WORKBOOK OF ANALYTICAL SKILLS-1

PEA-305

Department of Analytical Skills
Centre of Professional Enhancement

PREFACE

Companies that hire students through campus placements have various rounds to shortlist suitable candidates; these rounds include aptitude tests, group discussions and then personal interview. Most, if not all the companies follow this recruitment pattern.

Almost 90% of the applied candidates don't clear the aptitude test. The aptitude test is used to test the candidate on Quantitative Aptitude, Verbal Ability, and Analytical Ability/Logical Reasoning.

Quantitative Aptitude and Reasoning is very important subject to test your problem-solving skills. So, in every competitive written exam they asked questions from this subject, not only in written they may ask some brain storming puzzles in interview also. It is the one of the key concepts to qualify written exam almost every student who know basic mathematics can solve most of the questions in the exam but the main problem is that the time management, the recruiters does not give enough time to solve the problems so one who has more practice the model questions before exam can easily solve in the exams.

This book is essential for aptitude exams as all the important topics are discussed in this book. This book explains all the concepts clearly and also covers all the types of the questions.

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NUMBER SYSTEM

1. The numbers 1, 2, 3, 4, 5……..are called natural numbers or positive numbers.

   Example: 1, 2, 3, 4, 5……..

2. **Whole Numbers: –**The numbers including "0" and all natural numbers are called the while numbers.

   Example: 0, 1, 2, 3, 4, 5……..

3. **Integers –** The numbers including 0 and all the positive and negative of the natural numbers are called integers.

   Example: ……-3, -2, -1, 0, 1, 2, 3……

4. **Rational Numbers: –** A number which can be expressed in the form p/q where p and q are integers and q $\neq 0$ is called a rational number.

   For example, 4 is a rational number since 4 can be written as 4/1 where 4 and 1 are integers and the denominator 1 $\neq 0$. Similarly, the numbers ¾, -2/5, etc. are also rational numbers.

   Between any two numbers, there can be infinite number of other rational numbers.

5. **Irrational Numbers: –** Numbers which are not rational but which can be represented by points on the number line are called irrational numbers. Examples for irrational numbers are

   Example: $\sqrt{2}, \sqrt{3}, \sqrt{5}, \sqrt{8},$ etc.

   Numbers like π, e are also irrational numbers.

   Between any two numbers, there are infinite numbers of irrational numbers.

   Another way of looking at rational and irrational numbers is

   Any terminating or recurring decimal is a rational number.

   Any non-terminating non-recurring decimal is an irrational number.

6. **Real numbers: –** The set of natural numbers, integers, whole numbers, rational numbers, and irrational numbers constitute the set of real numbers.

7. **Even Numbers: –** The numbers that are divisible by 2 are called even numbers.

   Example: 2, 4, 6, 8, 16, 32 etc.

8. **Odd Numbers: –** The numbers that are not divisible by 2 are called odd numbers.

   a. Example: 3, 5, 7, 9, 15 etc.

9. **Prime Numbers: –** Those numbers which are divisible by themselves and 1 are called prime numbers or a number which has only two factors 1 and itself is called a prime number.

   b. Example: 2, 3, 5, 7 etc.

10. **Twin Primes: –** A pair of prime numbers when they differ by 2 are called twin prime numbers.

    c. Example: (3, 5), (5, 7), (11, 13), (17, 19) etc.

11. **Co-prime Numbers: –** A pair of two natural numbers are said to be co-prime if their G.C.D. or H.C.F. is 1.

    d. Example: H.C.F. (3, 4) = 1, H.C.F. (13, 15) = 1 then (3, 4) and (13, 15) are co-prime numbers.

12. **Composite Numbers: –** The natural numbers which are not prime are called composite numbers OR numbers that have factors other than itself and 1, are called composite numbers.

    Example: 4, 6, 9, 16, 25 etc.

    Note: 1 is neither a composite number nor a prime number.

13. **Perfect Numbers: –** If the addition of all the factors of a number excluding the number itself happens to be equal to the number, it is called a perfect number.

    First perfect number is 6.

    Factors of 6 are 1, 2, 3, 6.

    Now add all the factors excluding 6.

    1+2+3 = 6, hence 6 is a perfect number.

    Example: 28, 496 and 8128.

14. **Complex Numbers: –** The number which have real and imaginary component is called a complex number.

    Example: 3+4i, 5+6i, where $\mathrm{i} = \sqrt{-1} = \text{a imaginary number}$

15. **Face Value** of a digit in a number is its own value.

    Example: 6728, Face Value ⇒ 6 = 6, 7 = 7, 2 = 2 and 8 = 8

16. **Place Value** of a digit is given by multiplying it with value of place where it is placed.

    Example: 6729

    Place Value of 9 ⇒ 9 × 1 = 9

    Place Value of 2 ⇒ 2 × 10 = 20

    Place Value of 7 ⇒ 7 × 100 = 700

Divisibility Rules

Divisibility by	Criteria
2	A number is divisible by 2 when its units place is 0 or divisible by 2. Example: 130, 128 etc.
3	A number is divisible by 3 when the sum of its digits is divisible by 3. Example: 6561 ⇒ 6+5+6+1 = 18 is divisible by 3 17281 ⇒ 1+7+2+8+1 = 19 is not divisible by 3
4	When the last two digits of the number are 0's or divisible by 4. Example: 17400, 132, 12348 etc.
5	If the unit digit is 5 or 0, the number is divisible by 5. Example: 895, 100, 125, 625, 400 etc.
6	A number is divisible by 6, if it is divisible by both 2 and 3.

7	A number is divisible by 7, if and only if the number of tens added to 5 times the number of units, is divisible by 7 Example: 105 is divisible by 7, since 10+5*5= 10+25=35, which is divisible by 7.
8	If the last three digits of the number are 0's or divisible by 8, the number is divisible by 8. Example: 125128, 135000 etc.
9	If sum of digits is divisible by 9, the number is also divisible by 9. Example: 729 ⇒ 7+2+9 = 18 is divisible by 9. 46377 ⇒ 4+6+3+7+7 = 27 is divisible by 9.
10	A number is divisible by 10 if and only if the unit place digit is 0. Example: 100, 23450, 1100 etc.
11	When difference between sum of digits at odd places and sum of digits at even places is either 0 or 11, the number is divisible by 11. Example: 65967 ⇒ (6+9+7) – (5+6) = 22 – 11 = 11 is divisible by 11.
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+ (46) = 338 :: 33+(48) = 65. Since 65 is divisible by 13, the original no. 3146 is also divisible
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*8)=187. Since 187 is divisible by 17, the original number 2278 is also divisible.
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.

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

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

H.C.F or G.C.F = 2 x 2 x 3 = 12

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 isthe **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 = $(p^0+p^1+...+p^a)\ (q^0+ q^1+.... +q^b)\ (r^0+r^1+...+r^c)$

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** = [(20+21+22+23) (30+31) (50+51)]= 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)*(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 $\lfloor n$

N! =N(N-1) (N-2) ……1.
4! =4*3*2*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 divisible by powers of 5.Itmeans numerator is greater or equal to denominator.
N/5 + N/5^2 + N/5^3 ..... N>= 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! Have 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]+……..[N/p^n] till N>=p^n.Take only quotient of these divisions.

Example 1- Highest power of 2 in 50!?
50/2 +50/4 +50/8+50/16 +50/32
= 25+12+6+3+1 = 47

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=2x3.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, thehighest power of 6 is 8.

REMAINDER

Remainder Theorem:- Dividend =Divisor x Quotient + RemainderWhen dividend is of the form $a^n + b^n$ or $a^n - b^n$:

Theorem1: $a^n + b^n$ 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 +... is divided by x – a

The remainder when $f(x) = a + bx + cx^2 + dx^3 + ..$ 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 × 1999 × 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 × 4 × 5 = 60 is divided by 7.So, the final remainder is4.

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'stheorem.

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 state 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 remainderobtained when 16 is divided by 17 = Rem (16).

UNIT DIGIT

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

Example:- 121x76x528x172= 1x6x8x2=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
$2^1=2$	$3^1=3$	$4^1=4$	$5^1=5$	$6^1=6$	$7^1=7$	$8^1=8$	$9^1=9$
$2^2=4$	$3^2=9$	$4^2=6$	$5^2=5$	$6^2=6$	$7^2=9$	$8^2=4$	$9^2=1$
$2^3=8$	$3^3=7$	$4^3=4$	$5^3=5$	$6^3=6$	$7^3=3$	$8^3=2$	$9^3=9$
$2^4=6$	$3^4=1$	$4^4=6$	$5^4=5$	$6^4=6$	$7^4=1$	$8^4=6$	$9^4=1$
$2^5=2$	$3^5=3$	$4^5=4$	$5^5=5$	$6^5=6$	$7^5=7$	$8^5=8$	$9^5=9$
$2^6=4$	$3^6=9$	$4^6=6$	$5^6=5$	$6^6=6$	$7^6=9$	$8^6=4$	$9^6=1$
$2^7=8$	$3^7=7$	$4^7=4$	$5^7=5$	$6^7=6$	$7^7=3$	$8^7=8$	$9^7=9$

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 449/4 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 that numbers are same as there last digits ending in 0 or 1 or 5 or 6 whatever the power is.

Eg.- (235)^27= unit digit 5 (126)^344= 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 giveus the unit digit.

