decrease in 'x' causes 'y' to decrease proportionally. Therefore,  $x = ky$ , where 'k' is constant of proportionality.
- 2. Inverse Variation:** The quantity 'x' is in inverse variation to 'y', if an increase in 'x' causes a decrease in 'y' and decrease in 'x' causes 'y' to increase proportionally. Therefore,  $x = \frac{k}{y}$ , where 'k' is constant of proportionality.
- 3. Joint Variation:** If there are more than 2 quantities x, y and z; and x varies with both y and z, then x is in joint variation to y and z. It can be expressed as  $xyz$ , where k is constant of proportionality.  
Example: Men doing a work in some number of days working certain hours a day

## Partnership

Persons two or more than two persons when start and run the new business jointly of their own choice, the persons who start the business are called **partners** and the agreement between them is called **partnership**.

**Working and Inactive partners:**

A partner who manages the business is called **working/active partner** and the one who simply invests the money is called **inactive partner**.

**Ratio of division of gains:**

- 1.** The amount investment of all the partners are for the same time period, the gain or loss amount is distributed among the partners in the ratio of their invested amount.
- 2.** When investments are for different time periods  
**Example:** A invests Rs. **R1 for T1 months** and B invests Rs. **R2 for T2 months**, then (A's share of profit) : (B's share of profit) =  $A * T1 : B * T2$

**Partnership is of two types:**

- 1.** Simple Partnership
- 2.** Compound Partnership

**1. Simple Partnership:** When investments of all the partners are for the same period of time, the profit or loss is distributed among the partners in the ratio of their original investments.

Suppose A and B invest `p and `q respectively for a year in a business, then at the end of the year.

**Share of A's profit (loss): Share of B's profit (loss) = p : q**

**2. Compound Partnership:** When investments of all the partners are for different period of time, then equivalent capitals are calculated for a unit of time and the profit or loss is divided in the ratio of the product of time and investment.

Suppose A and B invest ` p and ` q for x months and y months respectively, then **Share of A's profit (loss) : Share of B's profit (loss) = px : qy**

**Example:** A and B started a business investing Rs. 90,000 and Rs 20,000 respectively. In what ratio should the profit earned after 2 years be divided between A and B respectively?

A. 9:2

B. 3:2

C. 18:20

D. 18:4

**Solution:** Exp: A: B = 90000 : 20000 = 90 : 20 = 18 : 4 = 9 : 2

**Example:** Ajay, Bhavan and Chetan started a business together. Thrice the investment of Ajay, twice the investment of Bhavan and the investment of Chetan are equal. Find the ratio of their respective profits at the end of the year?

A. 1:2:1

B. 2:3:6

C. 3:2:1

D. 1:2:3

**Solution:** Let the investments of Ajay, Bhavan and Chetan be Rs. a, Rs. b and Rs. c respectively.

$$3a = 2b = c, a = c/3, b = c/2.$$

Ratio of profits of Ajay, Bhavan and Chetan at the end of one year = Ratio of their respective investments = 2:3:6.

## **Practice Set 1**

### **Type 1 – Percentage & Ratio**

**Q1.** The salaries of A, B, C are in the ratio 2:3:5. If the increments of 15%, 10% and 20% are allowed respectively in their salaries, then what will be new ratio of their salaries?

A. 3:3:10

B. 10:11:20

C. 23:33:60

D. Can't be determined

**Q2.** In a class of 125, 20% students can dance.  $\frac{2}{5}$  of the total students can sing and  $\frac{2}{5}$  of the remaining students are good at sports. What is the respective ratio of the students who can dance to students who are good at sports?

A. 5:4

B. 3:2

C. 4:5

D. 3:7

**Q3.** X: Y: Z is in the ratio of 3: 2: 5. Then how much money will Z get out of Rs 500?

A. Rs. 200

B. Rs. 250

C. Rs. 300

D. Rs. 350

**Q4.** Rate of income tax is increased from 4% to 5%. However, the total tax liability of a person remains the same as was in the last year. If his income for the last year was Rs. 10000, find his present income.

A. 9000

B. 8000

C. 5000

D. 6000

**Q5.** Mohan distributed his assets to his wife, three sons, two daughters and five grandchildren in such a way that each grandchild got one-eighth of each son and one-tenth of each daughter. His wife got 40% of the total share of his sons and daughter together. If each daughter receives asset of Rs. 1.25 lakhs, what is the salary of his wife?

A. 2.5 Lakhs

B. 2.7 Lakhs

C. 2.2 Lakhs

D. 3.2 Lakhs

### **Type 2 - Coin Based Problem**

- Q6.** A sum of Rs. 36.90 is made up of 180 coins which are either 10 p coins or 25 p coins. The number of 10 p coins is?  
A. 48                      B. 54                      C. 56                      D. 60
- Q7.** A bag contains Rs 410 in the form of Rs 5, Rs 2 and Rs 1 coins. The numbers of coins are in the ratio 4:6: 9. So, find the number of 2 Rs coins.  
A. 40                      B. 50                      C. 60                      D. 70
- Q8.** A bag contains 50 P, 25 P and 10 P coins in the ratio 5: 9: 4, amounting to Rs. 206. Find the number of coins of each type respectively.  
A. 360, 160, 200      B. 160, 360, 200      C. 200, 360, 160      D. 200, 160, 300
- Q9.** A bag contains some coins in the denominations 50, 20 and 10 paise coins in the ratio 4:2:1. If their total value is Rs 12.50, then the number of 10 paise coins is?  
A. 10                      B. 5                      C. 20                      D. 15
- Q10.** In a bag, there are coins of 25 p, 10 p and 5 p in the ratio of 1 : 2 : 3. If there is Rs. 30 in all, how many 5 p coins are there?  
A. 50                      B. 100                      C. 150                      D. 200

### **Type 3 - Income and Expenditure**

- Q11.** Share of Rs.4200 among Rahul, Vijay and Mahinder in the ratio of 2:4:6. Find the amount received by Mahinder?  
A. 3100                      B. 2500                      C. 2100                      D. 4200
- Q12.** The ratio of the incomes of four persons A, B, C and D is 5:3:9:4. The sum of the incomes of A and C is 84,000. Find the difference of the incomes of B and D?  
A. 5000                      B. 7000                      C. 6000                      D. 8000
- Q13.** The ratio of income of A and B is 3:4. The Ratio of expenditure of both is 2: 3 and each saves RS 200. Find the income of A and B.  
A. Rs 500,600                      B. Rs 600,800                      C. Rs 600,900                      D. Rs 800, 1000
- Q14.** The salary of two friends Ramu and Raju are in the ratio of 4:5. If the salary of each one increases by Rs.6000, then the new ratio becomes 48:55. What is Raju's present salary?  
A. 11,500                      B. 16,500                      C. 9000                      D. 8,500

### **Type 4 - Ratios of Ratios**

- Q15.** In a school, the ratio to the number of boys and girls is 4:9, after inclusion of 32 new girls, the ratio becomes 4:17. How many boys were present at the starting in this school?  
A. 20                      B. 16                      C. 25                      D. 18
- Q16.** In an examination, the number of those who passed and the number of those who failed were in the ratio 25:4. If five more had appeared and the number of failures was 2 less

than earlier, the ratio of passers to failures would have been 22:3. The number of students who appeared at the examination, is?

- A. 154                      B. 145                      C. 160                      D. 150

**Q17.** The students in the three classes are in the ratio 2:3:5. If 20 students are increased in each class the ratio changes to 4:5:7. What was the total number of students in the three classes before the increase?

- A. 125                      B. 130                      C. 100                      D. 150

**Q18.** At a start of seminar, the ratio of the number of male participants to the number of female participants was 3:1. During the tea break 16 participants left and 6 more female participants registered. The ratio of the male to the female participants now becomes 2:1. What was the total number of participants at the start of the seminar?

- A. 54                      B. 64                      C. 34                      D. 44

**Q19.** The numerator and denominator of a fraction are in the ratio 2:3. If 6 is subtracted from the numerator the value of the fraction becomes  $\frac{2}{3}$  of the original fraction. The numerator of the original fraction is?

- A. 6                      B. 18                      C. 5                      D. 5

**Q20.** The ratio of the first and the second class train fares between two stations is 3:1 and that of the number of passengers travelling between the two stations by first and second class is 1:50. If on a particular day, Rs. 1325 are collected from passengers travelling between the two stations, then the amount collected from the second class passenger is?

- A. 1250                      B. 1350                      C. 1520                      D. 1400

### **Type 5 - Simple & Compound Partnership**

**Q21.** A, B, C subscribes together Rs. 50,000 for business. A subscribes Rs. 4000 more than B and B Rs. 5000 more than C. Out of a total profit Rs. 35,000, A receives?

- A. 14,700                      B. 15,500                      C. 16,500                      D. 17,400

**Q22.** A and B joined a partnership business by investing Rs. 30,000 and Rs. 50,000 respectively. If they earn a profit of Rs. 4,000, find A's share in profit.

- A. 2500                      B. 1500                      C. 2000                      D. 500

**Q23.** A starts a business with Rs. 7,000 and after 5 months, B joined as a partner. After a year, the profit is divided in ratio 2:3. The capital of B is?

- A. 18,000                      B. 7,000                      C. 10,000                      D. 16,000

**Q24.** A and B start a business jointly. A invests Rs. 16,000 for 8 months and B remains in the business for 4 months. Out of total, B claims  $\frac{2}{7}$  of the profit. How much money was contributed by B?

- A. 12,500                      B. 12,000                      C. 12,800                      D. 13,000

**Q25.** A and B are partners and invested Rs. 50,000 and Rs. 60,000 respectively. After 8 months B leaves and C joins with a capital of Rs. 90,000. If the profit for 1 year is Rs. 36,000, find A's share of profit.



A. 15000

B. 12000

C. 9000

D. 14000

**Q26.** A, B and C started a business with investment in ratio 5:6:8 respectively. After 1 year, C withdrew 50% of his capital and A increase his capital by 60% of his investment. After 2 years, in what ratio should the earned profit be distributed among A, B and C respectively?

A. 12:12:13

B. 13:12:12

C. 12:13:13

D. 13:12:13

**Q27.** A began with Rs. 45000 and was joined afterwards by B with Rs. 54000. After how many months did B join, if the profits at the end of the year were divided in the ratio 2:1?

A. 7 months  
months

B. 9 months

C. 5 months

D. 7.5

### **Type 6 - Partnership with Ratio**

**Q28.** A, B and C shared profits in ratio of 5:7:8. They partnered for 14 months, 8 months and 7 months respectively. Find the ratio of their investments.

A. 64:49:20

B. 49:64:20

C. 20:49:64

D. 20:64:49

**Q29.** A and B invests in the business in ratio 3:2. Assume that 5% of total profit goes to charity. If A's share is Rs. 855, what is the total profit?

A. 1000

B. 4275

C. 2525

D. 1500

**Q30.** In a business, A and C invested amounts in the ratio 2:1, whereas the ratio between amount invested by A and B was 3:2. If Rs. 1, 57,300 was their profit, how much amount did B receive?

A. 48,400

B. 46,400

C. 72,600

D. 36,300

**Q31.** A and B are partners. A contributes  $\frac{1}{4}$  of the capital for 15 months and B received  $\frac{2}{3}$  of the profit. For how many months B's money was used?

A. 15 months  
months

B. 18 months

C. 10 months

D. 8

**Q32.** A, B and C started a business with capitals in the ratio 5:6:8. At the end of 1 year, they shared profits in the ratio 5:3:12 find the ratio of time for which they had contributed their capitals?

A. 2:1:3  
2:3:3

B. 1:2:3

C. 2:3:1

D.

### **Type 7 - Partnership and Shares**

**Q33.** A and B started a business with Rs. 4000 and Rs. 3000 respectively. After 6 months, C joined them by investing Rs. 4,000. At the end of 2 years, profit was Rs. 5,000, then find B's share of profit?

A. 2000  
1000

B. 1500

C. 2500

D.

**Q34.** A started a business with capital of Rs. 1,00,000. 1 year later, B joined him with capital of Rs. 2,00,000. At the end of 3 years, from the start of the business, profit was Rs. 84,000.

B's share in profit exceeded A's share in profit by?

- A. 12,000                      B. 24,000                      C. 48,000                      D. 60,000

**Q35.** P, Q and R started a business by investing Rs.120000, Rs.135000 and Rs. 150000 respectively. Find the share of Q, out of annual profit of Rs.56,700?

- A. 16800                      B. 21000                      C. 18900                      D. 27000

### Practice Set- 1

1. C	2. A	3. B	4. B	5. C	6. B	7. C
8. C	9. B	10. C	11. C	12. C	13. B	14. B
15. B	16. B	17. C	18. B	19. B	20. A	21. A
22. B	23. A	24. C	25. A	26. B	27. A	28. C
29. D	30. A	31. C	32. A	33. B	34. A	35. C

## Competition Level

Q1. The ratio of income of A, B and C is 3: 7: 4 and the ratio of their expenditure is 4: 3: 5 respectively. If A saves Rs. 300 out of Rs. 2400, find the savings of B.

- (a) Rs. 4025                      (b) Rs. 570                      (c) Rs. 575                      (d) Rs. 580

Q2. A person cover certain distance by Train, Bus and Car in ratio 4 : 3 : 2. The ratio of fair is 1 : 2 : 4 per km. The total expenditure as a fair is Rs. 360. Then, total expenditure as fair on bus.

- (a) Rs. 140                      (b) Rs. 120                      (c) Rs. 160                      (d) Rs. 170

Q3. The price of copper is directly proportional to square of its weight. Rajesh broke down the copper in the ratio of 3 : 2 : 1 and faces a loss of Rs. 4730. Find the initial price of copper.

- (a) Rs. 7520                      (b) Rs. 7530                      (c) Rs. 7540                      (d) Rs. 7740

Q4. The ratio of copper and Tin in a 63kg alloy is 4: 3. Some amount of copper is extracted from the alloy and the ratio becomes 10: 9. How much copper is extracted.

- (a) 6 kg                      (b) 8 kg                      (c) 12 kg                      (d) 10 kg

Q5. A shopkeeper earns a profit of 12% on selling a book at 10% discount on the printed price. The ratio of the cost price to the printed price of the book is?

- (a) 45 : 56                      (b) 50 : 61                      (c) 55 : 69                      (d) 99 : 125

Q6. If  $(a + b) : (b + c) : (c + a) = 3 : 4 : 5$  and  $a + b + c = 17$ . Find C.

- (a) 17/2                      (b) 17/3                      (c) 17/4                      (d) 17/5

Q7. Rs. 4300 is divided between 45 persons in which men, women and children are included. The money received by men, women and children is in the ratio 12 : 15 : 16 while the money received by each is in the ratio 6 : 5 : 4. Find the number of men, women & children?

- (a) 10,15,20                      (b) 15,15,15                      (c) 5,15,25                      (d) 30,10,5

Q8. A man divides his property so that his son's share to his wife's and wife's share to his daughter's are both as in the ratio 3 : 1. If the daughter gets Rs. 10,000 less than son, the value (in rupees) of the whole property is?

- (a) Rs. 16,250 (b) Rs. 16,000 (c) Rs. 18,250 (d) Rs. 17,000

Q9. The ratio of the numbers of boys and girls in a school was 5 : 3. Some new boys and girls were admitted to the school, in the ratio 5 : 7. At this, the total no. of students in the school became 1200 and the ratio of boys to girls changed to 7 : 5. The number of students in the school before new admissions was?

- (a) 700 (b) 720 (c) 900 (d) 960

Q10. 555 Rs. was to be divided among A, B and C in the ratio of  $\frac{1}{4} : \frac{1}{5} : \frac{1}{6}$ . But by mistake it was divided in the ratio 4 : 5 : 6. The amount in excess received by C was?

- (a) Rs. 72 (b) Rs. 75 (c) Rs. 22 (d) Rs. 52

Q11. In the income statement of Asha and Ravenna, the ratio of their income in the year 2017 was 5 : 4. The ratio of Asha's income in the year 2018 to that in 2017 is 3 : 5 and the ratio of Ravenna's income in the year 2018 to that in 2017 is 3 : 2. If Rs. 10242 is the sum of the income of Asha and Ravenna in the year 2018, then find the income of Ravenna in the year 2017?

- (a) Rs. 1024 (b) Rs. 1138 (c) Rs. 2776 (d) Rs. 4552

Q12. Two vessels A and B of equal volume contain milk and water in the ratio 3 : 2 and 2 : 1 to their brim respectively. Two litres of the solution from vessel A and three litres of the solution from vessel B are poured into a big empty vessel C. If the solution in C occupied 40% of the capacity of C, what proportion of the volume of vessel C should be the volume of water that shall be added so that the ratio of milk and water in vessel C becomes 1 : 1?

- (a)  $\frac{21}{125}$  (b)  $\frac{2}{25}$  (c)  $\frac{4}{75}$  (d)  $\frac{14}{125}$

Q13. A bag contains certain number of coins of different denominations. The ratio of the number of Rs. 1 coins to Rs. 2 coins is 5 : 7, respectively and the ratio of number of Rs. 2 coins to Rs. 5 coins is 7 : 6 respectively. Find the total value of the Rs. 5 coins, if the total value of the Rs. 1 coins in the bag is Rs. 15.

- (a) Rs. 180 (b) Rs. 90 (c) Rs. 45 (d) Rs. 115

Q14. A father distributed some chocolates among his four children and kept some with him. The eldest three children got chocolates in the ratio 3 : 11 : 7. The total number of chocolates with father and youngest child is three times the total chocolates with the three eldest children. The ratio of chocolates with father and that with all the children is 3 : 4. Find the total number of chocolates if the youngest child has 81 chocolates with him?

- (a) 273 (b) 252 (c) 278 (d) 303

Q15. Out of three positive numbers, the ratio of the first and the second numbers is 3 : 4 that of the second and the third numbers is 5 : 6 if the product of the second and the third numbers is 4320. What is the sum of three numbers?

- (a) 177 (b) 165 (c) 185 (d) 160

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

## **ALLIGATION AND MIXTURES**

### **ALLIGATIONS**

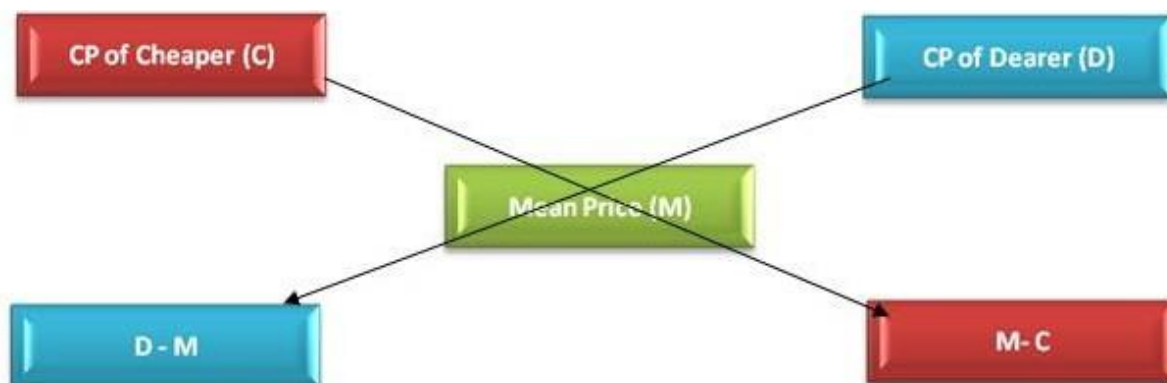
The technique of alligation is applicable in all the cases where two extreme values are given and one average value is given. It is a very useful technique which can be applied in chapters like Percentage, Simple interest, Ratio & proportion, Average etc.

This technique enables us to calculate the ratio in which extreme values/ prices/ interests/ ratios and averages should be mixed so that a given average value/price/interest/ratio and average can be obtained.

Alligation is the rule that enables us to find the proportion in which the two or more ingredients at the given price must be mixed to produce a mixture at a given price. Thus,

$$\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}} = \frac{(\text{C.P. of dearer}) - (\text{Mean Price})}{\text{Mean Price} - \text{CP of cheaper}}$$

Find it complicated to remember the Formula?? Don't worry, keep in mind the below short cut by following the direction of the arrows:



#### ***Attention please!!***

1. Mean price is always less than dearer price and is always more than cheaper price.
2. The price of the first kind should always be on the left hand side.
3. Keep in mind the simple point that the order of the ratio follows the order of what is written at the top.

### **MIXTURES**

Mixture or alloys contains two or more ingredients of certain quantity mixed together to get a desired quantity. The quantity can be expressed as a ratio or percentage. For ex: 1 liter of a mixture contains 250ml water and 750ml milk. That means,  $\frac{1}{4}$  of mixture is water and  $\frac{3}{4}$  of mixture is milk. In other words, 25% of mixture is water and 75% of mixture is milk.

### Concept 1: Finding the Quantity of an Ingredient in the Mixture

#### **Illustration 1:**

A mixture contains alcohol and water in the ratio 4 : 3. If 7 litres of water is added to the mixture, the ratio of alcohol and water becomes 3 : 4. Find the quantity of alcohol in the mixture.

#### **Solution:**

Let the alcohol : water be  $4x : 3x$ .

Adding 7 litres of water, the fraction becomes  $4x/(3x + 7) = 3/4$ . On solving, we get  $x = 3$  and alcohol =  $4x = 12$ .

### Concept 2: Quantity of Ingredient to be Added to Increase the Content of Ingredient in the Mixture to y%

#### **Illustration 2:**

A mixture of water and milk contains 80% milk. In 50 litres of such a mixture, how many litres of water is required to increase the percentage of water to 50%?

#### **Solution:**

Total mixture = 50 litres

Milk = 80% of 50 = 40 litres

Water = 20% of 50 = 10

Let 'x' litres of water is added.

Now, milk = 40 litres

Water =  $10 + x$

Total =  $50 + x$

Now, 50% of total = Water

$$\frac{1}{2} \times (50 + x) = 10 + x \Rightarrow x = 30 \text{ litres}$$

### Concept 3: Quantity of Ingredient to be Added to Change the Ratio of Ingredients in a Mixture

#### **Illustration 3:**

729 ml of a mixture contains milk and water in the ratio 7 : 2. How much more water is to be added to get a new mixture containing milk and water in the ratio of 7 : 3?

#### **Solution:**

Milk and water in the original liquid =  $7/9 \times 729 = 567$  and water =  $2/9 \times 729 = 162$ . Let water to be added =  $x$ .

Then,  $567/(162 + x) = 7/3$

Hence, we get  $1701 = 1134 + 7x$ ; or  $7x = 567$ ; or  $x = 81$

### Concept 4: Replacement of a Part of a Solution

If a vessel contains A liters of milk and if B litres of milk is withdrawn and replaced by water, and again if B litres of mixture is withdrawn and replaced by water and this operation is repeated n times in all, then

Quantity of milk left after  $n^{\text{th}}$  operation)

Initial quantity of milk)

Thus, quantity of milk/alcohol left after nth operation =  $[A(1 - (B/A))^n]$  Or in other words,

**Final Amount of ingredient that is not replaced =**

$$\text{Initial Amount} \times \left( \frac{\text{Vol. after removal}}{\text{Vol. after replacing}} \right)^n$$

## **Practice set 2**

### **Type 1- Alligation**

- Q1.** In what ratio must rice at Rs. 43/kg be mixed with rice at Rs 56/kg, so that mixture be worth Rs. 51/kg?  
A. 3:7                                      B. 5:8                                      C. 7:3                                      D. 7:5
- Q2.** In what ratio must rice at Rs. 20/kg be mixed with rice at Rs 12/kg, so that mixture be sold at Rs. 18/kg, with profit of 20%?  
A. 3:5                                      B. 5:3                                      C. 7:5                                      D. 7:3
- Q3.** In what ratio must rice at Rs. 42/kg be mixed with rice at Rs 24/kg, so that by selling the mixture at 40/kg, shopkeeper gain 25%?  
A. 3:4                                      B. 5:4                                      C. 4:5                                      D. 4:3
- Q4.** A shopkeeper has 50 kg rice, some part of rice he sold at 8 % profit & remaining at 18% profit. He gain 14% on the whole transaction. Find the quantity of rice sold at 8 % profit?  
A. 20 kg                                      B. 21 kg                                      C. 22 kg                                      D. 23 kg
- Q5.** A merchant has 25 kg rice, some part of rice he sold at 10 % profit & remaining at 5% loss. He gain 7% on the whole transaction. Find the quantity of rice sold at 10 % profit?  
A. 20 kg                                      B. 30 kg                                      C. 25 kg                                      D. 35 kg
- Q6.** A shopkeeper has 1000 kg sugar, some part he sold at 14 % profit & remaining at 6% loss. He lost 4% on the whole transaction. Find the quantity of rice he sold at 6 % loss?  
A. 700 kg                                      B. 900 kg                                      C. 800 kg                                      D. 600 kg

### **Type 2- Mixtures**

- Q7.** When 16 liter water be mixed with 108 Rs/liter pure milk. The price of mixture becomes 90 Rs/liter. Find the quantity of pure milk in the mixture?  
A. 83 liters                                      B. 80 liters                                      C. 82 liters                                      D. 81 liters
- Q8.** When 25 liter water be mixed with Rs. 12/liter pure milk so that the cost of mixture becomes Rs. 2 /liter. Find the quantity of pure milk in the mixture?  
A. 3 liters                                      B. 4 liters                                      C. 5 liters                                      D. 6 liters
- Q9.** How much water must be added to a bucket containing 40 liter of milk at 3.5 Rs/liter so that the cost of mixture becomes 2 Rs/liter?  
A. 30 liters                                      B. 40 liters                                      C. 50 liters                                      D. 60 liters

### **Type 3 –Removal of Some Quantity of the Mixture**

- Q10.** From 100 liter milk 10 liter milk is taken out instead of milk 10 liter water is added & this process repeated 2 more times than find quantity of pure milk left after 3 such processes (in liter)?  
A. 70  
80.9  
B. 80  
C. 72.9  
D.
- Q11.** From 100 liter milk 10 liter milk is taken out. Instead of milk, 10 liter water is added ,again 9 liter milk is taken out instead of this 9 liter water is added, again 8 liter water is taken out instead 8 liter water is added .Find the quantity of pure milk left after such processes (in liter)?  
A. 72  
B. 80  
C. 75.34  
D. 76
- Q12.** A container has 80 litres mixture of milk & water, if we pour out 70 % milk & 30 % water then an average 55 % container is empty, find quantity of milk and water in container?  
A. 30 lt, 50 lt  
B. 50 lt, 40 lt  
C. Rs. 50 lt, 30 lt  
D. 20 lt, 30 lt
- Q13.** A can contains a mixture of two liquids A and B is the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the can initially?  
A. 10  
B. 20  
C. 21  
D. 25
- Q14.** A jar contains a mixture of two liquids A and B in the ratio 4 : 1. When 10 litres of the mixture is taken out and 10 litres of liquid B is poured into the jar, the ratio becomes 2 : 3. How many litres of liquid A was contained in the jar?  
A. 14 litres  
B. 18 litres  
C. 20 litres  
D. 16 litres

### Type 4 – Mixing of Mixtures

- Q15.** Two equal glass having milk & water in ratio 3:2 & 4:1. Both glasses get mixed in third glass, then ratio of milk & water in third glass is?  
A. 3:7                                      B. 7:3                                      C. 7:2                                      D. 2:7
- Q16.** Three equal glass are having milk & water in ratio 9:2, 7:4 & 6:5. These glasses are mixed in fourth glass, then ratio of milk & water in fourth glass is?  
A. 2:1                                      B. 1:2                                      C. 3:1                                      D. 1:3
- Q17.** Two equal glass having milk & water in ratio 4:3 & 3:2 respectively. If content of both glasses are mixed in third glass, then ratio of milk & water in third glass is?  
A. 41:29                                      B. 29:41                                      C. 40:15                                      D. 15:40
- Q18.** Milk and water in two vessels are in ratio 4:3 & 2:3. In what ratio the liquid in both the vessels should be mixed to obtain the new mixture in vessel C, containing half milk & half water?  
A. 7:5                                      B. 5:3                                      C. 5:7                                      D. 3:5
- Q19.** Zinc and copper in two parts A & B are in ratio 1:2 & 2:3. In what ratio zinc & copper from both the parts can be mixed to obtain the new mixture in part C, in the ratio of 5:8?

A. 10:3

B. 3:10

C. 5:10

D. 10:5

**Q20.** A vessel contains a mixture of 2 liquid A & B in the ratio 3:2, when 20 liter of mixture is taken out & 20 liter of liquid of type B is added, then ratio becomes 1:4. Find quantity of liquid A & B in the container (in liter)?

A. 18, 12

B. 20, 12

C. 12, 20

D. 12, 18

**Q21.** One type of liquid contains 25% of milk, the other contains 30% of milk. A container is filled with 6 parts of the first liquid and 4 parts of the second liquid. The percentage of milk in the mixture is?

A. 27%

B. 31%

C. 29%

D. 33%

**Q22.** There are 2 bottles containing a mixture of wine, water and alcohol. The first bottle contains wine, water and alcohol in the ratio 3 : 5 : 2. The second bottle contains water and wine in the ratio 5 : 4. 1 litre of the first and 2 litres of the second are mixed together. What fraction of the mixture is alcohol?

A.  $\frac{1}{15}$  litres

B.  $\frac{6}{13}$  litres

C.  $\frac{2}{15}$  litres

D.  $\frac{6}{19}$  litres

### **Type 5- Applications**

**Q23.** In what ratio milk and water be mixed so that the mixture be sold at CP, The milkman gain 20%?

A. 1:3

B. 2:3

C. 3:4

D. 5:1

**Q24.** In what ratio milk and water be mixed so that the mixture be sold at CP, The milkman gain 25%?

A. 4:1

B. 1:4

C. 1:5

D. 5:1

**Q25.** In what ratio must water be mixed with milk to gain  $16\frac{2}{3}\%$  on selling the mixture at cost price?

A. 1:6

B. 6:1

C. 2:3

D. 4:3

**Q26.** A dishonest milkman professes to sell his milk at cost price but he mixes it with water and thereby gains 25%. The percentage of water in the mixture is?

A. 4 %

B.  $6\frac{1}{4}\%$

C. 20 %

D. 25 %

**Q27.** A man purchased, 150 pen at the rate 12 Rs/pen, out of them he sold 50 pen @ 10 % profit, remaining pens should be sold at what profit, if he earns a total profit of 15 %?

A. 4 %

B. 17.5 %

C. 20 %

D. 25 %

**Q28.** A man purchased, 200 pen at the rate Rs. 15/pen, out of them he sold 75 pen @ 5 % loss, remaining pens should be sold at what percent to gain 10% on the whole transaction?

A. 16 %

B. 17 %

C. 19 %

D. 20 %

**Q29.** In a class there are 65 students & 39 Rs is distributed among them in such a way that each boy gets 80 paise and each girl gets 30 paise. Find the number of boys and girls?

A. 39, 26

B. 26, 36

C. 26, 39

D. 25, 35



- Q30.** In a class there are 75 students & 48 Rs is distributed among them in such a way that each boy get 1 Rs and each girl gets 40 paise. Find the number of boys and girls?
- A. 30, 20                      B. 20, 30                      C. 45, 30                      D. 30, 45

### Practice Set- 2

<u>1. B</u>	<u>2. A</u>	<u>3. C</u>	<u>4. A</u>	<u>5. A</u>	<u>6. B</u>
<u>7. B</u>	<u>8. C</u>	<u>9. A</u>	<u>10. C</u>	<u>11. A</u>	<u>12. C</u>
<u>13. C</u>	<u>14. D</u>	<u>15. B</u>	<u>16. A</u>	<u>17. A</u>	<u>18. A</u>
<u>19. B</u>	<u>20. A</u>	<u>21. A</u>	<u>22. A</u>	<u>23. D</u>	<u>24. A</u>
<u>25. A</u>	<u>26. C</u>	<u>27. B</u>	<u>28. C</u>	<u>29. A</u>	<u>30. D</u>

### Competition Level

- There are three containers of equal capacity. The ratio of Sulphuric acid to water in the first container is 3 : 2, that in the second container is 7 : 3 and in the third container it is 11 : 4. If all the liquids are mixed together, then the ratio of Sulphuric acid to water in the mixture will be?  
 (a) 61 : 29                      (b) 61 : 28                      (c) 60 : 29                      (d) 59 : 29
- A trader has 44 kg of rice, a part of which he sells at 14% profit and the rest at 8% loss. On the whole, his loss is 4%. What is the quantity sold at 14% profit and that at 8% loss?  
 (a) 36 kg                      (b) 20 kg                      (c) 28 kg                      (d) 30 kg
- A container contained 80 L milk. From this container 8 L of milk was taken out and replaced by water. This process was further repeated two times. How much milk is now contained in the container?  
 (a) 50 L                      (b) 58.32 L                      (c) 60 L                      (d) 67.8 L
- In an alloy, zinc and copper are in the ratio 1 : 2. In the second alloy, the same elements are in the ratio 2 : 3. If these two alloys be mixed to form a new alloy in which two elements are in the ratio 5 : 8, the ratio of these two alloys in the new alloy is?  
 (a) 3 : 10                      (b) 3 : 7                      (c) 10 : 3                      (d) 7 : 3
- A jar contained a mixture of two liquids A and B in the ratio 4 : 1. When 10 litres of the mixture was taken out and 10 litres of liquid B was poured in the jar, this ratio became 2 : 3. The quantity of liquid B contained in the jar initially was?  
 (a) 4 litres                      (b) 8 litres                      (c) 16 litres                      (d) 32 litres
- A vessel of 80 litre is filled with milk and water. 60% of milk and 40% of water are taken out of the vessel. It is found that the vessel is empty by 55%. Find the initial quantity of milk and water?  
 (a) 20 litres, 30 litres                      (b) 30 litres, 50 litres

- (c) 40 litres, 40 litres (d) 60 litres, 20 litres
7. 20 litres of milk is taken out from a vessel containing 200 litres of pure milk and replaced with water. This process of replacement was repeated  $x$  number of times to leave 145.8 litres of pure milk in the mixture. Find the value of  $x$ .  
 (a) 3 (b) 5 (c) 2 (d) 4
  8. A milkman has 40 liters mixture of milk and water in the ratio of 5:3. If he sold 16 liters of mixture and then 12 liters of milk added to the mixture. Again he sold 20 liters of mixture and then he added 8 liters of milk to the mixture. The final quantity of the water is what percent of the final quantity of the milk?  
 (a) 10% (b) 15% (c) 20% (d) 25%
  9. Vessel A contains the mixture of Petrol and Diesel in the ratio of 3: 2, vessel B contains the mixture of Petrol and Kerosene in the ratio of 1: 2 and Vessel C contains mixture of Kerosene and Diesel in the ratio of 2: 3. If all the vessels are mixed in the ratio of 4: 3: 2, then find the respective ratio of Petrol, Diesel and Kerosene in the final mixture?  
 (a) 46: 58: 31 (b) 56: 63: 32 (c) 67: 72: 41 (d) 17:14:14
  10. A Jar contains 80 liters mixture of milk and water and the quantity of the water is 30% of the total mixture. If  $x$  liters of mixture is taken out and replaced by water and then again the same quantity of the mixture is taken out and replaced by water. If final quantity of the milk is 31.5 liters, then find the value of  $x$ ?  
 (a) 20 liters (b) 28 liters (c) 30 liters (d) 40 liters
  11. How many kilograms of rice of Rs 6.4/kg should be mixed with 10 kg of rice of Rs 4.8/kg, in such that by selling the mixture at 20 % profit, which is Rs. 1.12 more than the average price per kg of both the varieties of rice  
 (a) 12 kg (b) 15 kg (c) 10 kg (d) 11 kg
  12. The vessel A contains the ratio of the milk and water in the ratio of 8:5 and the vessel B contains 60 liters mixture of milk and water in the ratio of 7:5. If vessel A and B mixture mixed, then the ratio of the milk and water becomes 3:2, what is the initial quantity of the milk in vessel A?  
 (a) 32 liters (b) 24 liters (c) 40 liters (d) 48 liters
  13. A vessel has certain quantity of milk and then 8 liters of milk is taken out and replaced with water. Now 10 liters of mixture taken out and replace with water and again 12 liters of the mixture is taken out and replaced with water. If the initial quantity of the milk in the vessel is 80 liters, then what is the final quantity of the milk?  
 (a) 53.55 liters (b) 54.78 liters (c) 55.89 liters (d) 56.19 liters
  14. Ratio of the milk to water in vessel A to B is 3:2 and 5:6 respectively and the quantity of the milk in vessel B is 5 liters less than the quantity of the water in vessel B. If vessel A and Vessel B

mixtures are mixed, then the ratio of milk to water becomes 11:10, then what is the initial quantity of vessel A?