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

Example.1- (327)^2222/4 =Rem(2)
Last digit is 7. Make remainder 2 to power of 7=7^2=49So , 9 is a unit digit.

Example.2- (28)^36
36/4=Rem(0). Here take remainder as 4.
Last digit is 8. Then, 8^4 = 64 x 64 = 4 x 4 = 16.So, unit digit is 6.

Class Practice Problems

Questions on Rules of Divisibility

1. 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
2. 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
3. If 256X561 is divisible by 11, then what can be the value of 'X'?
   (a) 3 (b) 0 (c) 6 (d) 8
4. If ABC0 is a 4 digit number divisible by 4, then how many such 4 digit number exist?
   (a) 360 (b) 400 (c) 450 (d) 500

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

5. The LCM of 5,8,12, 20 will not be a multiple of?
   (a) 3 (b) 9 (c) 8 (d) 5
6. Find L.C.M. of 1.05 and 2.1?
   (a) 1.3 (b) 1.25 (c) 2.1 (d) 4.30

7. How many numbers between 200 and 600 are divisible by 4, 5 and 6?
   (a) 5 (b) 6 (c) 7 (d) 8
8. 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
9. Three bells toll at intervals of 9, 12 and 15 minutes respectively. All three begins to toll at 8 a.m. At whattime will they first toll together again?
   (a) 11 a.m. (b) 8:30 a.m. (c) 10 a.m. (d) 10:30 a.m.

10. A person has to completely put each of the three liquids i.e., 403 liters of petrol, 465 liters of diesel and 496liters 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
11. Five bells begin to toll together at intervals of 9 s, 6 s, 4 s, 10 s and 8 s, respectively. How many times willthey toll together in the span of one hour (excluding the toll at the start)?
    (a) 5 (b) 8 (c) 10 (d) None of these

Factors & Factorials

12. 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
13. How many factors of 1200 are odd integers?
    (a) 6 (b) 8 (c) 12 (d) 22

14. Find the total no of prime factors in $4^{11} \times 7^5 \times 11$?
    (a) 17 (b) 27 (c) 28 (d) 30
15. Find the sum of factors of 18?
    (a) 6 (b) 13 (c) 39 (d) 35
16. Find the number of factors of 6!?
    (a) 25 (b) 30 (c) 35 (d) 32
17. Find the number of trailing zeroes in the expansion of 23!?
    (a) 5 (b) 4 (c) 20 (d) 21

Remainders

18. 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)
19. Find the remainder when 2^{93} is divided by 7?
    (a) 1 (b) 2 (c) 4 (d) 6
20. Find the remainder when 24^5 is divided by 5?
    (a) 0 (b) 1 (c) 4 (d) None of these
21. The remainder, when $(15^{23} + 23^{23})$ is divided by 19, is?
    (a) 4 (b) 15 (c) 0 (d) 18
22. What is the remainder when 4^{96} is divided by 6?
    (a) 0 (b) 2 (c) 3 (d) 4

UNIT DIGIT

23. If the unit's digit in the product of (47ax729 x345 x343) is 5, then how many values that a can take?
    (a) 9 (b) 3 (c) 7 (d) 5
24. The rightmost non - zero digit of the number 30^{2720} is?
    (a) 1 (b) 3 (c) 7 (d) 9
25. What is the unit digit in 2^9?
    (a) 1 (b) 3 (c) 2 (d) 4
26. What is the unit's digit of the number $(6^{256} - 4^{256})$?
    (a) 0 (b) 1 (c) 4 (d) 7
27. Find the unit digit in the product (243 × 397 × 2497 × 3913)?
    (a) 4 (b) 3 (c) 7 (d) 1
28. 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
29. Find the unit's digit in $(264^{102}+264^{103})$?
    (a) 0 (b) 2 (c) 4 (d) 6
30. 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

Tutorial Practice Problems

Questions on Rules of Divisibility

1. If the number 517*324 is completely divisible by 3, then the smallest whole number in the place of * will be ?
   a) 2 b) 3 c) 4 d) 5
2. 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

3. 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
4. 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)

5. The least perfect square number which is divisible by 3, 4, 5, 6 and 8, is?
   (a) 900 (b) 1200 (c) 2500 (d) 3600
6. 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
7. 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
8. 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
9. Calculate H.C.F. of 2/3, 16/81 and 8/9?
   (a) 2/9 (b) 8/3 (c) 2/81 (d) 3/16
10. 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
11. 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

Remainders

12. (74n-64n), where n is an integer > 0, is divisible by?
    (a) 13 (b) 5 (c) 17 (d) All of these
13. Find the remainder when n is divided by 12 where
    N = 1821 × 1823 × 1827?
    (a) 9 (b) 12 (c) 15 (d) 18
14. 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
15. 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

16. What will be the last digit of the multiplication $3^{153}*7^{162}$?
    (a) 5 (b) 9 (c) 7 (d) 6
17. The digit in the unit place of the number 7^295 X 3^158 is?
    (a) 7 (b) 2 (c) 6 (d) 4
18. Find the unit digit of $(23)^{25!}$?
    (a) 0 (b) 2 (c) 3 (d) 1

19. The unit digit of $(137^{13})^{47}$ is?
    (a) 1 (b) 3 (c) 5 (d) 7
20. The unit digit of $35^{87} + 93^{46}$ is?
    (a) 2 (b) 4 (c) 6 (d) 8
21. The unit digit of $44^{91} \times 73^{37}$ is?
    (a) 2 (b) 4 (c) 6 (d) 8
22. The unit digit of $12^{34}-5^{9}$ is?
    (a) -1 (b) 1 (c) 9 (d) None of these
23. Find the unit digit of given product $(2^{34} \times 14^{832} \times 17^{21})$?
    (a) 6 (b) 8 (c) 2 (d) 7

Factors & Factorials

24. Find the number of trailing zeroes in the expansion of 1000!?
    (a) 250 (b) 300 (c) 249 (d) 245
25. Find the number of zeros in 2*3*4*5 *125?
    (a) 30 (b) 35 (c) 38 (d) 31
26. Find the highest power of 24 in 150!?
    (a) 48 (b) 72 (c) 58 (d) 45
27. Find the highest power of 30 in 40!?
    (a) 12 (b) 10 (c) 8 (d) 9
28. 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

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= (x1+x2+x3+… ..... +xn)/n

Example: If the ages of 4 students are 20 years, 22 years, 18 years and 24 years, then what is the average age ofthe 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*x) yr
2. If the average age of n persons increases by x years. Then, the total age of n persons increases by (n*x) yr

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

Solution: Total age increased=6*2=12 yearAge 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 whois 12 years older to him.

Average of Some Important Series of Numbers

The average of odd numbers from 1 to n,
= **(Last odd number +1)/2**(n=Last odd number)

The average of even numbers from 2 to n,
= **(Last even number +2)/2**(n=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 = (First Number+ Last Number)/2
5. The average of 1 to 'n' odd numbers = (Last Odd Number+1)/2
6. The average of 1 to 'n' even numbers = (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:-

$$A = \frac{n1a1+n2a2+n3a3+\ldots\ldots\ldots\ldots}{n1+n2+n3+\ldots\ldots\ldots\ldots\ldots}$$

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 frompoint 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 theentire journey?
Solution: Average Speed =2xy / (x+y)
= (2*30*10)/30+10
= 600 / 40 = 15 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 speedfor the whole journey will be = **3 ABC/ (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

$$\text{Average Speed} = \frac{xyz}{Pyz+Qxz+Rxy}$$

Class Practice Problems

Type 1 - Averages and Numbers

1. Find the average of the following set of scores 216,463,154,605,446,336?
   A. 370 B. 560 C. 360 D. 520
2. 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
3. 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
4. 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

5. In a college, 16 girls have the average age as 18 years and 14 boys have the average age as 17 years. Whatwould be the average age of the entire college?
   A. 18.64 B. 17.54 C. 20.84 D. 16.34
6. The average salary of 25 employees in a company per month is Rs.6000.If the manager's salary is also addedthen 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
7. 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 wasRs.92 per day. What was his wage on the 8th day?
   A. 67 B. 79 C. 97 D. 98
8. 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 annualincome of all the employees in the factory together?
   A. 480 B. 580 C. 408 D. 690
9. 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 theincomes of three?
   A. 3600 B. 4800 C. 5200 D. 4600
10. 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

11. Arithmetic mean of the scores of a group of students in a test was 52.The brightest 20% of them secured amean score of 80 and the dullest 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

12. When a student weighing 45 kg left a class, the average weight of the remaining 59 students increased by200 grams. What is the average weight of the remaining 59 students?

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

13. 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

14. 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

15. 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 31instead of 13.What will be the correct average of those 8 observations?

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

16. The Arithmetic mean of 100 numbers was computed as 89.05.It was later found that two numbers 92 and83 have been misreads 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

17. In an examination, the average marks of all the students calculated to be 58 marks. It was later found thatmarks 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

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

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

19. A cricketer had a certain average of runs for his 64th innings. In his 65th innings, he is bowled out for noscore 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

20. The batting average of a cricket player for 64 innings is 62 runs. His highest score exceeds his lowest scoreby 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

Tutorial Practice Problems

1. The average of first five prime number is:
   A] 4.5 B] 5 C] 5.6 D] 7.5
2. The average of first five multiples of 3 is:
   A] 3 B] 9 C] 12 D] 15
3. The average of three numbers is 20. If the two numbers are 16 and 22, the third number is:
   A] 22 B] 20 C] 19 D] 18
4. The average of five results is 46 and that of the first four is 45. The fifth result is:
   A] 1 B] 10 C] 12.5 D] 50
5. The average of Radhika's marks in 7 subjects is 75. His average in six subjects excluding science is 72. How many marks did he get in Science?
   A] 72 B] 90 C] 93 D] None of these
6. 9Of three numbers, second is twice the first and is also thrice the third. If the average of the three numbers is 44, the largest number is:
   A] 24 B] 36 C] 72 D] 108
7. The average of ten numbers is 7. If each number is multiplied by 12, then the average of new set of numbers is:
   A] 7 B] 19 C] 82 D] 84
8. The average age of 30 students of a class is 12 years. The average age of a group of 5 of the students is 10 years and that of another group of 5 of them is 14 years. What is the average age of the remaining students?
   A] 8 years B] 10 years C] 12 years D] 14 years
9. The average of 50 numbers is 38. If two numbers 45 and 55 are discarded, the average of the remaining numbers is:
   A] 36.5 B] 37 C] 37.5 D] 37.52
10. The mean of 100 observations was calculated as 40. It was found later on that one of the observations was misread as 83 instead of 53. The correct mean is:
    A] 39 B] 39.7 C] 40.3 D] 42.7
11. The average of 11 observations is 60. If the average of first five observations is 58 and that of the last five is 56, the sixth observation is:
    A] 90 B] 110 C] 85 D] 100
12. Harish has twice as much money as Rohan and Rohan has 50% more money than what Anita has. If the average money with them is Rs.110, then Harish has:
    A] Rs.55 B] Rs. 60 C] Rs.90 D] Rs. 180
13. A motorist has travels to a place 150 km away at an average speed of 50 km per hour and returns at 30 km per hour. His average speed for whole journey in km per hour is
    A] 35 B] 37 C] 37.5 D] 40
14. The average of 5 numbers is 7. When 3 new numbers are added, the average of the eight numbers is 8.5. The average of three new numbers is:
    A] 11 B] 7.75 C] 8.5 D] 7
15. The average age of 24 boys and the teacher is 15 years. When the teacher's age is excluded, the average decreases by 1. What is the age of the teacher?
    A] 38 years B] 39 years C] 40 years D] Data inadequate
16. The average salary per month of 30 employees in a company is Rs. 4000. If the manager's salary is added, the average salary increases to Rs. 4300, what is the salary of the manager?
    A] Rs. 10000 B] Rs. 13000 C] Rs. 12000 D] Rs. 13300
17. The average age of 40 students of a class is 15 years. When 10 new students are admitted, the average is increased by 0.2 years. The average age of new students is:
    A] 15.2 years B] 16 years C] 16.2 years D] 16.4 years
18. The average weight of 8 men is increased by 1.5 kg when one of the men who weighs 65 kg is replaced by a new man. The weight of the new man is:
    A] 76 kg B] 76.5 kg C] 76.7 kg D] 77 kg

19. The average weight of 6 men decreases by 3 kg when one of them weighing 80 kg is replaced by a new man. The weight of the new man is:
    A] 56 kg B] 58 kg C] 62 kg D] 76 kg
20. The average age of a committee of eight members is 40 years. A member aged 55 years retired and his place was taken by another member aged 39 years. The average age of the present committee is:
    A] 39 years B] 38 years C] 36 years D] 35 years

Competitive level

1. The average salary of all the employees in a small organization is Rs 8,000. The average salary of 7 technicians is Rs 12,000 and the average salary of the rest is Rs 6,000. The total number of employees in the organisation is ?
    a) 21 b) 22 c)23 d) 24
2. Without any stoppage, a person travels a certain distance at an average speed of 42 km/h, and with stoppages he covers the same distance at an average speed of 28 km/h. How many minutes per hour does he stop?
    a) 14 min b)15min c)28min d)None of these
3. The average marks of Suresh in 10 papers are 80. If the highest and the lowest scores are not considered, the average is 81. If his highest score is 92, find the lowest score.
    a) 55 b)60 c)62 d) Cant be determined
4. Three maths classes: X, Y and Z take an algebra test. The average score of class X is 83. The average score of class Y is 76. The average score of class Z is 85. The average score of class X and Y is 79 and average score of class Y and Z is 81. What is the average score of classes X, Y, Z ?
    a) 81.5 b)80.5 c)83 d)78
5. The average of 17 numbers is 10.9. If the average of first nine numbers is 10.5 and that of the last nine numbers is 11.4, the middle number is
    a) 11.8 b)11.4 c)10.9 d)11.7
6. Suraj has a certain average of runs for 12 innings. In the 13th innings he scores 96 runs thereby increasing his average by 5 runs. What is his average after the 13th innings?
    a) 48 b)64 c)36 d)72
7. A batsman in his 17th innings makes a score of 85, and thereby increases his average by 3. What is his average after the 17th innings? He had never been 'not out'.
    a) 47 b)37 c)39 d)43
8. The sum of three numbers is 98. If the ratio between first and second be 2 : 3 and that between second and third be 5 : 8, then the second number is?
    a) 30 b)20 c)58 d)48
9. The average weight of 8 sailors in a boat is increased by 1 kg if one of them weighing 56 kg is replaced by a new sailor. The weight of the new sailor is?
    a) 57 kg b)60 kg c)64 kg d)62 kg
10. A number X equals 80% of the average of 5, 7, 14 and a number Y. If the average of X and Y is 26, the value of Y is?
    a) 13 b)26 c)39 d)None of these
11. The average age of P, Q, R, S five years ago was 45 years. By including T, the present average age of all the five is 49 years. The present age of T is?
    a) 64 years b)48 years c)45 years d)40 years
12. At Chennai it rained as much on Tuesday as on all the others days of the week combined. If the average rainfall for the whole week was 3 cm. How much did it rain on Tuesday?
    a) 2.625 cm b)3 cm c)10.5 cm d)15 cm
13. The average monthly expenditure of a family for the first four months is Rs 2,750, for the next three months is Rs 2,940 and for the last five months Rs 3,130. If the family saves Rs 5,330 during the whole year, find the average monthly income of the family during the year.
    A) Rs 3,800 b)Rs 3,500 c)Rs 3,400 d)Rs 4,200

14. The average age of 8 men is increased by 2 years. When two of them, whose ages are 20 years and 24 years respectively are replaced by two women. What is the average age of these women?
    a) 36 years b)30 years c)40 years d)42 years
15. The average of 50 numbers is 38. If two numbers 45 and 55 are discarded, the average of the remaining set of numbers is
    a) 38.5 b)37.5 c)37.0 d)36.5
16. The average speed of a train running at a speed of 30 km/hr during the first 100 kilometres, at 40 km/hr during the second 100 kilometres and at 50 km/hr during the last 100 kilometres is nearly ?
    a) 38.5 km/hr b)38.3 km/hr c)40.0 km/hr d)39.2 km/hr
17. The average of 6 observations is 12. A new observation is included and the new average is decreased by 1. The seventh observation is?
    a) 1 b)3 c)5 d)6
18. The average age of 20 men in the class is 15.6 years. Five new men join and the new average becomes 15.56 years. What was the average age of five new men?
    a) 15.5 b)15.4 c)15.25 d)15.3
19. The average weight of 3 men A, B and C is 84 kg. Another man D joins the group and the average now becomes 80 kg. If another man E, whose weight is 3 kg more than that of D, replaces A, then average weight of B, C, D and E becomes 79 kg. The weight of A is?
    a) 70 kg b)72 kg c)75 kg d)80 kg
20. There was one mess for 30 boarders in a certain hostel. The number of boarders being increased by 10, the expenses of the mess were increased by Rs 40 per month while the average expenditure per head diminished by Rs 2. Find the original monthly expenses.
    A) Rs 390 b)Rs 410 c)Rs 360 d)Cannot be determined

Simplification

1. 'BODMAS' Rule:
This rule depicts the correct sequence in which the operations are to be executed, so as to find out the value of
given expression.
Easy and simple way to remember BODMAS rule!!
B → Brackets first (parentheses)
O → Of (orders i.e. Powers and Square Roots, Cube Roots, etc.)
DM → Division and Multiplication (start from left to right)
AS → Addition and Subtraction (start from left to right)
Thus, in simplifying an expression, first of all the brackets must be removed, strictly in the order (), {} and ||.
After removing the brackets, we must use the following operations strictly in the order:
(i) of (ii) Division (iii) Multiplication (iv) Addition (v) Subtraction.
Note:
(i) Start Divide/Multiply from left side to right side since they perform equally.
(ii) Start Add/Subtract from left side to right side since they perform equally.

2. Virnaculum (or Bar) :
When an expression contains Virnaculum, before applying the 'BODMAS' rule, we simplify the expression under
the Virnaculum.
3. Modulus of a Real Number :
Modulus of a real number a is defined as
$|a| = a$, if $a > 0$ or $-a$, if $a < 0$.
Thus, $|5| = 5$ and $|-5| = -(-5) = 5$.

Practice Problems

1. 180% of 25501 + 50% of 28999 = ?