- (a) 60 liters                      (b) 50 liters                      (c) 40 liters                      (d) 30 liters

15. The cost price of milk in vessel A is Rs.66 per liter and the cost price of milk in vessel B is Rs.51. If milk in vessel A and B are mixed, then the shopkeeper sold 37.5 liters of this mixture at the cost price of milk in vessel A while he gets the profit of 10%. If he sold the same mixture at the cost price of milk in vessel B, then what is the percentage of loss or profit earned by shopkeeper?
- (a) 8% profit                      (b) 8% loss                      (c) 15% loss                      (d) 15% profit

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

## COMPANY SPECIFIC

- A bag contains coins of 1 rupee, 2 rupee and 5 rupee in the ratio 4:8:5. The total amount in the bag is Rs 90. The number of 5 rupee coins is **(Capgemini)**

(a) 8              (b) 16              (c) 15              **(d) 10**
- In what ratio should a coffee blend containing coffee and chicory in the ration 3:7 and another blend with coffee to chicory ration as 2:3 be mixed so that the resultant blend will have a coffee to chicory ration of 7:13? **(Capgemini)**

**a)1:1**              b) 2:1              c) 3:2              d) 1:2
- Sea water contains 5% salt by weight .How many kilograms of fresh water must be added to 40 kg of sea water for the salt content of the solution to be 2%?**(Bosch)**

a) 50              **b) 60**              c) 65              d) 70
- Divide Rs 500 among A,B,C and D so that A and B together get thrice a much as C and D together , B gets 4 time of what C gets and C gets 1.5 times as much as D . now the value of what B gets is

**(a)300**              b)75              (c)125              (d)150
- If  $6x^2 + 6y^2 = 13xy$ , what is the ratio of x to y? **(Capgemini)**

(a)1:4              **(b)3:2**              (c)4:5              (d)1:2
- In a mixture of 40 litres , the ratio of milk and water is 4:1 . how much water must be added to this mixture so that the ratio of milk and water becomes 2:3?

(a) 20L              (b)32L              **(c)40L**              (d)30L

7. IF three no. are in the ratio of 1:2:3 and half the sum is 18, then the ratio of squares of the numbers **(Cognizant)**
- (a) 6:12:13      (b) 1:2:4      **(c) 36:144:324**      (d) 3:5:7
8. A and B two alloys of argentums and brass prepared by mixing metals in proportions 7:2 and 7:11 respectively. If equal quantities of two alloys are melted to form a third alloys C, the proportions of argentum and brass in C will be
- (a) 5:9      (b) 5:7      **(c) 7:5**      (d) 9:5
9. The incomes of A and B are in the ratio 3:2 and their expenditures are in the ratio 5:3. If each saves Rs 1000, then, A's income can be **(Capgemini)**
- (a) Rs 3000      (b) Rs 4000      **(c) Rs 6000**      (d) Rs 9000
10. The cost of a book and the cost of a pen are in the ratio 3 : 2. If the cost of 10 books and 6 pens is Rs. 63, the cost of a book is **(Cognizant)**
- a) Rs. 5.50      b) Rs. 6.50      c) Rs. 3.50      **d) Rs. 4.50**
11. Rs. 432 is divided amongst three workers A, B and C, such that 8 times A's share is equal to 12 times B's share which is equal to 6 times C's share. How much did A get?
- a) Rs. 192      b) Rs. 133      **c) Rs. 144**      d) Rs. 128
12. A, B and C started a business in which A invested Rs. 10000/- for 1 year, B invested Rs. 20000/- for 2 years, C invested Rs. 30000/- for 3 years. At the end of the profit received by them is Rs. 5600/-. What is C's share? **(Cognizant)**
- a) Rs. 1600      b) Rs. 400/-      **c) Rs. 3600/-**      d) Rs. 2000/-
13. P, Q, R enter into a partnership & their share are in the ratio  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ , after two months, P withdraws half of the capitals & after 10 months, a profit of Rs 378 is divided among them. What is Q's share? **(Bosch)**
- a) 144**      b) 154      c) 164      d) None of these
14. If  $4 (P's \text{ Capital}) = 6 (Q's \text{ Capital}) = 10 (R's \text{ Capital})$ , then out of the total profit of Rs 4650, R will receive **(CoCubes)**
- a) 700      **b) 900**      c) 600      d) 750
15. In a business, A and C invested amounts in the ratio 2 : 1, whereas the ratio between amounts invested by A and B was 3 : 2. If Rs 157300 was their profit, how much amount did B receive?
- a) 48600      **b) 48400**      c) 48500      d) 44800
16. A invested Rs 76000 in a business. After few months, B joined him with Rs 57000. The total profit was divided between them in the ratio 2 : 1 at the end of the year. After how many months did B join? **(CoCubes)**
- a) 3      b) 4      c) 5      **d) 8**

17. Rs.4800/- are divided among P,Q and R in such a way that the share of P is  $\frac{5}{11}$  of the combined share of Q and R. Thus, P gets:?  
a) Rs.300/-      b) Rs.3300/-      c) Rs.1800/-      **d) Rs.1500/-**
18. Rs.4800/- are divided among P,Q and R in such a way that the share of P is  $\frac{5}{11}$  of the combined share of Q and R. The share of Q is  $\frac{3}{13}$  of the combined share of R and P. Thus, R gets:? **(Wipro)**  
a) Rs.300/-      b) Rs.3300/-      c) Rs.1500/-      **d) Rs.2400/-**
19. Two vessels of equal volumes contains milk and water mixed in the ratio 1:2,2:3. When These mixtures are mixed to form a new mixture, what is the ratio of milk and water?  
**a) 11:19**      b) 19:11      c) 2:5      d) None of these
20. A, B and C play cricket. The ratio of A's runs are to B's runs is 4 : 3 and the ratio of B's runs to C's 3 : 6. What is ratio of A's runs to C's runs? **(Wipro)**  
a) 2 : 1      **b) 2 : 3**      c) 3 : 2      d) None of these
21. If 5 kg of salt costing Rs5/kg and 3kg of salt costing Rs 4/kg are mixed, find the average cost of the mixture per kilogram. **(TCS)**  
(a)Rs4.5      **(b)Rs 4.625**      (c)RS4.75      d) Rs4.125
22. How many kilograms of sugar worth Rs 3.60 per kg should be mixed with 8kg of sugar worth Rs4.20 per kg such that by selling the mixture at 4.40 per kg, there may be a gain of 10%?**(Infosys)**  
(a)6kg      (b)3kg      (c)2kg      **(d) 4kg**
23. In a bag, there are a certain number of toy-blocks with alphabets A, B, C and D written on them. The ratio of blocks A:B:C:D is in the ratio 4:7:3:1. If the number of 'A' blocks is 50 more than the number of 'C' blocks, what is the number of 'B' blocks?  
a) 300      b)325      **c)350**      d) 375
24. In what ratio two varieties of milk costing Rs. 8 and Rs. 9 per litre respectively is mixed, so that the mixture costs Rs. 8.30 per litre? **(Infosys)**  
a) 9 : 8      **b) 7 : 3**      c) 3 : 7      d) 8 : 9
25. How many litres of pure alcohol should be added to 10 litres of a 30% alcohol solution to make it a 44% alcohol solution?  
a) 7.5      b) 3.5      c) 5.0      **d) 2.5**
26. A grocer buys two kinds of rice at Rs. 1.80 and Rs. 1.20 per kg respectively. In what ratio should these be mixed, so that by selling the mixture at Rs. 1.75 per kg, 25% may be gained?**(TCS)**  
a) 2 : 1      b) 3 : 2      c) 3 : 4      **d) 1 : 2**
27. In a mixture of 60 litres, the ratio of milk to water is 2 : 1. If the ratio of the milk to water is to be 1 : 2, then the amount of water to be added is**(Infosys)**  
a) 20 litres      b) 30 litres      c) 40 litres      **d) 60 litres**

28. A trader mixes 'Ariel' detergent costing Rs. 64 per kg with 'Surf Excel' which costs Rs. 76 per kg in the ratio 1 : 3. If the cost of 'Surf excel' drops to Rs. 74 per kg, then in what ratio should he mix the two to leave the cost of mixture unchanged? **(Bosch)**  
a) 1 : 9                      b) 1 : 8                      c) 9 : 1                      d) None of these
29. A milkman dilutes 36 litres of milk with water. The percentage of milk in the solution is now 80%. How many litres of water does he add? **(Bosch)**  
a) 9                              b) 10                              c) 4                              d) 36
30. From a vessel containing only milk, 5 litres are drawn and replaced with water. This action is repeated once more (i.e. 5 litres of the mixture are drawn and replaced with water). The ratio of milk to water now is 36 : 13. How many litres of solution does the vessel hold? **(TCS)**  
a) 35                              b) 30                              c) 25                              d) None of these

# **PERMUTATION AND COMBINATION**

## **Principal Of Multiplication:**

AND suggests the use of Multiplication and shows that more than one operation has to be performed at a time. It also gives the idea that there should be one starting point and one end point.

## **Multiplication**

If an event can occur in  $m$  different ways, and following which another event can occur in  $n$  different ways, then the total number of occurrence of the events in the given order is  $m * n$

## **Principal Of Addition:**

OR suggests the use of Addition and shows that exactly one operation has to be performed at a time out of the given set of all the possible operations.

## **PERMUTATION**

A permutation is an arrangement in a definite order of a number of objects taken some or all at a time.

## **Linear Arrangement**

Number of permutations of  $n$  distinct objects among  $r$  different places, where repetition is not allowed, is  $P(n,r)$  kind, and where repetition is not allowed, is

$$= \frac{n!}{p! q! r! \dots}$$

(Where,  $p+q+r+\dots \leq n$ )

Number of permutations of  $n$  objects, when all of them are identical =  $n!/n!$

## **Circular Arrangement**

Number of ways to arrange  $n$  distinct objects on  $n$  places around a circle =  $(n-1)!$

Number of arrangements of  $n$  beads for forming a necklace =  $(n-1)!/2$

(In case of the necklace or garland, anticlockwise and clockwise arrangements are same)

Number of selection of  $k$  consecutive things out of  $n$  things in a circle

$$= n, \quad \text{when } k < n$$

$$= 1, \quad \text{when } k = n$$

## **Polygon Arrangement**

Number of ways to arrange  $n$  distinct objects along the sides of a  $r$  sided regular polygon with every side having  $n/r$  objects =  $n!/r$

If the polygon is not regular, then the number of arrangements will be

$${}^n P_r = \frac{n!}{(n-r)!} \quad (0 < r < n)$$

Number of permutations of  $n$  distinct objects among  $r$  different places, where repetition is allowed, is  $n^r$

Number of permutations of  $n$  objects in which  $p$  objects are alike of one kind,  $q$  are alike of second,  $r$  are alike of third and so on and remaining are of different

If  $n$  people are to be arranged around a rectangular table, such that there are equal number of people on each side of the table, then total number of arrangements will be  $n!/2$

### Derangement

Number of arrangements of  $n$  distinct things in a row, such that none of them occupies its original place is

$$= n! \left[ 1/0! - 1/1! + 1/2! - 1/3! + \dots + (-1)^n/n! \right]$$

$$\text{Dearr.}(2) = 1, \text{Dearr.}(3) = 2,$$

## **COMBINATION**

A combination is a selection, in no definite order, of a number of objects taken some or all at a time.

Number of combinations of  $n$  distinct objects taken  $r$  at a time, where repetition is not allowed, is  $C(n, r)$

$$\text{Dearr.}(4) = 9, \text{Dearr.}(5) = 44$$

### Miscellaneous

$${}^nC_r = \frac{n!}{r! (n-r)!} \quad (0 < r < n)$$

Number of ways 4 different letters can be posted in 7 different letter boxes =  $4^7$

Number of ways  $n$  identical things can be arranged among  $r$  different places =  ${}^n P_r$

e.g. Number of ways 4 identical rings can be worn in 5 fingers of a hand =  $5^4$

Number of ways  $n$  different things can be arranged among  $r$  different places

$$= (n+r-1)/(r-1)!$$

e.g. Number of ways 4 different rings can be worn in 5 fingers of a hand =  $5 \cdot 6 \cdot 7 \cdot 8$

Sum of all ' $r$ ' digit numbers formed by using each of the given ' $n$ ' non-zero distinct digits exactly once (no repetition) = (Sum of all the digits)  $(1111 \dots r \text{ times}) {}^n P_{r-1}$

Sum of all ' $r$ ' digit numbers formed by using each of the given ' $n$ ' non-zero distinct digits (with repetition) = (Sum of all the digits)  $(1111 \dots r \text{ times}) n^{r-1}$

Number of combinations of  $n$  distinct objects among  $r$  different places, where repetition is allowed, is  ${}^{n+r-1}C_r$

Number of combinations or distributions of  $n$  identical objects among  $r$  different places is  ${}^{n+r-1}C_{r-1}$



Also the whole number solutions of Equation ,

$$(x + y + z + \dots \text{ (r variables) }) = {}^{n+r-1}C_{r-1}$$

Number of combinations or distributions of n identical objects among r different places such that each place gets at least 1 is  ${}^{n-1}C_{r-1}$

Also the natural number solutions of Equation,  $(x + y + z + \dots \text{ (r variables) }) = (n) = {}^{n-1}C_{r-1}$

Number of selections out of n distinct objects

= (Select None) + (Select One) + (Select Two)

$$= {}^nC_0 + {}^nC_1 + {}^nC_2 + \dots + {}^nC_n = 2^n$$

Number of ways in which a selection can be made by taking some or all out of p + q + r + ... things where p are alike of one kind, q alike of second, r alike of third and so on is  $(p+1)(q+1)(r+1)\dots - 1$

Number of zero or more selections out of n same objects =  $1 + 1 + 1 + \dots + 1 = n + 1$

Number of one or more selections out of n same objects =  $1 + 1 + 1 + \dots + 1 = n$

Number of lines in a plane formed by n points (where no three points are collinear) =  ${}^nC_2$

Number of diagonals in a regular polygon =  ${}^nC_2 - n$

Number of triangles formed in a plane using n points (where no three points are collinear) =  ${}^nC_3$

### **Formulae related to Combination**

- a)  ${}^nC_0 = 1 = {}^nC_n$
- b)  ${}^nC_1 = n = {}^nC_{n-1}$
- c)  ${}^nC_{n-r} = {}^nC_r$
- d)  ${}^nC_a = {}^nC_b \quad \square \quad a + b = n$
- e)  ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$
- f)  ${}^nC_0 + {}^nC_1 + {}^nC_2 + \dots + {}^nC_{n-1} + {}^nC_n = 2^n$
- g)  ${}^nC_0 + {}^nC_2 + {}^nC_4 + \dots = {}^nC_1 + {}^nC_3 + {}^nC_5 + \dots = 2^{n-1}$

### **GROUPING & DISTRIBUTION**

Number of ways in which n distinct objects can be distributed equally among r people

$$= n! / p! q! r! \dots \quad (n = p + q + r \dots)$$

Number of ways in which n distinct objects can be distributed equally among r groups

$$= n! / [(n/r)!]^r \quad (\text{if groups are distinct})$$

$$= n! / r! [(n/r)!]^r \quad (\text{if groups are not distinct})$$

## Practice Set 1

1. How many 3 digit number can be formed with the digits 5, 6, 2, 3, 7 and 9 which are divisible by 5 and none of its digit is repeated?

- a) 12                      b) 16                      c) 20                      d) 24

2. In how many different ways can the letter of the word ELEPHANT be arranged so that vowels always occur together?

- a) 2060                      b) 2160                      c) 2260                      d) 2360

3. There are 4 bananas, 7 apples and 6 mangoes in a fruit basket. In how many ways can a person make a selection of fruits from the basket.

- a) 269                      b) 280                      c) 279                      d) 256

4. There are 15 points in a plane out of which 6 are collinear. Find the number of lines that can be formed from 15 points.

- a) 105                      b) 90                      c) 91                      d) 95

5. In how many ways 4 Indians, 5 Africans and 7 Japanese be seated in a row so that all persons of same nationality sit together

- a)  $4! 5! 7! 3!$                       b)  $4! 5! 7! 5!$                       c)  $4! 6! 7! 3!$                       d) can't be determined

6. In how many ways 5 Americans and 5 Indians be seated along a circular table, so that they are seated in alternative positions

- a)  $5! 5!$                       b)  $6! 4!$                       c)  $4! 5!$                       d)  $4! 4!$

7. 4 matches are to be played in a chess tournament. In how many ways can result be decided?

- a) 27                      b) 9                      c) 81                      d) 243

Q(8 –9) There are 6 players in a cricket team which is to be sent to Australian tour. The total number of members is 12.