   (a)62400 (b) 64000 (c) 60400 (d) 64200 (e) 60600

2. 171.995 × 14.995 ÷ 25 = ?

   (a)103 (b) 115 (c) 110 (d) 125 (e) 118

3. 175 × 28 + 275 × 27.98 = ?

   (a)11800 (b) 12600 (c) 12800 (d) 11600 (e) 16200

4. 324.995 × 15.98 ÷ 4.002 + 36.88 = ?

   (a)1300 (b) 1230 (c) 1340 (d) 1380 (e) 1390

5. 1164 × 128 ÷ 8.008 + 969.007 = ?

   (a)18800 (b) 19393 (c) 19593 (d) 19200 (e) 20293

6. $\sqrt{624.98} + \sqrt{729.25}$ = ?

(a)58 (b) 56 (c) 52 (d) 61 (e) 62

7. 69.008% of 699.98 + 32.99% of 399.999 = ?

(a)615 (b) 645 (c) 675 (d) 715 (e) 815

8. (9321 + 5406 + 1001) ÷ (498 + 929 + 660) = ?

(a)13.5 (b) 4.5 (c) 2.5 (d) 7.5 (e) 21.5

9. 63.5% of 8924.2 + ?% of 5324.4 = 6827.5862

(a)36 (b) 52 (c) 13 (d) 21 (e) 41

10. 67% of 801 – 231.17 = ? – 23% of 789

(a)490 (b) 440 (c) 540 (d) 520 (e) 590

11. 499.99 + 1999 ÷ 39.99 × 50.01 = ?

(a)3200 (b) 2700 (c) 3000 (d) 2500 (e) 2400

12. 73.99% of 1299 + 9.98% of 1899 = ?

(a)1250 (b) 1230 (c) 1150 (d) 1180 (e) 1200

13. 67% of 801 – 231.17 = ? – 23% of 789

(a)490 (b) 440 (c) 540 (d) 520 (e) 590

14. $(15.95)\ 1\ 4 + (3.01)\ 3 - 111.99 \times 2.02 + (9.98)\ 2$ = ?

(a)95 (b) –95 (c) 105 (d) –105 (e) –115

15. 126.99% of 1539.98 + 5.5% of 149.99 + 103.98% of 7 = ?

(a)1860 (b) 1970 (c) 2080 (d) 2150 (e) 1055

16. 67.99% of 1401 – 13.99% of 1299 = ?

(a)700 (b) 720 (c) 770 (d) 800 (e) 740

17. 5466.97 – 3245.01 + 1122.99 = ? + 2309.99

(a)1130 (b) 1000 (c) 1100 (d) 1035 (e) 1060

18. 5998 ÷ 9.98 + 670.99 – 139.99 = ?

(a)1080 (b) 1280 (c) 1180 (d) 1130 (e) 1230

19. $-(4.99)^3 + (29.98)^2 - (3.01)4$ = ?

(a)554 (b) 594 (c) 624 (d) 654 (e) 694

20. $\sqrt{3135} \times \sqrt{577} \div \sqrt{255}$ = ? ÷ 8

(a)620 (b) 670 (c) 770 (d) 750 (e) 700

21. 12.002 × 15.005 – 8.895 × 6.965 = ?

(a)130 (b) 117 (c) 105 (d) 110 (e) 95

22. 105.1% of 8401.01 – $\mathbf{3\ 7}$ % of 5600.12 + 9.999 = ?

(a)8880 (b) 8080 (c) 8850 (d) 8760 (e) 8806

23. $30.01^2 – 19.98^2$ - ? = 21.97^2

(a)49 (b) 50 (c) 30 (d) 39 (e) 16

24. $(4.989)^2 + (21.012)^3 + \sqrt{\mathbf{1090}}$ = ?

(a)9219 (b) 9391 (c) 9319 (d) 9129 (e) 9643

25. $\sqrt{\mathbf{65\ 3}} \times \mathbf{23.93} - \mathbf{31.04}$ = ?

(a)98 (b) 65 (c) 102 (d) 35 (e) 79

26. 56% of 958 + 67% of 1008 = ?% of 2000

(a)60.592 (b) 47.622 (c) 42.86 (d) 91.455 (e) 65.092

27. $\sqrt{\mathbf{5929}} + \sqrt{\mathbf{8464}}$ = (?) $\mathbf{2}$

(a)11 (b) 19 (c) 13 (d) 21 (e) 23

28. (47 × 588) ÷ (28 × 120) = ?

(a)6.284 (b) 7.625 (c) 8.225 (d) 8.285 (e) 82.25

29. $\mathbf{5\ 8\ of\ 4\ 9\ of\ 3\ 5\ of\ 222}$ =?

(a)42 (b) 43 (c) 39 (d) 37 (e) 47

30. 74156 – ? – 321 – 20 + 520 = 69894

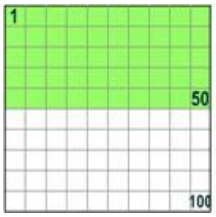
(a) 3451 (b) 4441 (c) 5401 (d) 4531 (e) 4414

PERCENTAGE

PERCENT

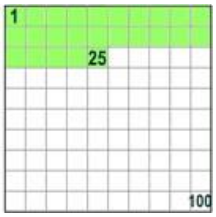
When we say "Percent" we mean "per 100"

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
½	0.5	50%
1/3	0.333…	33.333…%
2/3	0.666…	66.666…%
¼	0.25	25%
¾	0.75	75%
1/5	0.2	20%
2/5	0.4	40%
3/5	0.6	60%
4/5	0.8	80%
1/6	0.1666…	16.666…%
5/6	0.8333…	83.333…%
1/8	0.125	12.50%
3/8	0.375	37.50%
5/8	0.625	62.50%
7/8	0.875	87.50%
1/9	0.111…	11.111…%
2/9	0.222…	22.222…%
4/9	0.444…	44.444…%
5/9	0.555…	55.555…%
7/9	0.777…	77.777…%
8/9	0.888…	88.888…%
1/10	0.1	10%
1/12	0.08333…	8.333…%
1/16	0.0625	6.25%
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%	0.7.5. (2 Places)	0.75	move the decimal point **2 places to the left**, 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	0.1.2.5 (2 Places)	12.5%	move the decimal point **2 places to the right**, 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 $^{2}/_{5}$ to a decimal.

Divide 2 by 5: 2 ÷ 5 = 0.4
Answer: $^{2}/_{5}$ = 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.

E. FROM FRACTION TO PERCENTAGE:

The easiest way to convert a fraction to a percentage is to multiply the fraction by 100 and reduce it to decimal form and add the "%" sign.

Example: Convert $^{3}/_{8}$ to a percentage

Multiply 3/8 by 100: 37.5
Add the "%" sign: 37.5%
Answer: $^{3}/_{8}$ = 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!!!

Class Practice Problems

Type 1 – Basic Questions

1. A person who spends 66 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
2. 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
3. If x is 80% of y, what percent of x is y?
   A. 75% B. 80% C. 100% D. 125%
4. If 50% of (x-y) = 30% of (x+y) then what percent of x is y?
   A. 33% B. 30% C. 25% D. 23%
5. 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%
6. Arun got 30% of the maximum marks in an examination and failed by 10 marks.However, Sujith who tookthe 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
7. P is six times as large as Q. The per cent that Q is less than P is?
   A. 83 1/3% B. 16 2/3% C. 90% D. 60%
8. Dipin's score is 15% more than that of Rafi. Rafi's score is 10% less than that of Chandar. If the differencebetween the scores of Dipin and Chandar is 14, what is the score of Rafi?
   A. 180 B. 360 C. 120 D. 480

9. A student multiplied a number by 3/5 instead of 5/3. What is the percentage error in the calculation?
   A. 34% B. 44% C. 54% D. 64%
10. 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

11. 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%
12 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%
13. 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
14. 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

15. 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 2/3 D. 15
16. 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 1/13% D. 300/7%
17. 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
18. 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

19. 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%
20. 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

21. 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
22. 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%
23. 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
24. 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. 2/11 B. 1/4 C. 1/3 D. 3/4
25. In a library, 20% of the books are in Hindi. 50% of the remaining 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

Tutorial practice Problems

1. What is the value of 58.33% of 2412?
   a) 1332 b) 1403 c) 1407 d) 1427
2. What is 25% of 75% of $3/5^{th}$ of 4240?
   a) 595 b) 424 c) 348 d) 477
3. One-fifth of a number is 62. What will 73% of that number be?
   a) 198.7 b) 212.5 c) 226.3 d) 234.8
4. 71% of a number is 120 more than 46%. What is 30% of that number?
   a) 160 b) 150 c) 140 d) none of these
5. If 63% of a number exceeds 28% of the same number by 105. What is the value of that number?
   a) 260 b) 300 c) 320 d) 330
6. If 450% of a certain number is equal to $3/4^{th}$ of another number, then what will be 80% of the number?
   a) 3:2 b) 2:5 c) 5:2 d) 1:6
7. If $3/5^{th}$ of a number is 23 more than 50% of the same number, them what will be 80% of the number?
   a) 92 b) 18 c) 180 d) 186
8. If 8% of P is equal to 4% of Q, then 20% of P is:
   a) 10% of Q b) 15% of Q c) 20% of Q d) 25% of Q
9. If the numerator of a fraction is increased by 300% and the denominator is increased by 500%, the resultant fraction is 5/12. What was the original fraction?
   a) 8/5 b) 5/11 c) 12/5 d) none of these