If 2 particular members are always included

- a) 210                      b) 270                      c) 310                      d) 420

If 3 particular players are always excluded

- a) 76                      b) 82                      c) 84                      d) 88

10. In a group of 6 boys and 8 girls, 5 students have to be selected. In how many ways it can be done so that at least 2 boys are included

- a) 1524                      b) 1526                      c) 1540                      d) 1560

11. How many words of 4 letters with or without meaning be made from the letters of the word 'NUMBER', when repetition of letters is not allowed?  
A) 480                      B) 360                      C) 240                      D) 260
12. In how many ways the letters of the word 'ALLIGATION' be arranged taking all the letters?  
A) 120280                      B) 453600                      C) 360340                      D) 3628800
13. In how many ways all the letters of the word 'MINIMUM' be arranged such that all vowels are together?  
A) 60                      B) 30                      C) 90                      D) 70
14. In how many ways a group of 4 men and 3 women be made out of a total of 8 men and 5 women?  
A) 700                      B) 140                      C) 120                      D) 360
15. How many 3 digit numbers are divisible by 4?  
A) 256                      B) 225                      C) 198                      D) 252
16. How many 3 digits numbers have exactly one digit 2 in the number?  
A) 225                      B) 240                      C) 120                      D) 160
17. There are 8 men and 7 women. In how many ways a group of 5 people can be made such that the particular woman is always to be included?  
A) 860                      B) 1262                      C) 1001                      D) 1768
18. There are 6 men and 7 women. In how many ways a committee of 4 members can be made such that a particular man is always to be excluded?  
A) 280                      B) 420                      C) 220                      D) 495
19. How many 4 digit words can be made from the digits 7, 8, 5, 0, and 4 without repetition?  
A) 70                      B) 96                      C) 84                      D) 48
20. In how many ways 8 students can be given 3 prizes such that no student receives more than 1 prize?  
A) 348                      B) 284                      C) 224                      D) 336
21. A box contains 27 marbles some are blue and others are green. If a marble is drawn at random from the box, the probability that it is blue is  $\frac{1}{3}$ . Then how many number of green marbles in the box?  
A. 10                      B) 15                      C) 14                      D) 18

22. In how many ways can 3 prizes be given away to 12 students when each student is eligible for all the prizes?  
 A.1234                      B.1728                      C.5314                      D.1331
23. Total no of ways in which 30 sweets can be distributed among 6 persons?  
 A.  $35 C 5$       B.  $36 C 5$                       C.  $36 C 6$                       D.  $35!/5!$
24. A bag contains 4 red balls and 5 black balls. In how many ways can i make a selection so as to take atleast 1 red ball and 1 black ball ?  
 A.564                      B.345                      C.465                      D.240
25. In how many ways can 7 beads be strung into necklace ?  
 A.2520                      B.5040                      C.720                      D.360
26. Find the no of 3 digit numbers such that atleast one of the digit is 6 (with repetitions) ?  
 A.252                      B.345                      C.648                      D.560
27. In how many ways can 7 girls and 4 boys stand in a row so that no 2 boys are together ?  
 A.8467200                      B.9062700                      C.7407000                      D.8407200
28. In how many ways the letters of the word PERMUTATION be arranged ?  
 A.  $10!/2!$       B.  $10!$                       C.  $11!$                       D.  $11!/2!$
29. How many numbers can be formed with the digits 1, 7, 2, 5 without repetition ?  
 A.89                      B.56                      C.64                      D.72
30. There are 3 boxes and 6 balls. In how many ways these balls can be distributed if all the balls and all the boxes are different?  
 A.243                      B.512                      C.729                      D.416
31. In how many ways can 4 books be selected out of 10 books on different subjects ?  
 A.210                      B.320                      C.716                      D.5040
32. In how many ways can 5 boys and 4 girls can be seated in a row so that they are in alternate position.  
 a) 2780                      b) 2880                      c) 2800                      d) 2980
33. In how many ways 5 African and five Indian can be seated along a circular table, so that they occupy alternate position.  
 a)  $5! 5!$                       b)  $4! 5!$                       c)  $5! 4!$                       d)  $4! 4!$
34. There is meeting of 20 delegates is to be held in a hotel. In how many ways these delegates can be seated along a round table, if three particular delegates always seat together.  
 a)  $17! 3!$       b)  $18! 3!$                       c)  $17! 4!$                       d) can't be determined

35. In how many 8 prizes can be given to 3 boys, if all boys are equally eligible of getting the prize.

- a) 512                      b) 343                      c) 256                      d) 526

36. There are 15 points in a plane out of which 6 are collinear. Find the number of lines that can be formed from 15 points.

- a) 105                      b) 90                      c) 91                      d) 95

37. In party there is a total of 120 handshakes. If all the persons shakes hand with every other person. Then find the number of person present in the party.

- a) 15      b) 16                      c) 17                      d) 18

38. There are 8 boys and 12 girls in a class. 5 students have to be chosen for an educational trip. Find the number of ways in which this can be done if 2 particular girls are always included

- a) 812                      b) 816                      c) 818                      d) 820

39. In how many different ways the letters of the word INSIDE be arranged in such a way that all vowels always come together

- a) 64      b) 72      c) 84      d) 96

40. How many 3 digit number can be formed by 9, 2, 5, 3, 7 which is divisible by 5 and none of the digit is repeated.

- a) 20      b) 36      c) 48                      d) 60

### Practice Set- 1

1. C	2. B	3. C	4. C	5. A
6. C	7. C	8. A	9. C	10. B
11. B	12. B	13. A	14. A	15. B
16. A	17. C	18. D	19. B	20. D
21. D	22. B	23. A	24. C	25. D
26. A	27. A	28. D	29. C	30. C
31. A	32. B	33. B	34. A	35. A
36. C	37. B	38. B	39. B	40. A

# **PROBABILITY**

Probability or chance is a common term used in day-to-day life. For example, we generally say, 'it may rain today'. This statement has a certain uncertainty.

Probability is a quantitative measure of the chance of occurrence of a particular event.

If all the possible outcomes of an experiment are known but the exact output cannot be predicted in advance, that experiment is called a random experiment.

Examples

Tossing of a fair coin

When we toss a coin, the outcome will be either Head (H) or Tail (T)

Throwing an unbiased die

Die is a small cube used in games. It has six faces and each of the six faces shows a different number of dots from 1 to 6. Plural of die is dice.

When a die is thrown or rolled, the outcome is the number that appears on its upper face and it is a random integer from one to six, each value being equally likely.

Drawing a card from a pack of shuffled cards

A pack or deck of playing cards has 52 cards which are divided into four categories as given below

Spades (♠) Clubs (♣)

Hearts (♥) Diamonds (♦)

Each of the above mentioned categories has 13 cards, 9 cards numbered from 2 to 10, an Ace, a King, a Queen and a Jack

Hearts and Diamonds are red faced cards whereas Spades and Clubs are black faced cards.

Kings, Queens and Jacks are called face cards

Taking a ball randomly from a bag containing balls of different colours

Sample Space

Sample Space is the set of all possible outcomes of an experiment. It is denoted by S.

Examples

When a coin is tossed,  $S = \{H, T\}$  where H = Head and T = Tail

When a dice is thrown,  $S = \{1, 2, 3, 4, 5, 6\}$

When two coins are tossed,  $S = \{HH, HT, TH, TT\}$  where H = Head and T = Tail

Events are said to be equally likely if there is no preference for a particular event over the other.

### Examples

When a coin is tossed, Head (H) or Tail is equally likely to occur.

When a dice is thrown, all the six faces (1, 2, 3, 4, 5, 6) are equally likely to occur.

Two or more than two events are said to be mutually exclusive if the occurrence of one of the events excludes the occurrence of the other

This can be better illustrated with the following examples

When a coin is tossed, we get either Head or Tail. Head and Tail cannot come simultaneously. Hence occurrence of Head and Tail are mutually exclusive events.

When a die is rolled, we get 1 or 2 or 3 or 4 or 5 or 6. All these faces cannot come simultaneously. Hence occurrences of particular faces when rolling a die are mutually exclusive events.

Note : If A and B are mutually exclusive events,  $A \cap B = \emptyset$  where  $\emptyset$  represents empty set.

Consider a die is thrown and A be the event of getting 2 or 4 or 6 and B be the event of getting 4 or 5 or 6. Then

$A = \{2, 4, 6\}$  and  $B = \{4, 5, 6\}$

Here  $A \cap B \neq \emptyset$ . Hence A and B are not mutually exclusive events.

Events can be said to be independent if the occurrence or non-occurrence of one event does not influence the occurrence or non-occurrence of the other.

Example : When a coin is tossed twice, the event of getting Tail(T) in the first toss and the event of getting Tail(T) in the second toss are independent events. This is because the occurrence of getting Tail(T) in any toss does not influence the occurrence of getting Tail(T) in the other toss.

Exhaustive Event is the total number of all possible outcomes of an experiment.

### Examples

When a coin is tossed, we get either Head or Tail. Hence there are 2 exhaustive events.

When two coins are tossed, the possible outcomes are (H, H), (H, T), (T, H), (T, T). Hence there are 4 ( $=2^2$ ) exhaustive events.

When a dice is thrown, we get 1 or 2 or 3 or 4 or 5 or 6. Hence there are 6 exhaustive events.

Let A and B are two events with sample space S. Then

$A \cup B$  is the event that either A or B or Both occur. (i.e., at least one of A or B occurs)

$A \cap B$  is the event that both A and B occur

Let E be an event and S be the sample space. Then probability of the event E can be defined as

$$P(E) = n(E)/n(S)$$

where  $P(E)$  = Probability of the event  $E$ ,  $n(E)$  = number of ways in which the event can occur and  $n(S)$  = Total number of outcomes possible

$$P(S) = 1$$

$$0 \leq P(E) \leq 1$$

$$P(\phi) = 0$$

Addition theorem

Let  $A$  and  $B$  be two events associated with a random experiment. Then

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

If  $A$  and  $B$  are mutually exclusive events, then  $P(A \cup B) = P(A) + P(B)$  because for mutually exclusive events,  $P(A \cap B) = 0$

If  $A$  and  $B$  are two independent events, then  $P(A \cap B) = P(A) \cdot P(B)$

Let  $A$  be any event and  $A^c$  be its complementary event (i.e.,  $A^c$  is the event that  $A$  does not occur). Then  $P(A^c) = 1 - P(A)$

Let  $E$  be an event associated with a random experiment. Let  $x$  outcomes are favourable to  $E$  and  $y$  outcomes are not favourable to  $E$ , then

Odds in favour of  $E$  are  $x:y$ , i.e.,  $x/y$  and Odds against  $E$  are  $y:x$ , i.e.,  $y/x$

$$P(E) = \frac{x}{x+y} \quad P(E^c) = \frac{y}{x+y}$$

## Practice Set 2

1. A bag contains 5 red balls and 7 blue balls. Two balls are drawn at random without replacement, and then find the probability of that one is red and other is blue.

- a)  $33/65$                       b)  $35/66$                       c)  $37/66$                       d)  $41/65$

2. A bag contains 3 red balls and 8 black balls and another bag contains 5 red balls and 7 black balls, one ball is drawn at random from either of the bags, find the probability that the ball is red.

- a)  $93/264$                       b)  $95/264$                       c)  $91/264$                       d)  $97/264$

3. 12 persons are seated at a circular table. Find the probability that 3 particular persons always seated together.

- a)  $9/55$                       b)  $7/55$                       c)  $4/55$                       d)  $3/55$

4.  $P$  and  $Q$  are two friends standing in a circular arrangement with 10 more people. Find the probability that exactly 3 persons are seated between  $P$  and  $Q$ .

- a)  $5/11$                       b)  $4/11$                       c)  $2/11$                       d)  $3/11$

5. A basket contains 5 black and 8 yellow balls. Four balls are drawn at random and not replaced. What is the probability that they are of different colors alternatively.

- a)  $56/429$                       b)  $57/429$                       c)  $61/429$                       d)  $68/429$

Direction (Q6 – Q8):

6. A bag contains 6 red balls and 8 green balls. Two balls are drawn at random one after one with



replacement. 6. What is the probability that Both the balls are green

- a)  $13/49$                       b)  $15/49$                       c)  $16/49$                       d)  $17/49$

7. First one is green and second one is red

- a)  $16/49$                       b)  $14/49$                       c)  $11/49$                       d)  $12/49$

8. Both the balls are red

- a)  $14/49$                       b)  $9/49$                       c)  $11/49$                       d)  $12/49$

9. Find the probability that in a leap year, the numbers of Mondays are 53?

- a)  $1/7$                       b)  $2/7$                       c)  $3/7$                       d)  $4/7$

10. A urn contains 4 red balls, 5 green balls and 6 white balls, if one ball is drawn at random, find the probability that it is neither red nor white.

- a)  $1/3$                       b)  $1/4$                       c)  $1/5$                       d)  $2/3$

11. A six-digit is to be formed from the given numbers 1, 2, 3, 4, 5 and 6. Find the probability that the number is divisible by 4.

- a)  $3/17$                       b)  $4/15$                       c)  $4/19$                       d)  $4/17$

12. A bag contains 6 red balls and 7 white balls. Another bag contains 5 red balls and 3 white balls. One ball is selected from each. Find the probability that one ball is red and one is white?

- a)  $53/104$                       b)  $47/104$                       c)  $63/104$                       d)  $51/104$

13. A lottery is organized by the college ABC through which they will provide scholarship of rupees one lakhs to only one student. There are 100 fourth year students, 150 third year students, 200 second year students and 250 first year students. What is the probability that a second year student is chosen.

- a)  $1/7$                       b)  $2/7$                       c)  $3/7$                       d)  $4/7$

14. A card is drawn from a pack of 52 cards. The card is drawn at random; find the probability that it is neither club nor queen?

- a)  $4/13$                       b)  $5/13$                       c)  $7/13$                       d)  $9/13$

15. A box contains 50 balls, numbered from 1 to 50. If three balls are drawn at random with replacement. What is the probability that sum of the numbers are odd?

- a)  $1/2$                       b)  $1/3$                       c)  $2/7$                       d)  $1/5$

16. From a pack of cards, if three cards are drawn at random one after the other, find the probability that one is ace, one is jack and one is queen?

- a)  $16/7725$                       b)  $16/5525$                       c)  $18/5524$                       d)  $64/5515$

17. A and B are two persons sitting in a circular arrangement with 8 other persons. Find the probability that both A and B sit together.

- a)  $1/9$                       b)  $2/7$                       c)  $2/9$                       d)  $2/5$

18. Find the probability that in a random arrangement of the letter of words in the word 'PROBABILITY' the two l's come together.

- a)  $2/11$                       b)  $1/11$                       c)  $3/11$                       d)  $4/11$

19. In a race of 12 cars, the probability that car A will win is  $1/5$  and of car B is  $1/6$  and that of car C is  $1/3$ . Find the probability that only one of them won the race.

- a)  $2/7$                       b)  $7/10$                       c)  $9/10$                       d)  $3/7$

20. A bag contains 3 red balls and 8 black balls and another bag contains 5 red balls and 7 black balls, one ball is drawn at random from either of the bags, find the probability that the ball is red.

- a)  $\frac{93}{264}$                       b)  $\frac{95}{264}$                       c)  $\frac{91}{264}$                       d)  $\frac{97}{264}$

21. In a bag there are 4 white, 4 red and 2 green balls. Two balls are drawn at random. What is the probability that at least one ball is of red colour?

- A.  $\frac{4}{3}$                       B.  $\frac{7}{3}$                       C.  $\frac{1}{3}$                       D.  $\frac{2}{3}$

22. Sahil has two bags (A & B) that contain green and blue balls. In the Bag 'A' there are 6 green and 8 blue balls and in the Bag 'B' there are 6 green and 6 blue balls. One ball is drawn out from any of these two bags. What is the probability that the ball drawn is blue?

- A.  $\frac{15}{28}$                       B.  $\frac{13}{28}$                       C.  $\frac{17}{28}$                       D.  $\frac{23}{28}$

23. In an examination, there are three sections namely Reasoning, Maths and English. Reasoning part contains 4 questions. There are 5 questions in maths section and 6 questions in English section. If three questions are selected randomly from the list of questions then what is the probability that all of them are from maths?

- A.  $\frac{7}{91}$                       B.  $\frac{8}{91}$                       C.  $\frac{2}{91}$                       D.  $\frac{4}{91}$

24. A basket contains 5 red 4 blue 3 green marbles. If three marbles are picked up randomly, What is the probability that either all are green or all are red?

- A.  $\frac{1}{20}$                       B.  $\frac{7}{20}$                       C.  $\frac{3}{20}$                       D.  $\frac{9}{20}$

25. A basket contains 5 red 4 blue 3 green marbles. If three marbles are picked up randomly, What is the probability that at least one is blue?

- A.  $\frac{41}{55}$                       B.  $\frac{53}{55}$                       C.  $\frac{47}{55}$                       D.  $\frac{49}{55}$

26. A basket contains 5 red 4 blue 3 green marbles. If two marbles are picked up randomly, What is the probability that both are red?

- A.  $\frac{4}{33}$                       B.  $\frac{5}{33}$                       C.  $\frac{7}{33}$                       D.  $\frac{8}{33}$

27. A bag contains 5 red caps, 4 blue caps, 3 yellow caps and 2 green caps. If three caps are picked at random, what is the probability that two are red and one is green?

- A.  $\frac{22}{55}$                       B.  $\frac{15}{81}$                       C.  $\frac{10}{91}$                       D.  $\frac{5}{91}$

28. A bag contains 5 red caps, 4 blue caps, 3 yellow caps and 2 green caps. If four caps are picked at random, what is the probability that two are red, one is blue and one is green?

- A.  $\frac{22}{1001}$                       B.  $\frac{80}{1001}$                       C.  $\frac{21}{1001}$                       D.  $\frac{55}{1001}$

29. A bag contains 2 red caps, 4 blue caps, 3 yellow caps and 5 green caps. If three caps are picked at random, what is the probability that none is green?

- A.  $\frac{2}{13}$                       B.  $\frac{3}{13}$                       C.  $\frac{1}{13}$                       D.  $\frac{5}{13}$

30. A bag contains 5 red and 7 white balls. Four balls are drawn out one by one and not replaced. What is the probability that they are alternatively of different colours?

- a)  $\frac{7}{99}$                       b)  $\frac{11}{99}$                       c)  $\frac{14}{99}$                       d)  $\frac{19}{99}$

31. P and Q are sitting in a ring with 11 other persons. If the arrangement of 12 persons is at random, then the probability that there are exactly 4 persons between them?

- a)  $\frac{1}{3}$                       b)  $\frac{1}{4}$                       c)  $\frac{1}{5}$                       d)  $\frac{1}{6}$

32. 10 persons are seated around a round table. What is the probability that 4 particular persons are always seated together?

- a)  $\frac{1}{21}$       b)  $\frac{4}{21}$       c)  $\frac{8}{21}$       d)  $\frac{11}{21}$
33. A box contains 4 red, 5 black and 6 green balls. 3 balls are drawn at random. What is the probability that all the balls are of same colour?  
a)  $\frac{33}{455}$       b)  $\frac{34}{455}$       c)  $\frac{44}{455}$       d)  $\frac{47}{455}$
34. An apartment has 8 floors. An elevator starts with 4 passengers and stops at 8 floors of the apartment. What is the probability that all passengers travel to different floors?  
a)  $\frac{109}{256}$       b)  $\frac{135}{256}$       c)  $\frac{105}{256}$       d)  $\frac{95}{256}$
35. A speaks truth in 60% cases and B in 80% cases. In what percent of cases they are likely to contradict each other narrating the same incident?  
a)  $\frac{9}{25}$       b)  $\frac{7}{25}$       c)  $\frac{11}{25}$       d)  $\frac{13}{25}$
36. A box contains 30 electric bulbs, out of which 8 are defective. Four bulbs are chosen at random from this box. Find the probability that at least one of them is defective?  
a)  $\frac{432}{783}$       b)  $\frac{574}{783}$       c)  $\frac{209}{784}$       d)  $\frac{334}{784}$
37. Two persons A and B appear in an interview. The probability of A's selection is  $\frac{1}{5}$  and the probability of B's selection is  $\frac{2}{7}$ . What is the probability that only one of them is selected?  
a)  $\frac{11}{35}$       b)  $\frac{12}{35}$       c)  $\frac{13}{35}$       d)  $\frac{17}{35}$
38. A 4-digit number is formed by the digits 0, 1, 2, 5 and 8 without repetition. Find the probability that the number is divisible by 5.  
a)  $\frac{1}{5}$       b)  $\frac{2}{5}$       c)  $\frac{3}{5}$       d)  $\frac{4}{5}$
39. A bag contains 6 red balls and 8 green balls. 2 balls are drawn at random one by one. Find the probability that both the balls are green  
a)  $\frac{16}{49}$       b)  $\frac{25}{49}$       c)  $\frac{12}{49}$       d)  $\frac{21}{49}$
40. A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn and are found to be both hearts. Find the probability of the lost card being a heart?  
A.  $\frac{12}{50}$       B.  $\frac{8}{50}$       C.  $\frac{11}{50}$       D.  $\frac{9}{50}$

### Practice Set- 2

1. B	2. C	3. D	4. C	5. A
6. C	7. D	8. B	9. B	10. A
11. B	12. A	13. B	14. D	15. A
16. B	17. C	18. A	19. B	20. C
21. D	22. A	23. C	24. A	25. A
26. B	27. D	28. B	29. B	30. C
31. D	32. A	33. B	34. C	35. C
36. B	37. C	38. B	39. A	40. C

## Competition Level

- In how many ways can letters the word ATTITUDE be rearranged such that no two Ts are adjacent to each other?  
a. 6720                  b. 2400                  c. 4320                  d. 1800
- $2a + 5b = 103$ . How many pairs of positive integer values can  $a, b$  take such that  $a > b$ ?  
a. 7                      b. 9                      c. 14                      d. 15
- I roll a die four times. In how many outcomes do we have two throws have the same number and the other two something different?  
a. 720                  b. 480                  c. 360                  d. 350
- In how many ways can be select 5 cards from a card pack such that all 4 suits appear?  
a. 52728                b. 405646                c. 685464                d. 4056
- Find all 3-digit numbers such that sum of their digits is a whole number less than 5?  
a. 18                    b. 20                    c. 19                    d. 17
- Of 22 points on a plane, 8 are on a straight line, 7 are on another straight line and 10 are on a third straight line. How many triangles can be drawn by connecting some three points from these 22?  
a.  $22C3$     b.  $22C3 - (8C3 + 7C3 + 10C3)$   
c.  $22C3 + (8C3 + 7C3 + 10C3)$     d.  $8C3 + 7C3 + 10C3$
- The number of solutions  $(x, y, z)$  to the equation  $x - y - z = 25$ , where  $x, y$ , and  $z$  are positive integers such that  $x \leq 40, y \leq 12$ , and  $z \leq 12$  is  
a. 101                  b. 99                  c. 87                  d. 105
- In how many ways can 7 identical erasers be distributed among 4 kids in such a way that each kid gets at least one eraser but nobody gets more than 3 erasers?  
a. 16                    b. 20                    c. 14                    d. 15
- How many signposts can be made using 6 different coloured symbols when any number of them can be posted at a time?  
a. 1988                b. 1976                c. 1966                d. 1956
- How many 3-digit numbers greater than 500 contain the digit 9 appearing at least once?  
a. 191                  b. 176                  c. 153                  d. 189
- In how many ways can 6 boys be allotted into 5 rooms such that no room is empty and all 6 boys are accommodated?  
a.  $6 * 5!$  Ways      b.  $7 * 5!$  Ways      c.  $3 * 3!$  Ways      d.  $15 * 5!$  Ways
- What is sum of all rearrangements of the 4-digit number 3214?  
a. 66660                b. 55554                c. 60048                d. 65024
- How many numbers of up to 5 digits can be created using the digits 1, 2, 3 and 5 each at least once such that they are a multiple of 15?  
a. 24                    b. 18                    c. 15                    d. 12
- There are 6 periods in each working day of a school. In how many ways can one organize 5 subjects such that each subject is allowed at least one period?  
a. 3200                  b. 1800                  c. 3600                  d. none of these

15. How many 4-digit number can be formed with the digits 0, 1, 2, 3, 4, 5, 6 which are divisible by 5 and none of its digit is repeated?  
a. 120                      b. 100                      c. 220                      d. 320
16. Find the no. of 3-digit numbers such that at least one of the digits is 6 (with repetitions)?  
a. 252                      b. 345                      c. 648                      d. 560
17. In how many ways three numbers can be selected from the set of numbers 1,2,3.....20 such that the selected numbers are in ascending order?  
a.  ${}^7C_3$                       b.  ${}^{20}C_3$                       c.  ${}^{20}C_3 / 3!$                       d. 1240
18. In how many ways 3 playing cards can be selected from a card of 52 cards such that there is at least face card?  
a.  ${}^{52}C_3$                       b.  ${}^{52}C_3 - {}^{36}C_3$                       c.  ${}^{52}C_3 - {}^{40}C_3$                       d. None
19. Find the sum of all numbers that can be formed using all the digits 1, 2, 8, 9 and 5 without repetition.  
a. 5555500                      b. 666600                      c. 4444400                      d. 6666600
20. In how many ways can 6 girls and 6 boys sit around a circular table so that no two boys sit together?  
a.  $5! \cdot 5!$                       b.  $6! \cdot 6!$                       c.  $5! \cdot 6!$                       d. 11!
21. A and B take part in a duel. A can strike with an accuracy of 0.6. B can strike with an accuracy of 0.8. A has the first shot, post which they strike alternately. What is the probability that A wins the duel?  
a.  $7/10$                       b.  $15/23$                       c.  $2/3$                       d.  $11/17$
22. If all the rearrangements of the word AMAZON are considered, what is the probability that M will feature between the 2As?  
a.  $1/3$                       b.  $1/6$                       c.  $2/5$                       d.  $3/8$
23. N is a 3-digit number that is a multiple of 7; what is the probability that it will be a multiple of 5?  
a.  $1/5$                       b.  $11/54$                       c.  $13/64$                       d.  $13/66$
24. A bag contains 4 red and 3 black balls. A second bag contains 2 red and 3 black balls. One bag is selected at random. If from the selected bag one ball is drawn, then what is the probability that the ball drawn is red?  
a.  $39/70$                       b.  $41/70$                       c.  $29/70$                       d.  $17/35$
25. A coin of radius 3 cm is randomly dropped on a square floor full of square shaped tiles of side 10 cm each. What is the probability that the coin will land completely within a tile? In other words, the coin should not cross the edge of any tile.  
a. 0.91                      b. 0.5                      c. 0.49                      d. 0.16
26. A bag contains 4 blue, 5 white and 6 green balls. Two balls are drawn at random. What is the probability that one ball is white?  
a.  $10/21$                       b.  $\frac{1}{2}$                       c.  $\frac{3}{4}$                       d.  $2/35$
27. A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn and are found to be both hearts. Find the probability of the lost card being a heart?  
a.  $12/50$                       b.  $8/50$                       c.  $11/50$                       d.  $9/50$
28. A bag contains 5 red and 7 white balls. Four balls are drawn out one by one and not replaced. What is the probability that they are alternatively of different colors?  
a.  $7/99$                       b.  $11/99$                       c.  $14/99$                       d.  $19/99$
29. A bag contains 3 red balls and 8 blacks' ball and another bag contains 5 red balls and 7 blacks' balls,

- one ball is drawn at random from either of the bag, find the probability that the ball is red.  
a.  $\frac{93}{264}$       b.  $\frac{95}{264}$       c.  $\frac{91}{264}$       d.  $\frac{97}{264}$
30. An examination consists of two papers, Paper1 and 2. The probability of failing in Paper1 is 0.3 and that in paper 2 is 0.2. Given that a student has failed in paper2, the probability of failing in paper 1 is 0.6. the probability of failing in both the papers is?  
a. 0.5      b. 0.18      c. 0.12      d. 0.06
31. If eight unbiased coins are tossed together, then the probability that the number of heads exceeds the number of tails is  
a.  $\frac{31}{128}$       b.  $\frac{1}{2}$       c.  $\frac{93}{256}$       d.  $\frac{57}{256}$
32. If a number is selected randomly from the natural number 1 to 30. The probability that the number is divisible by either 4 or 7 is  
a.  $\frac{2}{5}$       b.  $\frac{7}{15}$       c.  $\frac{11}{30}$       d.  $\frac{1}{3}$
33. A and B pick a card at random from a well shuffled pack of cards, one after the other replacing it every time till one of them gets a spade. The person who picks a spade is declared the winner. If A begins the game, then the probability that B wins the game is \_\_\_\_\_.  
a.  $\frac{5}{9}$       b.  $\frac{4}{9}$       c.  $\frac{3}{7}$       d.  $\frac{4}{7}$
34. One hundred identical coins each with probability 'p' showing up heads and tossed If  $0 < p < 1$  and the probability of heads showing on 50 coins is equal to that of heads on 51 coins, then the value of p is:  
a.  $\frac{1}{2}$       b.  $\frac{49}{101}$       c.  $\frac{50}{101}$       d.  $\frac{51}{101}$
35. I forgot the last digit of a 7-digit telephone number. If I randomly dials the final 3 digits after correctly dialing the first four, then what is the chance of dialing the correct number?  
a.  $\frac{1}{1001}$       b.  $\frac{1}{1000}$       c.  $\frac{1}{999}$       d.  $\frac{1}{990}$
36. The probability that a man can hit a target is  $\frac{3}{4}$ . He tries 5 times. The probability that he will hit the target at least three times is:  
a.  $\frac{291}{364}$       b.  $\frac{371}{464}$       c.  $\frac{471}{502}$       d.  $\frac{459}{512}$
37. A 5-digit number is formed by the digits 1,2,3,4 and 5 without repetition. What is the probability that the number formed is a multiple of 4?  
a.  $\frac{1}{4}$       b.  $\frac{1}{5}$       c.  $\frac{2}{5}$       d.  $\frac{1}{120}$
38. A box contains 10 balls numbered 1 through 10. Anuj, Anisha and Amit pick a ball each, one after the other each time replacing the ball. What is the probability that Anuj picks a ball numbered less than that picked by Anisha, who in turns picks lesser number ball than Amit?  
a.  $\frac{3}{25}$       b.  $\frac{1}{6}$       c.  $\frac{4}{25}$       d.  $\frac{81}{400}$
39. A biased die has a probability of  $\frac{1}{4}$  of showing a 5, while the probability of any of 1, 2, 3, 4, or 6 turning up is the same. If three such dice are rolled, what is the probability of getting a sum of at least 14 without getting a 6 on any die?  
a.  $\frac{5}{24}$       b.  $\frac{9}{160}$       c.  $\frac{1}{30}$       d.  $\frac{7}{160}$
40. A box contains 20 electric bulbs, out of which 4 are defective. Two bulbs are chosen at random from this box. The probability that at least one of these is defective is:  
a.  $\frac{4}{19}$       b.  $\frac{7}{19}$       c.  $\frac{12}{19}$       d.  $\frac{21}{95}$

1. b	2. a	3. a	4. c	5. b	6. b	7. b	8. a	9. d	10. b
11. d	12. a	13. d	14. b	15. c	16. a	17. b	18. c	19. d	20. c
21. b	22. a	23. c	24. d	25. d	26. d	27. c	28. c	29. c	30. c
31. c	32. d	33. c	34. d	35. b	36. d	37. b	38. a	39. d	40. b

## COMPANY SPECIFIC

- The total combination of picking 3 balloons from a packet of 25 balloons is: **(Congnizant)**  
A]2100      B]2200      **C]2300**      D]2400
- A written exam consists of 6 questions with the answer options yes/ no/ none. In how many ways can the examinees select the answer? **(Bosch)**  
A]6P3ways      B]5C3 ways      **C]3C1.3C1.3C1.3C1.3C1**      D] (3C1)6
- What is the number of ways of selecting 7 files out of 14 distinct files if one is always selected? **(TCS)**  
A]14C7      **B]13C6**      C]1      D]14P7      E) 13P6
- Five paramedics and four technicians are registered for a rescue team. How many possible combinations one can choose to make a rescue team of a paramedic and a technician? **(Congnizant)**  
A]9      B]40      **C]20**      D]18
- A company decides new identity code for all its employees. The identity code would comprise of five letter initials that can be formed using the alphabets of English language such that the fifth letter is always a consonant. How many such combinations are possible?  
A] $26^3 \times 21^2$       B] $21^4 \times 26$       C] $21^3 \times 26^2$       **D] $26^4 \times 21$**
- In how many ways can the digits 2, 3, 5, 7 and 9 be placed to form a three – digit number so that the higher order digit is always greater than the lower order digits? (Assume digits are all different) **(TCS)**  
A] 8      B] 9      **C] 10**      D] 15
- The number of 5-digit odd numbers that can be made from number 1,2,3,4,5 are:  
a. 24      b. 32      c. 64      **d. 72**
- If from a deck of 52 cards, 4 cards are to be selected and one card of it should be a spade and another card should be a heart, in how many ways can these cards be selected? **(Congnizant)**

- a.  $13^2 \times 50C2$                       b.  $52C4$                       c.  $26 \times 50C2$                       d.  $13C4$

9. How many words with or without meaning, can be formed by using all the letters of the word, 'DELHI' using each letter exactly once? **(Bosch)**

- (a) 720                      (b) 24                      (c) None of these                      **(d) 120**

10. How many 6 digit telephone numbers can be formed if each number starts with 35 and no digit appears more than once?

- (a) 720                      (a) 360                      (c) 1420                      **(d) 1680**

11. An event manager has ten patterns of chairs and eight patterns of tables. In how many ways can he make a pair of table and chair? **(TCS)**

- (a) 100                      **(b) 80**                      (c) 110                      (d) 64

12. In how many different ways can the letters of the word 'CORPORATION' be arranged so that the vowels always come together?

- (a) 47200                      (b) 48000                      (c) 42000                      **(d) 50400**

13. How many 3 digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9 which are divisible by 5 and none of the digits is repeated? **(Bosch)**

- (a) 20**                      (b) 16                      (c) 8                      (d) 24

14. How many numbers are there between 100 and 1000 such that at least one of their digits is 6?

- (a) 648                      (b) 258                      (c) 654                      **(d) 252**

15. How many numbers not exceeding 10000 can be made using the digits 2,4,5,6,8 if repetition of digits is allowed? **(TCS)**

- (a) 9999                      (b) 820                      **(c) 780**                      (d) 740

16. In a game show there are 5 prize cards and 20 blank cards. A contestant is asked to choose a card at random. What is the probability that he won a prize? **(Bosch)**

- a)  $\frac{3}{5}$                       b)  $\frac{2}{5}$                       **c)  $\frac{1}{5}$**                       d)  $\frac{4}{5}$

17. A bag contain oranges flavoured candies only. Malini takes out one candy without looking into the bag . what is the probability that she takes out an orange flavoured candy?