10. Naresh's salary is 40% more than Rajesh. How much percentage does Rajesh salary less than Naresh?
    a) 26 5/7% b) 28 4/7% c) 29 1/7% d) 27 3/7%
11. Two numbers are respective by 40% and 50% more than a third number. By what percentage is the first number less than the second number?
    a) 8.75% b) 6.67% c) 3.33% d) 12.55
12. If the price of car is increased by 20%, then by how much percentage the new price is decreased to get back to the original price?
    a) 20% b) 25% c) 16.66% d) 33.33%
13. If the price of a car is increased by 10%, then by how much percentage the new price is decreased so that it becomes equal to the original price?
    a) 9.09% b) 10% c) 11.11% d) 12.5%
14. The population of a village is 5000 and it increases at the rate of 4% every year. After 2 years, the population will be:
    a) 5416 b) 5402 c) 5400 d) 5408
15. A positive number is divided by 5 instead of being multiplied by 5. What percent is the result of the required correct value?
    a) 4% b) 25% c) 5% d) 10%
16. Sonika spent Rs. 45,760 on the interior decoration for her home, Rs. 27896 on buying air conditioner and the remaining 28% of the total amount she had as cash with her. What was the total amount?
    a) Rs. 98540 b) Rs. 102300 c) Rs. 134560 d) cannot be determined
17. Latika spends 45% of her monthly income on food and 30% of the monthly income on transport. Remaining amount of Rs. 4500 she saves. What is her monthly income?
    a) Rs. 16000 b) Rs. 18000 c) Rs. 16500 d) Rs. 18500
18. The price of a Maruti car rises by 30% while the sales of the car comes down by 20%. What is the percentage change in the total revenue?
    a) -4% b) -2% c) +4% d) +2%
19. The tax on commodity is diminished by 20% and its consumption increases by 15% find the effect of revenue?
    a) 8% b) 7.5% c) 10% d) 6%
20. If tax on a commodity is reduced by 10%, total revenue remains unchanged. What is the percentage increase in its consumption?
    a) 11 1/9% b) 20% c) 10% d) 9 1/11%
21. If the price of petrol is increases by 25% and Kevin intends to spend only 15% more on petrol. By how much percentage should he reduces the quantity of petrol that he buys?
    a) 4 b) 6 c) 8 d) 10
22. If the length and breadth of a rectangle became half and double, respectively, what will be the net effect in the resultant area?
    a) 25% b) 55% c) 75% d) none of these

23. A man had Rs. 4800 in his locker two years ago. In the first year, he deposited 20% of the amount in his locker. In the second year, he deposited 25% of the increased amount in his locker. Find the amount at present in his locker.
    a) Rs. 5200 b) Rs. 6800 c) Rs. 7200 d) Rs. 8000

24. An exhibition was conducted for 4 weeks. The number of tickets sold increased by 20% in 2nd week and increased by 16% in the 3rd week but decreased by 20% in the 4th week. Find the number of tickets sold in the 1st week, if 1392 tickets were sold in the last week.
    a) 1350 b) 1250 c) 1200 d) 1050
25. If the length of a rectangular field is increased by 20% nd the breadth is reduced by 20%, the area of the rectangle will be 192 m^2. What is the area of original rectangle?
    a) 184m^2 b) 196m^2 c) 204m^2 d) none of these

26. If the length of a rectangle increases by 20% while the breadth decreases by 20%, what is the percentage change in the area of the rectangle?
    a) No change b) 4% decrease c) 45 increase d) 20% decrease
27. If the radius of a circle is increased by 20% then the area is increased by :
    a) 44% b) 120% c) 144% d) 40%
28. Sujata scored 2240 marks in an examination that is 128 marks more than the minimum passing percentage of 64%. What is the percentage (approx.) of marks obtained by Meena if she scores 907 marks less than Sujata?
    a) 35 b) 40 c) 45 d) 36
29. Prerna decided to donate 15% of her salary to an orphanage. On the day of donation she changed her mind and donated Rs. 1896 which was 82% of what she decided earlier. How much is Prerna's salary?
    a) Rs. 18500 b) Rs. 10250 c) Rs. 15800 d) none of these
30. 405 sweets were distributed equally among children in such a way that the number of sweets received by each child is 20% of the total number of children. How many sweets did each child receive?
    a) 15 b) 45 c) 9 d) 18

Competition Level

1. A district has 64000 inhabitants. If the population increases at the rate of 2 * 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
2. 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
3. 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
4. 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
5. 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

6. The cost price of goods with a bankrupt is Rs. 25500 and if the goods had realised in their full value, his creditiors would have received 85 paise in the rupee. But 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
7. 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. 2/5th 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) 2/11 (b) ¼ (c) 1/3 (d) 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 epaper. 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.
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)3/5 (b) 6/7 (c) 5/7 (d) 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°C 50°C and it loses at the same rate when the temperature is in the range of 20° – C30°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°C per hour and during the afternoon it stated 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°C and at 4 p.m, it was 40°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 panchyat 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 get 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

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 tomake 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 greaterthan 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)/ CPx100

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 piece 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(%)	Profit=(SP) – (CP) $\text{Profit percentage}\% = \left(\frac{\text{Profit}}{\text{Cost Price}}\right) \times 100$
Loss percentage(%)	Loss= (CP) – (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

Class Practice Problems

1. 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
2. Monika purchased a pressure cooker at 9/10th of its selling price and sold it at 8% more than its S.P. Findher gain percent?
   A.20% B. 10% C. 15% D. 30%
3. 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
4. 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
5. A shopkeeper buys scientific calculators in bulk for Rs. 15 each. He sells them for Rs. 40 each. Calculate theprofit on each calculator as percentage of the cost price.
   A. 166.67% B. 150% C. 66.67% D. 123%
6. If the cost price of a book is Rs. 150 and selling price is 137.50, then calculate the percentage loss on thebook?
   A. 12.33% B. 8.33% C. 10% D. 15%
7. What is the loss percent if a man loses Rs.10 on selling and article for Rs.100?
   A. 120/13 B. 111/12 C. 100/11 D. 120/11
8. 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

9. 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
10. A man sells 320 mangoes at the cost price of 400 mangoes. His gain percent is?
    A. 25% B. 30% C. 35% D. 15%
11. 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

12. 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
13. 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
14. 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
15. 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

16. A man sells 2 flats for Rs 675958 each. On one he gains 16% while on the other his losses 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
17. 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

18. A shopkeeper marks the price of the price of the article at Rs.80. Find the cost if after allowing a discount of 10%, he stills gains 20% on the cost price?
    A. 60 B. 40 C. 29 D. 39
19. 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)
20. Find the single discount equivalent to successive discounts of 40% and 20%.
    A. 52% B. 45% C. 46% D. 48%
21. 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%
22. 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

23. 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%

24. 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
25. A trader sold an article at a loss of 5% but when he increased the selling price by Rs.65 he gained 3.33% onthe 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
26. A person incurs a loss of 5% be selling a watch for Rs. 1140. At what price should the watch be sold to earn5% profit?
    A. Rs.1200 B. Rs.1230 C. Rs.1260 D. Rs.1290
27. The marked price of an article is increased by 25% and the selling price is increased by 16.66%, then theamount of profit doubles. If the original marked price be Rs. 400 which is greater than the corresponding costprice by 33.33%, what is the increased selling price?
    A. 240 B. 360 C. 420 D. 600
28. 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 mustbe the selling price per ream?
    A. 90 B. 89 C. 87.48 D. 86
29. If the manufacturer gains 10 %, the wholesale dealer 15 % and the retailer 25 %, then find the cost ofproduction of a table if the retail price was Rs 1265
    A. Rs. 750 B. Rs. 800 C. Rs. 850 D. Rs. 900

Tutorial Practice Problems

1. An article was sold for Rs. 5220 at a loss of 42% of the cost price. What will be the selling price of the article for a profit of 42%?
   a) Rs. 12680 b) Rs. 12780 c) Rs. 12880 d) Rs. 12580
2. A man sells a book at a profit of 20%. if he had bought it at 20% less and sold it for Rs. 18 less, he would have gained 25%. The cost price of the book is:
   a) Rs. 80 b) Rs. 70 c) Rs. 60 d) Rs. 90
3. A shopkeeper purchased a bat and sold it at a loss of 15%. If he had bought it for 20% less and sold it for Rs. 147.2 more, he would have earned profit of 35%. What is the cost price of bat?
   a) Rs. 540 b) Rs. 600 c) Rs. 625 d) Rs. 640
4. A man buys one table and one chair for Rs. 500. He sells the table at a loss of 10%and the chair at a gain of 10%. He still gains Rs. 10 on the whole. The cost price of the chair is:
   a) Rs. 250 b) Rs. 300 c) Rs. 350 d) Rs. 200
5. Raju purchased an item for Rs. 4500 and sold it at a gain of 15%. From that amount he purchased another item and sold it at a loss of 10%. What is his overall gain/loss?
   a) Gain of Rs. 152.50 b) Gain of Rs. 157.50 c) Loss of Rs. 165 d) neither gain or loss
6. A milkman mixes 10% water in pure milk but he is not content with it. So, he again mixes 20% more water in the previous mixture. What is the profit percentage of milkman if he sells it at cost price?
   a) 21% b) 32% c) 12.5% d) 9.99%