- a) 0                      b)  $\frac{1}{2}$                       c)  $\frac{1}{3}$                       **d) 1**

18. In a non-leap year, what is the probability that the last day of the year starts with a 'T'?

- a.  $\frac{4}{7}$                       b. 1                      c. 0                      **d.  $\frac{2}{7}$**

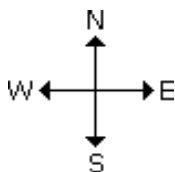


19. Two dice are thrown simultaneously. Find the probability of obtaining a total score of seven.  
**(a)  $1/6$**  (b)  $1/36$  (c)  $2/35$  (d)  $1/12$
20. What is the probability of getting exactly three heads while tossing 4 coins at a time? **(Bosch)**  
 (a)  $1/6$  (b)  $1/3$  **(c)  $1/4$**  (d)  $1/12$
21. What is the probability of getting at least three heads while tossing 5 coins at a time?  
 (a)  $1/6$  (b)  $1/3$  (c)  $1/4$  **(d)  $1/2$**
22. What is the probability of getting at most three heads while tossing 5 coins? **(TCS)**  
 (a)  $12/16$  **(b)  $13/16$**  (c)  $12/32$  (d)  $14/26$
23. What is the probability of getting doublets while throwing 2 dice simultaneously? **(Bosch)**  
**(a)  $1/6$**  (b)  $1/3$  (c)  $1/4$  (d)  $1/2$
24. What is the probability that a number selected from 1, 2, 3....25 is a prime number?  
 (a)  $7/29$  **(b)  $9/25$**  (c)  $8/25$  (d)  $1/25$
25. Find the probability of getting heads in all four trials when a coin is tossed four times.  
**(a)  $1/16$**  (b)  $1/32$  (c)  $1/64$  (d)  $1/8$
26. A sequence of 4bits is randomly generated. Each bit takes up a binary format and can either have a value of 0 or 1. What is the probability that at least one of these bits is zero?  
 (a) 0 (b)  $1/16$  **(c)  $15/16$**  (d) 1
27. In a shooting competition, the probability that Rahul will hit the target is  $5/7$  and the probability that Sheela will hit the target is  $3/4$ . So what is the probability that both of them will hit the target?  
 (a)  $2/5$  (b)  $1/5$  (c)  $20/21$  **(d)  $15/28$**
28. Two unbiased dice are thrown simultaneously. What is the probability of getting at most one five in a single throw of the two dice? **(TCS)**  
 (a)  $35/36$  **(b)  $5/18$**  (c)  $1/36$  (d)  $1/6$
29. One card is drawn from a pack of 52 cards. Each of the 52 cards being equally likely to be drawn, find the probability that the card drawn is '9' of hearts **(Congnizant)**  
 (a)  $1/13$  (b)  $1/26$  **(c)  $1/52$**  (d)  $3/52$

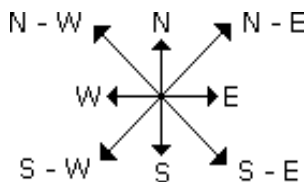
30. In a game show there are 5 prize cards and 20 blank cards. A contestant is asked to choose a card at random. What is the probability that he won a prize? **(TCS)**
- (a)  $\frac{3}{5}$                       (b)  $\frac{2}{5}$                       **(c)  $\frac{1}{5}$**                       (d)  $\frac{4}{5}$
31. A developed car in the workshop comprises of around 70 components. Each component has a probability of having a manufacturing error 0.015. What is the probability that this developed car will get rejected due to manufacturing error in any of the component?
- A)  $(0.015)^{70}$                       B)  $(0.985)^{70}$                       **C)  $1 - (0.985)^{70}$**                       D)  $1 - (0.015)^{70}$
32. Ritu visited a mall where tokens are given while submitting belongings at the entrance. Tokens are lettered a, b, c, ....., z. Guard gives the token at random. What is the probability that token given to Ritu is consonant? **(Bosch)**
- A)  $\frac{5}{21}$                       **B)  $\frac{21}{26}$**                       C)  $\frac{5}{26}$                       D)  $\frac{26}{21}$
33. What is the probability that Sharique's test would be fixed on Monday or Tuesday, in a week from Monday to Sunday? **(Cognizant)**
- A)  $\frac{2}{7}$**                       B)  $\frac{1}{5}$                       C)  $\frac{2}{3}$                       D)  $\frac{5}{7}$
34. 10 scooters, 5 motorcycles and 15 cars are parked in the parking area of a market. What is the probability that a scooter will leave the parking first? **(TCS)**
- A)  $\frac{1}{6}$                       B)  $\frac{1}{2}$                       C)  $\frac{3}{5}$                       **D)  $\frac{1}{3}$**
35. A jar contains 5 white, 8 red, 2 blue and 3 black balls. Find the probability that a ball drawn at random is red or blue. **(Capgemini)**
- A)  $\frac{4}{9}$                       **B)  $\frac{5}{9}$**                       C)  $\frac{2}{7}$                       D)  $\frac{1}{5}$
36. A bag is full of 20 bananas and no other fruit. Rajeev draws a fruit from the bag. What is the probability that he will draw a banana? **(Wipro)**
- A) 1**                      B) 0                      C)  $\frac{1}{2}$                       D) None of these
37. A group is analyzing quality control problems. Suppose that the probability of a defective shape is 0.03 and the probability of a defective paint job is 0.60. What is the probability of non-defective items? **(TCS)**
- A) **0.91**                      B) 0.18                      C) 0.32                      D) 0.03

## **DIRECTION SENSE**

1. There are four main directions - East, West, North and South as shown below:



2. There are four cardinal directions - North-East (N-E), North-West (N-W), South-East (S-E), and South-West (S-W) as shown below:



3. At the time of sunrise if a man stands facing the east, his shadow will be towards west.
4. At the time of sunset the shadow of an object is always in the east.
5. If a man stands facing the North, at the time of sunrise his shadow will be towards his left and at the time of sunset it will be towards his right.
6. At 12:00 noon, the rays of the sun are vertically downward hence there will be no shadow.
7. Left Right Movement:-
- ✚ A person facing north, on taking left will face towards west and on taking the right turn towards east.
  - ✚ A person facing west, on taking left will face towards south and on taking right turn towards north.
  - ✚ A person facing east, on taking left will face towards north and on taking the right turn towards south.
  - ✚ A person facing south, on taking left will face towards east and on taking the right turn towards west.
  - ✚ Whenever a person moves to his left side, he will move towards anti- clockwise direction.
  - ✚ Whenever a person moves to his right side, he will move towards clockwise direction.
8. When a question says moved towards left or right side, we assume that the movement is at an angle of 90degrees.

### **PRACTICE Set 1**

**Q1.** If A is to the south of B and C is to the east of B, in what direction is A with respect to C?

- A. South-East                      B. North                      C. None of These                      D. South-West

**Q2.** A is 40 m south-west of B. C is 40 m south-east of B. Then C is in which direction of A?

- A. East                      B. West                      C. South                      D. North

**Q3.** There are four towns P, Q, R and T. Q is to the south-west of P, R is to the east of Q and

south-east of P, and T is to the north of R in line with QP. In which direction of P is T located?

- A. South-East                      B. North                      C. North-East                      D. West

**Q4.** A, B, C and D playing cards. A and B are partners. D faces towards North. If A faces towards West, then who faces towards South?

- A. A                      B. C                      C. D                      D. Data Inadequate

**Q5.** Laxman travels 7 km towards south and then 5 km towards his left. He further travels 5 km towards south. How far is he from the starting point?

- A. 13 Km                      B. 10 Km                      C. 20 Km                      D. 25 Km

**Q6.** One evening before sunset two friends Sumit and Mohit were talking to each other face to face. If Mohit's shadow was exactly to his right side, which direction was Sumit facing?

- A. North                      B. South                      C. East                      D. West

**Q7.** A man is facing north-west. He turns 90 degree in the clockwise direction and then 135 degree in the anticlockwise direction. Which direction is he facing now?

- A. East                      B. West                      C. North                      D. South

**Q8.** Keshav walks 10 km towards North. From there, he walks 6 km towards South. Then, he walks 3 km towards East. How far and in which direction is he with reference to his starting point?

- A. 5 km West                      B. 5 km North-east                      C. 7 km East                      D. 7 km West

**Q9.** Suganya moves towards South-east a distance of 7 km, and then she moves towards West and travels a distance of 14 m. From here, she moves towards North-west a distance of 7 m and finally she moves a distance of 4 m towards East and stood at that point. How far is the starting point from where she stood?

- A. 3 m                      B. 4 m                      C. 5 m                      D. 10 m

**Q10.** Vimal walks northwards. After a while, he turns to his right and a little further to his left. Finally, after walking a distance of one kilometer, he turns to his left again. In which direction is he moving now?

- A. North                      B. South                      C. West                      D. East

**Q11.** Raju moved to his North- West side for 2 km. From there he turned 90 degrees clockwise & moved 2 km. From there he turned 90 degrees clockwise & travelled 2km, then he would be in which direction from the original position?

- A. South East Region                      B. North East Region                      C. South West Region                      D. Western Region

**Q12.** Ravi started walking from his house east direction on Bus stop which is 3km away. Then he set off in the bus straight towards his right to the school 4 km away. What is the crow flight

distance from his house to the school?

- A. 1 km                      B. 5 km                      C. 7 km                      D. 12 km

**Q13.** Debu walks towards East then towards North and turning  $45^\circ$  right walks for a while and lastly turns towards left. In which direction is he walking now?

- A. North                      B. East                      C. South-East                      D. North-West

**Q14.** Suman is 40 metres South-West of Ashok. Prakash is 40 meters South-East of Ashok. Prakash is in which direction of Suman?

- A. South                      B. West                      C. East                      D. North-East

**Q15.** Mohan started from point 'A' and preceded 7 km straight towards East, then he turned left and proceeded straight for a distance of 10 km. He then turned left again and proceeded straight for a distance of 6 km, and then turned left again and proceeded straight for another 10 km. In which direction is Mohan from his starting point?

- A. East                      B. West                      C. North                      D. South

**Q16.** One evening before sunset Rekha and Hema were talking to each other face to face. If Hema's shadow was exactly to the right of Hema, which direction was Rekha facing?

- A. North                      B. South                      C. West                      D. Data Inadequate

**Q17.** K is 40 m South-West of L. If M is 40 m South-East of L, then M is in which direction of K?

- A. East                      B. West                      C. North-East                      D. South

**Q18.** A is east of B and west of C. H is south-west of C, B is south-east of X. Which is the farthest west?

- A. A                      B. B                      C. C                      D. X

**Q19.** Rahul put his timepiece on the table in such a way that at 6 p.m. hour-hand points to North. In which direction the minute-hand will point at 9.15 p.m.?

- A. South-East                      B. South                      C. North                      D. West

**Q20.** P started from his house towards west. After walking a distance of 25 m, he turned to the right and walked 10 m. He then again turned to the right and walked 15 m. After this he is to turn right at  $135^\circ$  and to cover 30 m. In which direction should he go?

- A. West                      B. South                      C. South-West                      D. South-East

**Q21.** A boy rode his bicycle northward, then turned left and rode 1 km and again turned left

and rode 2 km. He found himself 1 km west of his starting point. How far did he ride northward initially?

- A. 1 Km                                      B. 2 Km                                      C. 3 Km                                      D. 5 Km

**Q22.** Starting from the point X, Jai walked 15 m towards west. He turned left and walked 20 m. He then turned left and walked 15 m. After this he turned to his right and walked 12 m. How far and in which directions is now Jai from X?

- A. 32 m, South                                      B. 47 m, East                                      C. 42 m, North                                      D. 27 m, South

**Q23.** Two cars start from the opposite places of a main road, 150 km apart. First car runs for 25 km and takes a right turn and then runs 15 km. It then turns left and then runs for another 25 km and then takes the direction back to reach the main road. In the mean time, due to minor break down the other car has run only 35 km along the main road. What would be the distance between two cars at this point?

- A. 65 Km                                      B. 75 Km                                      C. 80 Km                                      D. 85 Km

**Q24.** Rajat walked 20 m towards north. Then he turned right and walks 30 m. Then he turns right and walks 35 m. Then he turns left and walks 15 m. Finally he turns left and walks 15 m. In which direction and how many metres is he from the starting position?

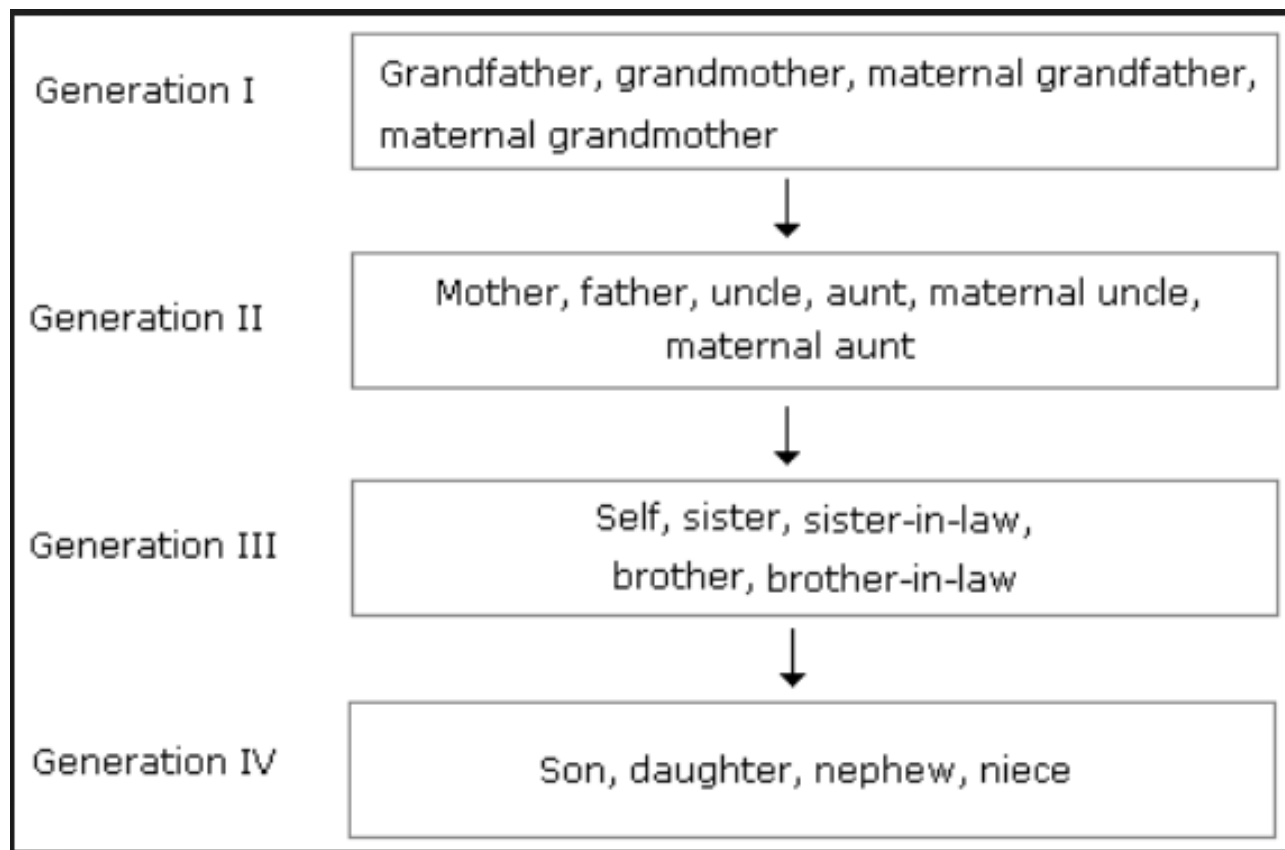
- A. 15 m West                                      B. 30 m East                                      C. 30 m West                                      D. 45 m East

### Practice Sheet 1

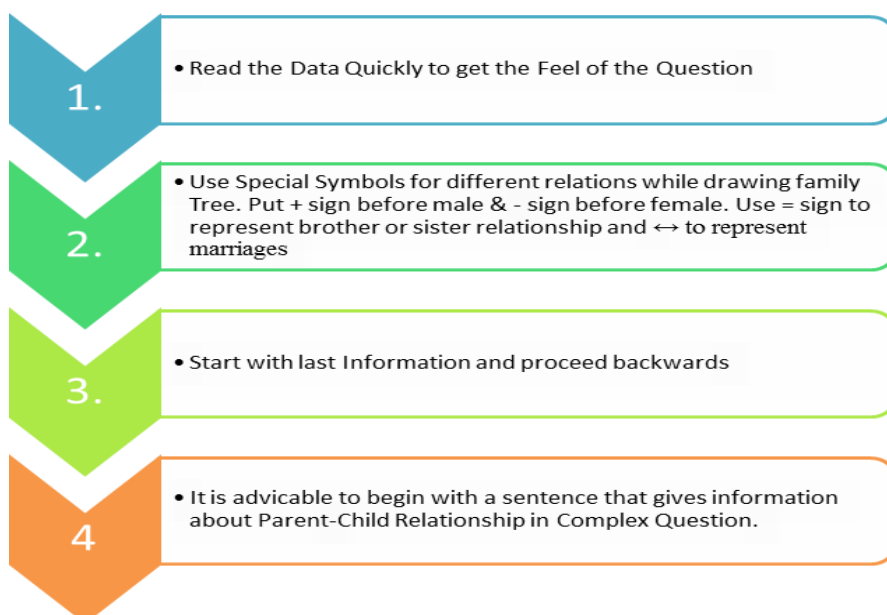
1. D	2. A	3. C	4. B	5. A
6. B	7. B	8. B	9. D	10. C
11. B	12. B	13. D	14. C	15. A
16. B	17. A	18. D	19. D	20. C
21. B	22. A	23. A	24. D	

## **BLOOD RELATION**

### COMMON RELATIONS-



### *How To Solve Questions:*



## **PRACTICE Set 2**

**Q1.** Pointing to a photograph, a man said, "I have no brother or sister but that man's father is my father'sson." Whose photograph was it?

- A. His own                      B. His son                      C. His Father                      D. His Grandfather

**Q2.** Pointing to a man, a woman said, "His mother is the only daughter of my mother." How is the woman related to the man?

- A. Mother                      B. Daughter                      C. Sister                      D. Brother

**Q3.** Pointing to the photograph, Vipul said, "She is the daughter of my grandfather's only son." How is Vipul related to the girl in the photograph?

- A. Father                      B. Sister                      C. Brother                      D. Son

**Q4.** Pointing to a girl in photograph. Amar said, "Her mother's brother is the only son of my mother's father."How the girl's mother related to Amar?

- A. Mother                      B. Sister                      C. Aunt                      D. Father

**Q5.** Pointing to a gentleman, Deepak said," His only brother is the father of my daughter's father." How is gentleman related to Deepak?

- A. Brother                      B. Sister                      C. Father                      D. Uncle

**Q6.** If Kamal says, "Ravi's mother is the only daughter of my mother", how is Kamal related to Ravi?A.Brother                      B. Sister                      C. Maternal Uncle                      D. Aunt

**Q7.** A's father is B's son-in-law. C, A's sister, is the daughter of P. How is P related to B?

- A. Brother                      B. Sister                      C. Mother                      D. Can't be determined

**Q8.** Divyansh said to Nimish, "The boy playing with the football is the younger of the two brothers of thedaughter of my father's wife." How is the boy playing football related to Divyansh?

- A. Cousin                      B. Brother                      C. Son                      D. Brother-in-law

**Q9.** B is the brother of A, S is the sister of B, E is the brother of D, D is the daughter of A, F is the father of S.Then, the uncle of E is?

- A. A                      B. F                      C. B                      D. D

**Q10.** R is the brother of G. Q is the sister of R. O is the brother of N. N is the daughter of G. L is the father ofQ, who is the uncle of O?

- A. R                      B. L                      C. G                      D. Q

**Q11.** Pointing to Sagar in a photograph, Manjula said, "His brother's father is the only son of my grandfather."How is Manjula related to Sagar?



A. Aunt                      B. Sister                      C. Mother                      D. None of these

**Q12.** Sia introduced Raghav as the son of the only daughter of the father of her maternal uncle. How is Raghav related to Sia?

A. Brother                      B. Cousin                      C. Nephew                      D. Can't be determined

**Q13.** Introducing a woman, Nisha said, 'She is the daughter-in-law of the grandmother of my father's only son.' How is the woman related to Nisha?

A. Grandmother                      B. Sister-in-law                      C. Sister                      D. CND

**Q14.** A man said to a lady, "Your mother's husband's sister is my aunt". How is that lady related to that man?

A. Daughter                      B. Sister                      C. Grand-daughter                      D. Mother

**Q15.** Anupam said to a lady sitting in a car, "The only daughter of the brother of my wife is the sister-in-law of the brother of your sister." How the husband of the lady is related to Anupam?

A. Maternal Uncle                      B. Uncle                      C. Father                      D. Son-In-Law

**Q16.** Pointing to Varman, Madhav said, "I am the only son of one of the sons of his father." How is Varman related to Madhav?

A. Nephew                      B. Uncle                      C. Father or Uncle                      D. Father

**Q17.** Pointing to Gopi, Nalni Says, "I am the daughter of the only son of his grandfather." How Nalni is related to Gopi?

A. Niece                      B. Daughter                      C. Sister                      D. Indeterminable

**Q18.** Introducing a woman, Shashank said, "She is the mother of the only daughter of my son." How that woman is related to Shashank?

A. Daughter                      B. Sister-in-law                      C. Wife                      D. Daughter-in-law

**Q19.** A man introduced the boy coming with him as "He is son of the father of my wife's daughter". What relation did the boy bear to the man?

A. Son-in-law                      B. Son                      C. Brother                      D. Father

**Q20.** If B says that his mother is the only daughter of A's mother, how is A related to B?

A. Son                      B. Father                      C. Brother                      D. Uncle

**Q21.** Veena who is the sister-in-law of Ashok, is the daughter-in-law of Kalyani. Dheeraj is the father of Sudeep who is the only brother of Ashok. How Kalyani is related to Ashok?

A. Mother-in-law                      B. Aunt                      C. Wife                      D. Mother

**Q22.** If A + B means A is the mother of B; A – B means A is the brother B; A % B means A is the father of B and A x B means A is the sister of B, which of the following shows that P is the maternal uncle of Q?

A. Q – N + M x P                      B. P + S x N – Q                      C. P – M + N x Q                      D. Q – S % P

**Q23.** If  $A + B$  means A is the brother of B;  $A \times B$  means A is the son of B; and  $A \% B$  means B is the daughter of A then which of the following means M is the maternal uncle of N?

A.  $M + O \times N$                       B.  $M \% O \times N + P$                       C.  $M + O \% N$                       D. None of these

**Q24.** If  $A + B$  means A is the father of B;  $A - B$  means A is the brother of B;  $A \% B$  means A is the wife of B and  $A \times B$  means A is the mother of B, which of the following shows that M is the maternal grandmother of T?

A.  $M \times N \% S + T$                       B.  $M \times N - S \% T$                       C.  $M \times S - N \% T$                       D.  $M \times N \times S \% T$

**Q25.** If D is the brother of B, how B is related to C? To answer this question which of the statements is/are necessary?

1. The son of D is the grandson of C.  
2. B is the sister of D.

A. Only 1                      B. Only 2                      C. Either 1 or 2                      D. 1 and 2 both are required

**Q26.** Pointing to Sahil, Neeru says, "I am the daughter of the only son of his grandfather." How Neeru is related to Sahil?

A. Daughter                      B. Mother                      C. Sister                      D. Cousin

## Practice Sheet 2

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

## Competition Level

### Non Verbal Reasoning

Out of the given answer figures, which is the correct one to replace the question mark?

#### Question Figures



#### Answer Figures



(A)

(B)

(C)

(D)

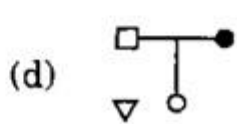
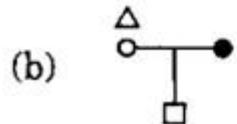
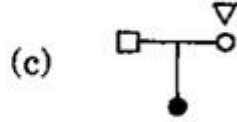
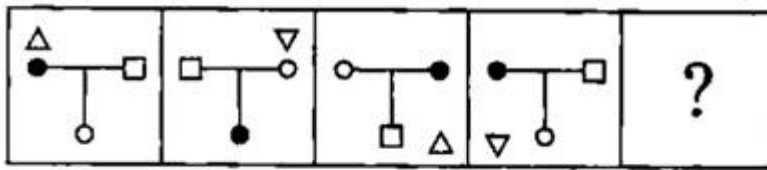
A) A

B) C

C) B

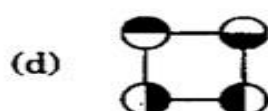
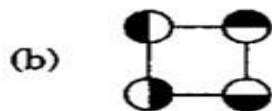
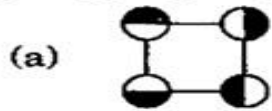
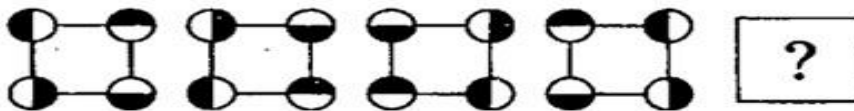
D) D

2) Out of the given answer figures, which is the correct one to replace the question mark?



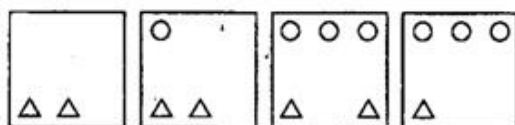
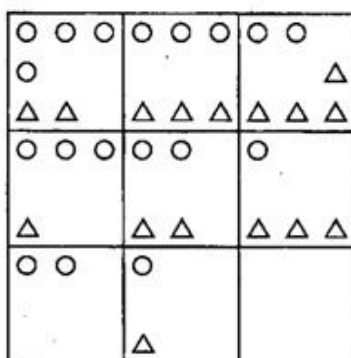
A) A      B) C      C) B      D) D

3) Out of the given answer figures, which is the correct one to replace the question mark?



A) A      B) C      C) B      D) D

4) Out of the given answer figures, which is the correct one to replace the empty box?

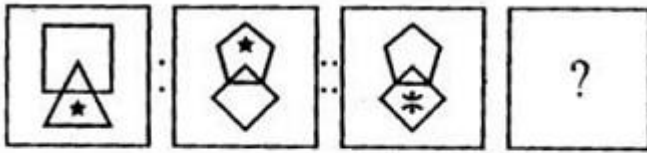


(a)      (b)      (c)      (d)

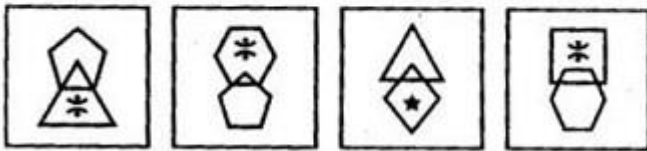
A) A      B) C      C) B      D) D

5) Out of the given answer figures, which is the correct one to replace the question mark?

**Question Figure**



**Answer Figures**



(A)

(B)

(C)

(D)

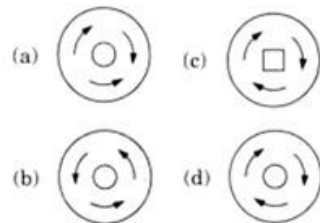
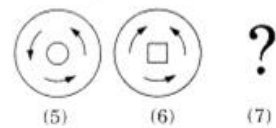
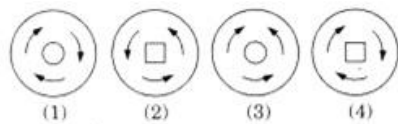
A) A

B) C

C) B

D) D

6) What will be the seventh image in the sequence out of the given options a, b, c and d?



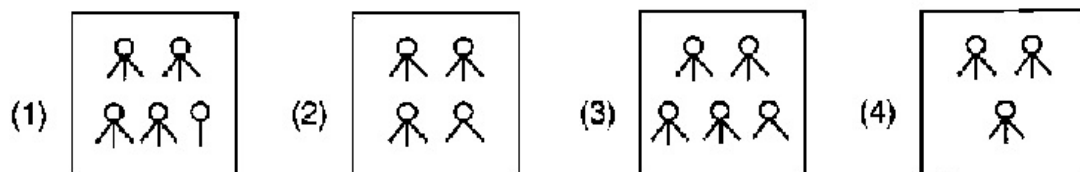
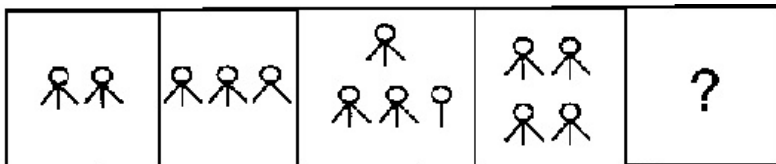
A) A

B) C

C) B

D) D

7) What will be next in the sequence out of the given answer figures?



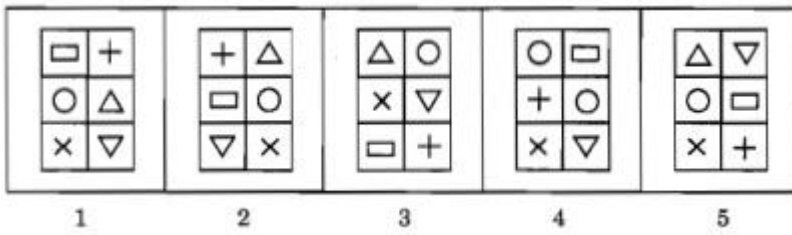
A) 1

B) 3

C) 2

D) 4

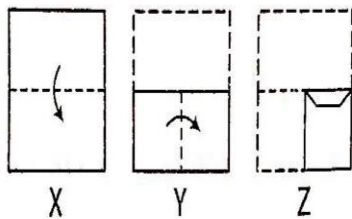
8) Out of the given 5 images, one image is not same as the other 4. Which is it?



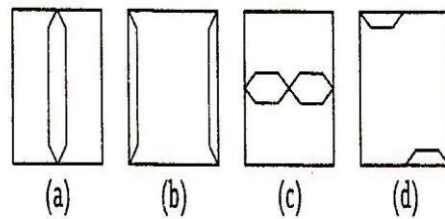
- A) 3      B) 4      C) 2      D) 5

9) A piece of paper is folded and cut as shown below in the question figures. From the given answer figures, indicate how it will appear when opened.

**Question Figures**



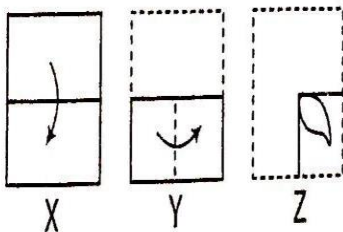
**Answer Figures**



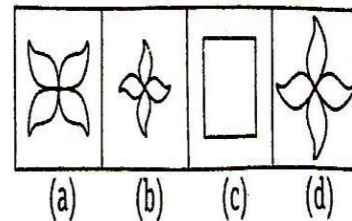
- A) A      B) C      C) B      D) D

10) The three question figures marked X, Y, and Z show the manner in which a paper is folded step by step and then cut. From the answer figures (a),(b),(c) and (d), select the one showing the unfolded pattern of the paper after the cut.

**Question Figures**

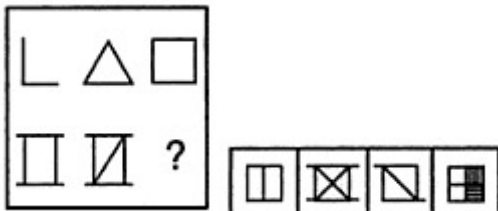


**Answer Figures**



- A) A      B) C      C) B      D) D

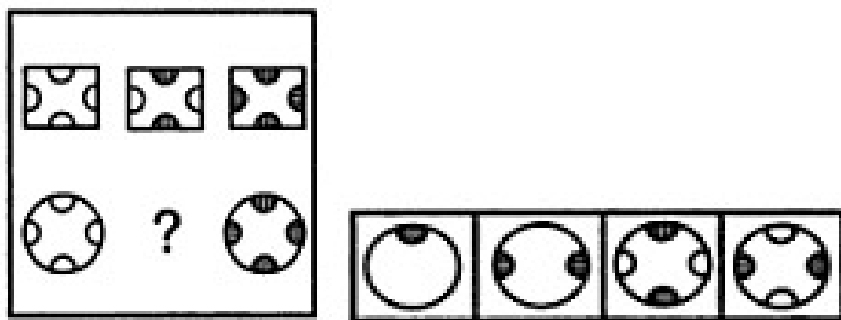
11) Select a suitable figure from the four alternatives that would complete the figure matrix.



(1) (2) (3) (4)

- A) 1      B) 4      C) 3      D) 2

12) Select a figure from the four alternatives that would complete the Figure Matrix.



(1) (2) (3) (4)

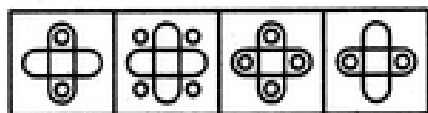
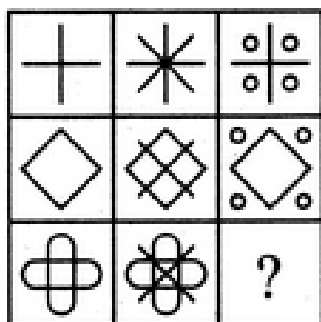
A) 1

B) 4

C) 3

D) 2

3) Select a suitable figure from the four alternatives that would complete the figure matrix



(1) (2) (3) (4)

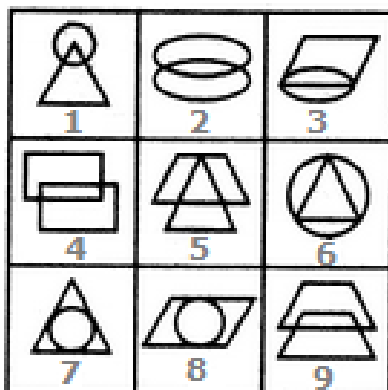
A) 1

B) 4

C) 3

D) 2

14) Group the given figures into three classes using each figure only once.



A) 1,5,9 ; 2,7,8 ; 3,4,6

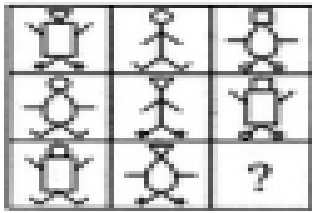
B) 2,4,9 ; 6,7,8 ; 1,3,5

C) 3,7,8 ; 4,5,9 ; 1,2,6

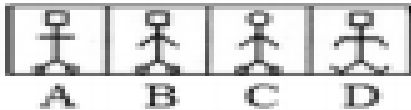
D) 1,5,6 ; 4,7,8 ; 2,3,9

15) Complete the Problem figure with an appropriate option from the Answer figure.

**Problem Figures**



**Answer Figures**

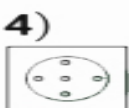
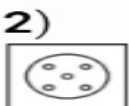


- A) C      B) D      C) B      D) A

16) A piece of paper is folded and cut as shown below in the question figures. From the given answer figures, indicate how it will appear when opened.

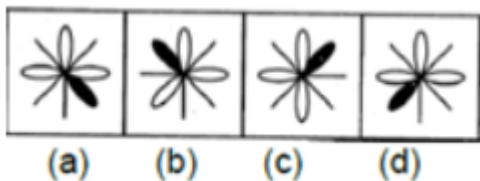


**Options:**



- A) 1      B) 2      C) 3      D) 4

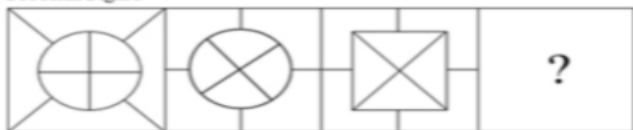
17) In each problem, out of the four figures marked (a) (b) (c) and (d), three are similar in a certain manner. However, one figure is not like the other three. Choose the figure which is different from the rest.



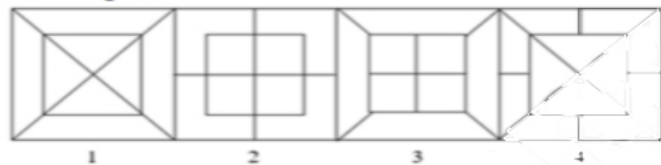
- A) a      B) b      C) c      D) d

18) Choose the correct figure that replaces the question mark.

Problem Figure

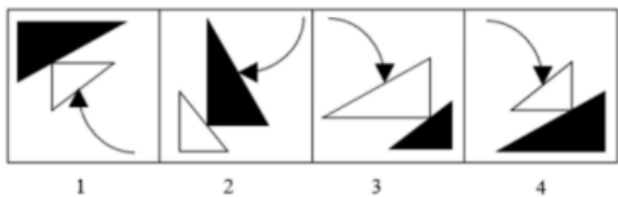
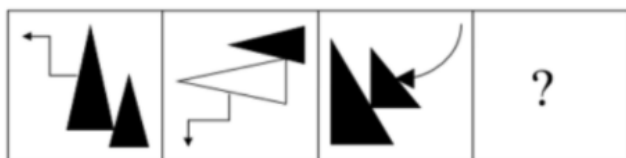


Answer Figures



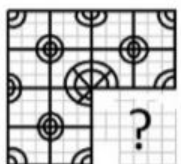
- A) 1      B) 3      C) 2      D) 4

9) Choose the correct figure that can replace the question mark.