7. If the selling price of a product is increased by 162, then the business would make a profit of 175 instead of a loss of 19%. What is the cost price of the product?
   a) Rs. 540 b) Rs. 450 c) Rs. 360 d) Rs. 600
8. If on selling 12 notebooks a seller makes a profit equal to the selling price of 4 notebooks, what is his percent profit?
   a) 50 b) 25 c) $16\frac{2}{2}$ d) data inadequate
9. By selling 300 apples a seller gains the selling price of 60 apples. What is the gain percent?
   a) 200 b) 20% c) 25% d) $16\frac{2}{3}$ %
10. 60% goods are sold at 5% loss while rests are sold at 10% profit. If there is a total profit of Rs. 400, then the worth of goods sold is:
    a) Rs. 24000 b) Rs. 32000 c) Rs. 40000 d) Rs. 52000
11. A person bought 76 cows and sold 20 cows at 15% profit, 40 cows at 19% profit and remaining 16 cows' at25% profit and got a profit of Rs. 6570 as a whole. The cost price of each cow is:
    a) Rs. 450 b) Rs. 425 c) Rs. 420 d) Rs. 400
12. For a new apartment complex a person purchased 60 toilets and 20 shower heads. If the price of a toilet is three times the price of a shower head. Cost of all shower heads is what of the total cost?
    a) 9% b) 10% c) 11% d) 13%
13. Krishna has 12 oranges with him. He sells x of them at a profit of 10% and remaining at a loss of 10%. He gains 5% on the whole outlay. The value of x is:
    a) 7 b) 8 c) 9 d) 10
14. An article when sold for Rs. 960 fetches 20% profit. What would be the percent profit/loss if 5 such articles are sold for Rs. 825 each?
    a) 3.125% profit b) 3.125% loss c) neither profit nor loss d) 5% profit
15. A fruit seller buys some oranges at the rate of 4 for Rs. 10 and an equal number more at 5 for Rs. 10. He sells the whole lot at 9 for Rs. 20. What is his loss or gain percent?
    a) Loss percent $1\frac{19}{81}$ b) gain percent $1\frac{19}{81}$ c) no loss or no profit d) loss percent 2%
16. A shopkeeper sells two watches for Rs. 308 each. On one he gets 12% profit and on the other 125 loss. His profit or loss in the entire transaction was:
    a) 2.4% loss b) 2% profit c) 1.44% loss d) 1.44% profit
17. Ajit and Mohit sold their articles at Rs. 3636 each but Ajit incurred a loss of 10% while Mohit gained by 1%. What is the ratio of cost price of the articles of Ajit to that of Mohit?
    a) 101:90 b)89:92 c) 85:71 d) 87:99
18. I sold two watches for Rs. 300 each, one at the loss of 10% and the other at the profit of 10%. What is the net profit/loss that resulted from the transaction?
    a) 10% profit b) 1% profit c) 1% loss d) no profit, no loss
19. A man wants to sell his scooter. There are two offers, one at Rs. 12000 cash and the other at a credit of Rs. 12880 to be paid after 8 months, money being at 18% per annum. Which is the better offer?
    a) Rs. 12000 in cash b) Rs. 12880 at credit c) both are equal d) none of these

20. A shopkeeper uses 880 gm in place of one kg to sell his goods. Find his actual gain % when he sells his article on 6% gain on cost price?
    a) $28\frac{3}{17}\%$ b) $20\frac{5}{11}\%$ c) $23\frac{15}{21}\%$ d) $24\frac{8}{16}\%$
21. A seller uses 900 gm in place of 1 kg. if he sells his articles at 5% loss, then what is the profit percent?
    a) 5 b) 6 c) 5.55 d) 20
22. A trader uses a weight of 920 gram instead of 1 kg and sells the articles at the marked price which is 15% above the cost price. Find the profit percentage.
    a) 20% b) 23% c) 25% d) 10%
23. A balance of dealer weights 105 less than it should be. Still the trader marked-up his goods to get an overall profit of 20%. What is the markup done by the dealer on the cost price?
    a) 4% b) 8% c) 12% d) 16%
24. A shopkeeper earns a profit of 125 on selling a book at 10% discount on printed price. The ratio of the cost price to printed price of the book is:
    a) 45:56 b) 50:61 c) 90:97 d) 99:125
25. A printer manufacturer initially makes a profit of 12% by selling a particular model of printer for Rs. 6500. If the cost of manufacturing of that printer increased by 255 and selling price increased by 155, then what will be the profit percent.
    a) 5% b) 2.20% c) 4.5% d) 3.04%
26. A dealer marks his goods 20% above cost price. He then allows some discount on it and makes a profit of 6%. Find the profit percentage is:
    a) 14% b) 12% c) 11.67% d) 10%
27. The MP of an article is 30% higher than its CP and 20% discount is allowed on this article. Then the profit percentage is:
    a) 10% b) 14% c) 4% d) 25%
28. A dealer offers a discount of 15 on the marked price of an article and still makes a profit of 205. If its marked price is Rs. 800, then the cost price is:
    a) Rs. 600 b) Rs. 700 c) RS. 800 d) Rs. 900
29. Deepa bought calculator with 30% discounts on the listed price. Had she not got the discount, she would have paid Rs. 82.50 extra. At what price did she buy the calculator?
    a) Rs. 192.50 b) Rs. 275 c) Rs. 117.85 d) cannot be determined
30. After allowing a discount of 11.11%, a trader still makes a gain of 14.285. at how many percentage above the cot price does he mark up his goods?
    a) 28.56% b) 35% c) 22.22% d) 27%

Competition Level

1. A person buys 860 articles at Rs. 1900 due to some reason 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 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(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(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(1/9) c)Rs422(2/9) d)Rs322(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(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

INTEREST

SIMPLE INTEREST

If the interest on a sum borrowed for certain period is calculated uniformly, it is called **simple interest (SI).**Simpleinterest 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 inyears, 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 ofthe 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.

Formula

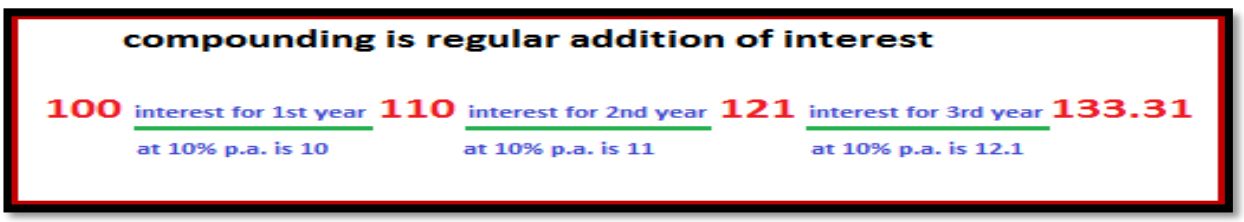
SIMPLE INTEREST **=** $\frac{\text{PRINCIPAL*RATE OF INTEREST*TIME}}{\mathbf{100}}$

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

COMPOUND INTEREST

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

Example: Calculate the interest if compounded annually for an amount of Rs. 100 for a time period of 3 years at therate of 10 % per annum.
Solution: Here, Principal =Rs. 100Time Period=3 years
Rate of interest =10% per annum



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	$P(1+\frac{R}{100})^n$	$P(1+\frac{R}{100})^n - P$

Class Practice Problems

Type 1 – Simple Interest

1. 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
2. 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
3. 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%
4. 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
5. A person borrows Rs. 5000 for 2 years at 4% p.a. simple interest. He immediately lends it to another person at 6 ¼% 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
6. 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
7. 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%
8. 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

9. 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
10. The Compound interest on Rs. 20,480 at 6 1⁄4 % per annum for 2 years 73 days is?
   A. Rs. 2929 B. Rs. 2219 C. Rs. 3021 D. Rs. 3049
11. A man invests Rs.5000 for 3 years at 5% p.a. compound interest reckoned yearly. Income tax at the rate of20% 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
12. The population of a town was 3600 three years back. It is 4800 right now. What will be the population threeyears 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
13. A tree increases annually by 1⁄5 th of its height. If its height today is 50 cm, what will be the height after 2years?
   A. 64 cm B. 72 cm C. 66 cm D. 84 cm
14. 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
15. 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
16. 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
17. 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
18. 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
19. 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

Tutorial Practice Problems:

1. A sum of Rs. 500 amounts to Rs. 650 in 3 years at simple interest. If the interest rate is increased by 4%, it would amount to how much for the same time period?
   a) Rs. 910 b) Rs. 810 c) Rs. 710 d) Rs. 610
2. Simple interest on a sum of Rs. 1550 for 2 years is Rs. 60 more than the simple interest on Rs. 1450 for the same duration and at the same interest. Find the rate of interest.
   a) 15% b) 30% c) 10% d) 20%
3. A sum of money invested for 5 years at $7\frac{1}{2}$% per annum yield Rs. 180000 simple interest. What is the total amount received at the end of 5 years?
   a) Rs. 400000 b) Rs. 480000 c) Rs. 540000 d) Rs. 660000

4. Rs. 800 becomes Rs. 956 in 3 years at certain rate of simple interest. If the rate of interest is increased by 4%, what amount will Rs. 800 become in 3 years?
   a) Rs. 1020. 8 b) Rs. 1025 c) Rs. 1052 d) data inadequate
5. A certain sum at a certain rate of simple interest amounts to Rs. 2250 in 4 years and Rs. 2400 in 7 years. Find the sum and rate of interest.
   a) Rs. 3050, 3.52% b) Rs. 5020, 2.43% c) Rs. 2050, 2.43% d) Rs. 3050, 2.85%
6. Rs. 20000 is being compounded at 20% per annum. If the rate of interest is charged half yearly. What will be the amount after 2 years?
   a) Rs. 28292 b) RS. 27292 c) Rs. 29282 d) Rs. 22358
7. The compound interest earned on a sum in 3 years at 15% per annum compounded annually is Rs. 6500.52. What is the sum?
   a) Rs. 2480 b) Rs. 10500 c) Rs. 14800 d) none of these
8. Sudharshan invested Rs. 15000 at compound interest at the rate of 10% per annum for one year. If the interest is compounded every six months what amount will Sudharshan get at the end of the year?
   a) Rs. 16537.50 b) Rs. 16500 c) Rs. 16525.50 d) Rs. 18150
9. The compound interest earned by Suresh on a certain amount at the end of two years at the rate of 8% per annum was Rs. 1414.4. What was the total amount that Suresh got back at the end of two years in the form of principal plus interest earned?
   a) Rs. 9414.4 b) Rs. 9914.4 c) Rs. 9014.4 d) Rs. 8914.4
10. How much will Rs. 20000 amount to (approximately) in 2 years at the rate of 15% per annum, the interest being compounded semi-annually?
    a) Rs. 27809 b) Rs. 27609 c) Rs. 26709 d) Rs. 28709
11. What will be the compound interest on a sum of Rs. 3000 at 10% per annum for 3/2 years (if interest compounded half yearly)
    a) Rs. 473 b) Rs. 374 c) Rs. 495 d) Rs. 347
12. The compound interest on Rs 8000 for 3 years at 8% for first year, 10% for second year and 12% for third year will be:
    a) Rs. 2722.24 b) Rs. 2644.48 c) Rs. 2836.18 d) Rs. 2684.12
13. If the compound interest on a sum of Rs. 5000 at the rate of 10% per annum is Rs. 1050, then what is the time period (interest compounded yearly)?
    a) 1 year b) 21/2 years c) 3 years d) 2 years
14. Rs. 12000 amounts to Rs. 20736 in 3 years at r% per annum of compound interest, find the value of 'r'?
    a) 10% b) 25% c) 12% d) 20%
15. A sum of Rs. 400 would become Rs. 441 after 2 years at r% compound interest; find the value of 'r'?
    a) 15% b) 5% c) 10% d) 20%
16. The effective annual rate of interest corresponding to a nominal rate of 8% per annum payable half yearly is:
    a) 8% b) 8.01% c) 8.13% d) 8.16%
17. A sum of money doubles in 3 years at r% compound interest. In 9 years it will be k times of the original principal. What is the value of k?
    a) 10 b) 9 c) 6 d) 8

18. Find the difference between the simple interest and compound interest on a principal of Rs. 5000 at the rate of 15% per annum for two years.
    a) Rs. 112.5 b) Rs. 115 c) Rs. 105 d) Rs. 120
19. What will be the difference between the simple interest accrued on a sum of Rs. 4500 at 12% per annum for 2 years and that on a sum of Rs. 5600 at 9% per annum for 2 years?
    a) Rs. 75 b) Rs. 72 c) Rs. 69 d) Rs. 76
20. The simple interest accrued on an amount of Rs. 20000 at the end of three years is Rs. 7200. What would be the compound interest accrued on the same amount at the same rate in the same period?
    a) Rs. 8342.36 b) RS. 8098.56 c) Rs. 8246.16 d) Rs. 8112.86

Competition Level

1. 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%
2. 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
3. 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
4. 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 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 3rd 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-twelvth 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 yrars. 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(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(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

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 theseries.

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

Types of Series:

Number SeriesAlpha 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 thenumbers 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 averageof 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. (162x3 = 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,.....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. (192x4 =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 x 3/2= next number. 32x3/2=48, 48x3/2=72, 72x3/2=108, 108x3/2=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 1x2, 2x3, 3x4, 4x5. The next number is 5x6=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 0x1x2, 1x2x3, 2x3x4, etc. The missing number is 6x7x8=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+3^2etc. 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

Class Practice Problems

1. In following question, a number series is given with one term missing. Choose the correct alternativethat will same pattern and fill in the blank spaces.: 1, 4, 9, 16, 25, x
   A. 35 B. 36 C. 48 D. 49
2. In following question, a number series is given with one term missing. Choose the correct alternative thatwill same pattern and fill in the blank spaces.: 1, 6, 13, 22, 33,
   A. 44 B. 45 C. 46 D. 47
3. In following question, a number series is given with one term missing. Choose the correct alternativethat will same pattern and fill in the blank spaces.: 19, 2, 38, 3, 114, 4…
   A. 228 B. 256 C. 352 D. 456
4. In following question, a number series is given with one term missing. Choose the correct alternative thatwill same pattern and fill in the blank spaces.: 4, 5, 9, 18, 34,..
   A. 43 B. 49 C. 50 D. 59
5. In following question, a number series is given with one term missing. Choose the correct alternativethat 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
6. In following question, a number series is given with one term missing. Choose the correct alternative thatwill same pattern and fill in the blank spaces.: 11, 10, (…….), 100, 1001, 1000, 10001
   A. 101 B. 110 C. 111 D. None of these
7. In following question, a number series is given with one term missing. Choose the correct alternative thatwill same pattern and fill in the blank spaces.: 123456147, 12345614, 2345614, 234561,
   A. 3456 B. 2345 C. 23456 D. 34561
8. In following question, a number series is given with one term missing. Choose the correct alternative thatwill 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
9. In following question, a number series is given with one term missing. Choose the correct alternative thatwill 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^{th}

10. 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

Direction (11-20) Find the next one…

11. 8,17,35,71,143,__
    a.287 b.299 c.285 d.286
12. 3 , 5, 9, 17, 33 __
    a. 60 b. 62 c. 65 d. 64
13. 98 72 50 32 18 __
    a.10 b.8 c.6 d.12
14. 46 ,60, 52, 54 ,58 ,48 __
    a. 64 b. 54 c. 66 d. 58
15. 20,20,19,16,17,13,14,11 _ _
    a. 11,13 b. 12,12 c.10,10 d. 10,12
16. 500,356,456,392 __
    a. 400 b. 418 c. 430 d. 428
17. 41,42,41,45,37,46,__
    a.56 b.19 c.28 d.62
18. 4,6,9,14,21,32,__
    a.45 b.48 c.51 d.55
19. 3,7,17,31,53__
    a.71 b.69 c.79 d.83
20. 6,24,96,384, __
    a.1568 b.1563 c.1655 d.1536

Tutorial Practice Problems

What will come next

1. 1,2,6,21,88,445, __
   a.2760 b.2600 c.2670 d.2676
2. 10,17,26,37,50, __
   a.65 b.63 c.71 d.66
3. 20,30,42,56,72,__
   a.91 b.88 c.92 d.90
4. 56,42,30,20,12,__
   a.6 b.8 c.10 d.12
5. 65,126,217,344,__
   a.516 b.315 c.513 d.520
6. 0,7,26,63,124,__
   a.215 b.217 c.213 d.218
7. 64040,27030,8020,__
   a.1000 b.1010 c.1800 d.1001
8. 0,6,24,60,120,__
   a.212 b.200 c.210 d.212
9. 24,12,12,18,36,__
   a.42 b.44 c.90 d.88
10. 5,16,49,104,__
    a.181 b.180 c.172 d.176

11. 9,27,31,155,161,1127,__
    a.1603 b.12764 c.1135 d.34178
12. 8,8,32,288,4608,___
    a.115200 b.115300 c.115000 d.114200
13. 9,13.5,27,67.5__
    a.198.5 b.200.5 c.134.5 d.202.5
14. 1,0,5,8,17,24,37,__
    a. 49 b.42 c.48 d.43
15. 1,5,11,49,239__
    a.1441 b.1444 c.1414 d.1244
16. 1,30,136,417,838,__
    a.833 b.764 c.814 d.839
17. 3,4,12,45,196__
    a. 1100 b.1005 c.1005 d.1092
18. 6,9,11.25,22.50,26.50,__
    a.60.25 b.66 c.66.25 d.56
19. 2807,1400,697,346,171,__
    a.80 b.66 c.88 d.84
20. 16,4,2,1.5,1.5,__
    a.3.25 b.1.875 c.1.25 d.1.7

Competition Level (Wrong one out)

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
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

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 tothe 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 thecommon 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 ascoding. 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.