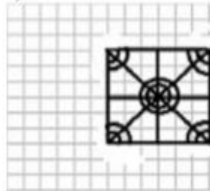
- A) 1      B) 2      C) 3      D) 4

20) Which answer figure will complete the pattern in the question figure?

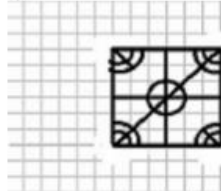


Options:

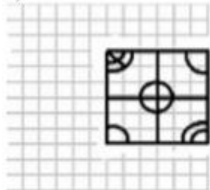
1)



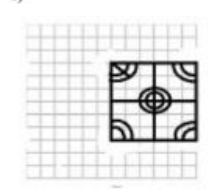
3)



2)



4)



- A) 1      B) 2      C) 3      D) 4



### Answer key

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

### Blood Relation

1) If 'A \$ B' means 'A is the son of B', 'A @ B' means 'A is the mother of B', 'A % B' means 'A is son-in law of B' and 'A # B' means 'A is the daughter of B' then in 'P \$ R # M % N' how is N related to R?

- a) Daughter
- b) Grandfather
- c) Grandmother
- d) Can't determined

2) Pointing towards a girl in a Photograph Priya, who is a female said, "she is the only daughter of the son of my mother's father's only sister. How is Priya related to that girl?

- a) Paternal Aunt
- b) Daughter
- c) Cousin
- d) Maternal Aunt

3) Prema is Ajay's sister. Benita is Ajay's mother. Benjamin is Benita's father. Leela is Benjamin's mother. How is Prema related to Leela?

- a) Daughter-in-law
- b) Daughter
- c) Grand Daughter
- d) Great Grand Daughter

4) Pointing to a woman, a girl says, "Her daughter-in-law is married to the only son of my husband's mother-in-law." How is the girl related to the woman?

- a) Niece
- b) Granddaughter
- c) Daughter
- d) Cousin

5) Showing a man on the stage, Rita said, "He is the brother of the daughter of the wife of my husband. How is the man on stage related to Rita?

- a) Son
- b) Husband
- c) Cousin
- d) Nephew

6) Karan has a brother 'Prem' and a sister 'Neesha'. Karan's wife is 'Naj' and has a daughter 'Naksha'. Naksha got married with Neesha's son Akbar and has a baby girl 'Riya'. What is relation between 'Naksha' and 'Neesha'?

- a) Sister
- b) Niece and Aunt
- c) Mother and Daughter
- d) Mother and Granddaughter

7) Introducing a lady, a lady said, "She is the only daughter of Mohan's grandfather who is my husband's father". How does the lady relate herself with the introduced lady?

- a) Aunt
- b) Mother
- c) Mother-in-law
- d) Sister-in-law

8) There are two generation and two married couple in the family. There are five members in this family. A is mother-in-law of B. D is father of C. A has only one son. C is nephew of E. B is not married to D. E is unmarried women. Then who among the following is father-in-law of B?

- a) D
- b) A
- c) C
- d) E

9) There are eight persons in a family. In this family there are three married couples and three generations. P is grandfather of T. V is daughter-in-law of Q, who is mother of O. U is father-in-law of V. O is granddaughter of R. T is not unmarried. S is brother-in-law of U. R has only one daughter. Who among the following is grandson of R?

- a) O                      b) T                      c) V                      d) U

10) Introducing a boy, a girl says, "He is the son of the only sister of my mother's brother." How is the boy related to that girl?

- a) Father-in-law                      b) Brother  
c) Cousin                      d) Niece

11) Study the following information carefully and answer the questions which follow—

'P – Q' means 'P is father of Q'

'P ÷ Q' means 'P is sister of Q'

'P × Q' means 'P is mother of Q'

'P + Q' means 'P is brother of Q'

Which of the following means 'A is nephew of B'?

- a)  $A + C - B \times K$   
b)  $B \div H - A + D$   
c)  $B \div G - A \div R$   
d)  $B + T \times A \div E$

12) There are eight members in the family having three generations. There are only three married couples. A is the mother of D. G is son in law of B. H is the nephew of D. C has only one son. F is the granddaughter of C. E is the mother of F. D is unmarried. How C is related to D?

- a) Father                      b) Mother  
c) Son                      d) Son in law

13) A boy introduced a girl as the daughter of the son of the mother of his aunt. The girl is boy's :

- a) Sister                      b) Cousin sister  
c) Sister-in-law                      d) Aunt

14) Sunil is the son of Kesav. Simran, Kesav's sister, has a son Maruti and daughter Sita. Prem is the maternal uncle of Maruti. How is Sunil related to Maruti?

- a) Nephew                      b) Cousin  
c) Uncle                      d) Brother

15) A man showed a boy next to him and said – "He is the son of my wife's sister-in-law, but I am the only child of my parents." How is my son related to him?

- a) Nephew                      b) Cousin  
c) Brother                      d) Uncle

Answer key

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

**Direction Sense Questions:**

1) Ajay goes 6 m North and turns right and walks 8 m. Again, he turns to his right and walks 4 m. After this, he takes another turn to his right and walks 8 m. So, what is the distance between his current position and his starting point?

- a) 1m                      b) 3m                      c) 5m                      d) 2m

2) If South-West becomes East, South-East becomes North and so on. What will North become?

- a) South-West              b) South-East              c) North-West              d) North-East

3) Vijay walks 10 m towards the South. From there he takes a U-Turn and walks 6 m. Then, he takes a left walks 3 m. What is the distance and direction of his current location with respect to his starting point?

- a) 4 km, South-West                      b) 5 km, South-West  
c) 5 km, South-East                      d) 5 km, North-West

4) Amar is 40 km away from Akbar in the South-West Direction. Anthony is 40 km away from Akbar in the South-East direction, then what is the direction of Anthony with respect to Amar?

- a) North                      b) South                      c) East                      d) West

5) A ran 15m towards South, took a turn towards east and ran 20m and again he took a turn towards the north and ran 15m. What is the distance between his current position and his starting position?

- a) 10                      b) 15                      c) 30                      d) 20

6) Laxman left his home for a run and ran 15 km in the Northern direction. Then he turned left and ran 10 km. Then he turned another left and ran 5 km. Finally, he took a turn to the East and ran 10 km. In which direction is his current location with respect to his home?

- a) North                      b) South                      c) Northwest              d) South-East

7) Apeksha walked a distance of 8 km in Eastern direction and then took a U-turn and walked 13 km, then she turned south and walked 4 km; After which she turned left and walked 5 km; and finally, she turned north and walked 3 km. How far is she from the starting point?

- a) 8 km                      b) 10 km                      c) 1 km                      d) 3 km

8) Arjun started walking towards North and walked for 5 km, then he turned right and walked for 3 km, he took another right turn and walked 5 km and finally, he took a left turn and walked 2 km. What is Arjun's current direction from his starting point?

- a) North                      b) South                      c) East                      d) West

9) Shaan is doing an exercise with his legs up and head down. He is facing west. In which direction, will his left hand be?

- a) North                      b) South                      c) East                      d) West

10) Narendra runs 5 km in the east direction from his home. He then takes a left and runs 15 km. He then takes a right turn and runs 10 km. He then took a turn towards the south and ran 15 km. What is the distance between his home and his current location?

- a) 10 km                      b) 15 km                      c) 20 km                      d) 30 km

11) Anitha and Kathir are two friends studying in the XYZ Arts College. Anitha starts walking from her house in north direction. After walking 120m, she reached the Axis Bank. Then she turns and walks 40m in north-east direction. Then she turns 90 degree clock wise direction and walks 30m to reach Kathir's house which is in the east of the Axis Bank. Then from Kathir's house both of them walk 130m in south-east direction to reach their college which is east of Anitha's house. What is the shortest distance between Anitha's House and XYZ Arts College?

- a) 100m                      b) 110m                      c) 120m                      d) 130m

12) Ankush walked 50 m towards north then turned left and walked 68 m. He then turned to south and walked 22 m then he took a left turn and walked 44 m. After that he turned right and walked 18 m and finally, he turned left to and walked 48 m. What is the total distance travelled by Ankush in south direction during the entire journey?

- a) 22 m                      b) 36 m                      c) 40 m                      d) 48 m

13) The post office is to the east of the school while my house is to the south of the school. The market is to the north of the post office. If the distance of the market from the post office is equal to the distance of my house from the school, in which direction is the market with respect to my school?

- a) South-west                      b) North-east                      c) North                      d) East

14) Rasik walks 20 m North. Then he turns right and walks 30 m. Then he turns right and walks 35 m. Then he turns left and walks 15 m. Then he again turns left and walks 15 m. In which direction and how many metres away is he from his original position?

- a) 15 metres West                      b) 30 metres East  
c) 30 metres West                      d) 45 metres East

15) I am facing east. I turn  $100^\circ$  in the clockwise direction and then  $145^\circ$  in the anticlockwise direction. Which direction am I facing now?

- a) North                      b) North-east                      c) East                      d) South-west

Answer key

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

## COMPANY SPECIFIC

1. Pointing to a photograph, a man said, "I have no brother or sister but that man's father is my father's son." Whose photograph was it?(**Amcat**)  
A. His own **B. His son** C. His Father D. His Grandfather
2. Pointing to a man, a woman said, "His mother is the only daughter of my mother." How is the woman related to the man?(**Cocubes**)  
**A. Mother** B. Daughter C. Sister D. Brother
3. Pointing to the photograph, Vipul said, "She is the daughter of my grandfather's only son." How is Vipul related to the girl in the photograph?(**Wipro**)  
A. Father **B. Sister** C. Brother D. Son
4. Pointing to a girl in photograph. Amar said, "Her mother's brother is the only son of my mother's father." How the girl's mother related to Amar?(**Infosys**)  
A. Mother B. Sister **C. Aunt** D. Father
5. Pointing to a gentleman, Deepak said, "His only brother is the father of my daughter's father." How is gentleman related to Deepak?(**Infineon**)  
A. Brother B. Sister C. Father **D. Uncle**
6. If Kamal says, "Ravi's mother is the only daughter of my mother", how is Kamal related to Ravi?(**TCS**)  
A. Brother B. Sister **C. Maternal** Uncle D. Aunt
7. A's father is B's son-in-law. C, A's sister, is the daughter of P. How is P related to B?(**Capgemini**)  
A. Brother B. Sister C. Mother **D. Can't be determined**
8. Divyansh said to Nimish, "The boy playing with the football is the younger of the two brothers of the daughter of my father's wife." How is the boy playing football related to Divyansh?(**Cognizant**)  
A. Cousin **B. Brother** C. Son D. Brother-in-law
9. B is the brother of A, S is the sister of B, E is the brother of D, D is the daughter of A, F is the father of S. Then, the uncle of E is?(**TCS**)  
A. A B. F **C. B** D. D
10. R is the brother of G. Q is the sister of R. O is the brother of N. N is the daughter of G. L is the father of Q, who is the uncle of O?(**TCS**)  
**A. R** B. L C. G D.
11. Pointing to Sagar in a photograph, Manjula said, "His brother's father is the only son of my grandfather. "How is Manjula related to Sagar?(**CoCubes**)  
A. Aunt **B. Sister** C. Mother D. None of these
12. Sia introduced Raghav as the son of the only daughter of the father of her uncle. How is Raghav related to Sia?(**Wipro**)  
A. Brother B. Cousin C. Nephew **D. Can't be determined**
13. Introducing a woman, Nisha said, 'She is the daughter-in-law of the grandmother of my father's only

son." How is the woman related to Nisha?(Infosys)

A. Grandmother B. Sister-in-law C. Sister **D. Mother**

14. A man said to a lady, "Your mother's husband's sister is my aunt". How is that lady related to that man?(TCS)

A. Daughter **B. Sister** C. Grand-daughter D. Mother

15. Anupam said to a lady sitting in a car, "The only daughter of the brother of my wife is the sister-in-law of the brother of your sister." How the husband of the lady is related to Anupam?(Amcat)

A. Maternal Uncle B. Uncle C. Father **D. Son-In-Law**

16. Pointing to Varman, Madhav said, "I am the only son of one of the sons of his father." How is Varman related to Madhav?

A. Nephew B. Uncle **C. Father or Uncle** D. Father

17. Pointing to Gopi, Nalni Says, "I am the daughter of the only son of his grandfather." How Nalni is related to Gopi?

A. Niece B. Daughter **C. Sister** D. Indeterminable

18. Introducing a woman, Shashank said, "She is the mother of the only daughter of my son." How that woman is related to Shashank?

A. Daughter B. Sister-in-law C. Wife **D. Daughter-in-law**

19. A man introduced the boy coming with him as "He is son of the father of my wife's daughter". What relation did the boy bear to the man?(Accenture)

A. Son-in-law **B. Son** C. Brother D. Father

20. If B says that his mother is the only daughter of A's mother, how is A related to B?(Capgemini)

A. Son B. Father C. Brother **D. Uncle**

21. If  $A + B$  means A is the mother of B;  $A - B$  means A is the brother B;  $A \% B$  means A is the father of B and  $A \times B$  means A is the sister of B, which of the following shows that P is the maternal uncle of Q?(Bosch)

A.  $Q - N + M \times P$  B.  $P + S \times N - Q$  **C.  $P - M + N \times Q$**  D.  $Q - S \% P$

22. If  $A + B$  means A is the brother of B;  $A \times B$  means A is the son of B; and  $A \% B$  means B is the daughter of A then which of the following means M is the maternal uncle of N?(TCS)

A.  $M + O \times N$  B.  $M \% O \times N + P$  C.  $M + O \% N$  **D. None of these**

23. If  $A + B$  means A is the father of B;  $A - B$  means A is the brother B;  $A \% B$  means A is the wife of B and  $A \times B$  means A is the mother of B, which of the following shows that M is the maternal grandmother of T?

**A.  $M \times N \% S + T$**  B.  $M \times N - S \% T$  C.  $M \times S - N \% T$  D.  $M \times N \times S \% T$

24. If D is the brother of B, how B is related to C? To answer this question which of the statements is/are necessary?(Bosch)

1. The son of D is the grandson of C.

2. B is the sister of D.

A. Only 1 B. Only 2 C. Either 1 or 2 **D. 1 and 2 both are required**

25. Pointing to Sahil, Neeru says, "I am the daughter of the only son of his grandfather." How Neeru is related to Sahil?(TCS)

A. Daughter B. Mother **C. Sister** D. Cousin

26. Rohan walked 50 m towards East, took a right turn and walked 30 m. Which direction is he now from his starting position? **(TCS)**  
**(1) South-West** (2) North-East (3) North-West (4) South-East (5) None of these
27. Pranav started walking straight facing West .After walking some distance he took a left turn and again after walking some distance he took a left turn. Which direction is he facing now?**(TCS)**  
 (1) West (2) North **(3) East** (4) South (5) Cannot be determined
28. Nishtha lives to the North of Nihar who lives to the West of Harry. Arun who lives to the South of Nishtha has house in which direction with respect to Harry ?  
 (1) North-West (2) North (3) South-West **(4) Cannot be determined** (5) None of these
29. R is to the West of P. T is to the East of S. P is to the North of S. T is in which direction with reference to R ?  
 (1) West (2) East (3) North (4) South **(5) None of these**
30. There are four towns P,Q,R & T. Q is to the South-West of P, R is to the East of Q and South-East of P, and T is to the North of R in line with QP. In which direction of P is T located?**(eLitmus)**  
 1) South-East 2) North **3) North-East** 4) East 5) None of these.
31. Kamal is facing South . Kunal is walking towards him , stops, and turns to his right . He sees Komal standing before him facing him. Which direction Komal is facing ?  
**(1) West** (2) South (3) East (4) Data inadequate (5) None of these
32. Ashok walked five metres towards North, took a right turn and walked 10 metres and again he took a right turn and walked 10 metres and in the end turns left. Which direction is he facing now?  
 (1) South (2) West **(3) North** (4) South-West (5) None of these
33. Karan walked 40 m towards North, took a left turn and walked 20 m and again took a left turn and walked 40 m. How far he is from his starting position and in which direction ? **(Amcat)**  
 (1) 10 m North **(2) 50 m South** (3) 20 m West. (4) 10 m South (5) None of these
34. Sahil cycled 10 miles from point P towards the East. He then took right turn and peddled 5 miles and taking another right turn cycled again for another 5 miles. In which direction is point P from where Sahil is standing now? **(Infineon)**  
 (1) West (2) North-West **(3) North-East** (4) Cannot be determined (5) None of these
35. Amit walked 30 metres towards East, took a right turn and walked 40 meters. Then he took a left turn and walked 30 metres. In which direction is he now from the starting point and how far?**(Cognizant)**  
 (1) 50 m East **(2) 10 m South-East** (3) 20v13 m South East (4) 20 m North-East (5) None of these
36. Kunal walks 10 kms towards North, from here he goes 6 kms towards South. Then he goes 3 kms towards East. How far and in which direction is he from the starting point?**(Wipro)**  
 1) 5 km West 2) 5 km North-East **3) 7 km East** 4) 7 km West 5) None of these.
37. A man goes 30 km to South and then turning left he goes 20 km. Then turning to North he goes 30 km. After this, turns to his left and goes 40 km. How far is the from his starting point?**(TCS)**  
 (1) 10 km (2) 6 km (3) 20 km **(4) 25 km** (5) None of these

38. A boy walks northwards. After a while he turns towards his right and a little further to his left. Finally after walking a distance of one kilometer, he turns to his left again. In which direction he is moving now ?  
(1) North      (2) South      **(3) East**      (4) West      (5) None of these
39. From his office, Rakesh walks 10 km to the East turns left walks 6 km and turns left and walks another 14 km. Which direction is he facing ?**(Accenture)**  
(1) South      **(2) East**      (3) West      (4) North      (5) None of these
40. One morning Meena started walking towards the Sun. After walking a while she turned towards her left and again towards her left. After walking a while . She turned left. In which direction is she facing now?**(Accenture)**  
(1) West      (2) South      (3) North      **(4) East**      (5) None of these