Class Practice Problems

1. If COURSE is coded as FRXUVH, how is RACE coded as?
   A. ABHF B.UDFH C.DUHF D.WQYF
2. In a certain code, MONKEY is written as XDJMNL. How is TIGER written in that code?
   A.QDFHS B.FHSQD C.DQSFH D.STFDQ
3. If BOMBAY is written as MYMYMY, how will TAMIL NADU be written in that code?
   A. YMNYMNYMN B.ABHABHABH C.ABCDABCDA D.MNUMNUMNU
4. 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
5. If in a certain language, COUNSEL is coded as BITIRAK, how is GUIDANCE written in that code?
   A.OHYFZJBB B.OFHBJZYB C.BJZYBHFO D.FOHYZJB
6. If in a certain code, TWENTY is written as 863985 and ELEVEN is written as 323039, how is TWELVE writtenin that code?
   A.203863 B.368302 C.863203 D.320368
7. In a certain code, if LOGIC is coded as 1512201824, how is PEARL coded as?
   A.112226915 B.113331596 C.112226571 D.113336734
8. If APPLE is written as 24991320, how is LOVELY coded as?
   A.13101310130 B.1310320130 C.13101350140 D.13101340120
9. If ENGLAND is written as 1234526 and FRANCE is written as 785291, how is GREECE coded?
   A.117186 B.381191 C.131871 D.112235

10. 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
11. 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
12. If the animals which can walk are called swimmers, animals who crawl are called flying, those living inwater 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
13. 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
14. 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
15. 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
16. 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
17. 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
18. 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
19. In a certain code, SQHOOKD is written as TRIPPLE. How CHRONRD is written in that code?
    A.GLITTER B.TROUSER C.JANUARY D.DISPOSE
20. If HUMJTK is coded as FRIEND, how is EDRIRL written in that code ?
    A.SUNDAY B.MONDAY C.BEAUTY D.CANDLE

Tutorial Practice Problems

1. 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
2. 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
3. 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
4. In a certain code language DELHI is written as FGNJK , how will ALWAR be written in that code ?
   (a) CNYCT (b) DMXCT (c) CNWCT (d) CNDTY (e) None of these
5. 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

6. In a code language VICTORY =YLFWRUB than what is the code for FAILURE = ?
   (a) JELOZUH (b) IDLOXUH (c) JDLKWUH (d) IDOLKUH (e) None of these
7. In a code language COULD = BNTKC and MARGIN=LZQFHM than what is the code for MOULDING=?
   (a) LNTKCHMF (b) CNMFINTK (c) LNKTCHMF (d) NITKCHMP (e) None of these
8. In a code language SAND =VDQG and BIRD=ELUG than what is the code for LOVE= ?
   (a) PRYG (b) ORTG (c) NPUH (d) ORYH (e) None of these
9. In a code language SATELLITE=FUBTLDSHK than what is the code for LAUNCHING=?
   (a) OVBCFMHGI (b) BVCRTOMPU(c) OVBMCFMHG (d) VBUMCINGP
10. In a system of coding ACCESS is coded CEEGUU, PONTIFF as HHKPORV, LIMERICK as EGKKMNOT and LAMINATE as CCGKNOPV. what is likely to be the word of which the code is COTUV?
    a)TRAPS b)PARTS c)SMART d) none of these
11. In a certain code language,
    (A) 'pit na som' means 'bring me water'
    (B) 'na jo tod' means 'water is life'
    (C) 'tub od pit' means 'give me toy'
    (D) 'jo lin kot' means 'life and death'
    Which of the following represents 'is' in that language ?
    A) jo B) na C) tod D) lin
12. If ROSE is coded as 6821, CHAIR is coded as 73456 and PREACH is coded as 961473, what will be the code for SEARCH ?
    A) 246173 B) 214673 C) 214763 D) 216473
13. In a certain code language, '3a, 2b, 7c' means 'Truth is Eternal';
    '7c, 9a, 8b, 3a' means 'Enmity is not Eternal' and
    '9a, 4d, 2b, 8b' means 'Truth does not perish'.
    Which of the following means 'enmity' in that language ?
    A) 3a B) 7c C) 8b D) 9a
14. In a certain code language,
    (A) 'pit dar na' means 'you are good'
    (B) 'dar tok pa' means 'good and bad'
    (C) 'tim na tok' means 'they are bad'
    In that language, which word stands for 'they' ?
    A) na B) tok C) tim D) pit
15. In a certain code language TUTDNES is written as STUDENT. How will SUORECS be written in that codelanguage?
    a. BATTERY B.FASHION C.SOURCES D.LIMITED
16. ZA5, Y4B, XC6, W3D,
    A. E7V B.V2E C.VE5 D.VE7
17. In a certain code 'TOME' is written as '@ $ * ?' and ARE is written as ' • £ ? ' How can 'REMOTE' be writtenin that code?
    a) ?*$@? £ B. *$@? £? C. £?*$@? D. *$? £@?
18. In a certain code 'PALM' is coded as '!@?$' and 'ARM' is written as '@*$', how can 'ALARM' be written inthat code?
    A.@!@?$ B. @$?!@ C. ?@@!$ D.NONE OF THESE
19. If Pour is wrtten as 4156
    Sware is written as 78269
    Clear is written as 3@926
    Then what is the code for PEARL= ?
    A) 429@6 B) 4962@ C) 4692@ D) 4926@
20. In a certain code language, 'dom put ta' means 'bring hot food';
    'put tir sop' means 'food is good' and
    'tak da sop' means 'good bright boy'.
    Which of the following does mean 'hot' in that language ?
    A) dom B) pul C) ta D) Can't be determined

ALPHABET TEST

Class Practice Problems

1. Arrange the given words Alphabetical Order and choose the one that comes first.
   (A) Wasp (B) Waste (C) War (D) Wrinkle (E) Wrist
2. Arrange the given words Alphabetical Order and choose the one that comes first
   (A) Science (B) Scrutiny (C) Scripture (D) Scramble (E) Script
3. Arrange the given words Alphabetical Order and choose the one that comes first.
   (A) Intense (B) Intellect (C) Intend (D) Intelligent (E) Integument
4. Arrange the given words Alphabetical Order and choose the one that comes first.
   (A) Nature (B) Native (C) Narrate (D) Nascent (E) Naughty
5. Arrange the given words Alphabetical Order and choose the one that comes first.
   (A) Didactic (B) Dictum (C) Dictionary (D) Diastole (E) Dictate
6. Arrange the given words Alphabetical Order and choose the one that comes first.
   (A) Praise (B) Practical (C) Prank (D) Prayer (E) Practices
7. Arrange the given words Alphabetical Order and choose the one that comes first.
   (A) Animate (B) Animosity (C) Anguish (D) Ankle (E) Announce
8. Arrange the given words Alphabetical Order and choose the one that comes first.
   (A) Probe (B) Proclaim (C) Proceed (D) Problem (E) Probate
9. Arrange the given words Alphabetical Order and choose the one that comes first.
   (A) Signature (B) Sight (C) Shrine (D) Shrill (E) Shrink
10. How many pairs of letters in the word 'CHAIRS' have as many letters between them in the word as in the alphabet?
    (A) 2 (B) 3 (C) 1 (D) 4
11. How many pairs of letters are there in the word " CASTRAPHONE" which have as many letters between them in the word as in the alphabet?
    (A)4 (B)5 (C)6 (D)1
12. 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 .
    Which letter in this series is the eighth letter to the right of the letter which is tenth letter to the left of the last but one letter of the series?
    (A) A (B) X (C) C (D)W
13. How many meaningful English words can be formed with the letters ESRO using each letter only once in each word?
    (A) NONE (B) 1 (C) 3 (D) 2
14. If in the word 'DISTURBANCE', the first letter is interchanged with the last letter, the second letter is interchanged with the tenth letter and so on, which letter would come after the letter T in the newly formed word ?
    (A) S (B) I (C) N (D)T
15. If the first and second letters in the word DEPRESSION' were interchanged, also the third and the fourth letters, the fifth and the sixth letters and so on, which of the following would be the seventh letter from the right ?
    (A) R (B)P (C)D (D)S
16. What should come next in the following letter sequence?
    A A B A B C A B C D A B C D E A B C D
    (A)A (B)E (C)C (D)B
17. If the first half of the English alphabet is reversed and then next portion of English alphabet is reversed so as 'A' takes the portion of 'M' and 'N' takes the portion of 'z' then which letter will be 6th to the left of 17th letter to the right of 7th letter from the left?
    (A) U (B) V (C) C (D) D
18. From the word 'LAPAROSCOPY' how many independent meaningful words can be made without changing the order of the letters and using each letter only once ?
    (A) 3 (B)4 (C)2 (D)1
19. From the word 'ASTOUNDER', how many independent words can be made with-out changing the order of the letters and using each letter only once ?
    (A)1 (B)2 (C)3 (D)4

20. Arrange these words in alphabetical order and tick the one that comes last
    1.Abandon 2. Actuate 3. Accumulate 4. Acquit 5. Achieve
    (A) Actuate (B) Abandon (C) Accumulate (D) Achieve

TUTORIAL PRACTICE PROBLEMS

1. If the first and second letters in the word 'MISFORTUNE' were interchanged, also the third and the fourth letters, the fifth and the sixth letters and so on, which letter would then be the eighth letter counting to your left ?
   (A) O (B) F (C) T (D) I
2. How many independent words can 'HEARTLESS' be divided into without changing the order of the letters and using each letter only once ?
   (A) 2 (B) 3 (C) 4 (D) 5
3. Arrange the following words will come in middle if all of them are arranged alphabetically as in a dictionary?
   (A)SAVE (B) SAVIOUR (C) SAVAGE (D) SAVOUR
4. How many meaningful English words can be made from the letters EOPR using each letter only once?
   (A) NONE (B) 1 (C) 2 (D) 3
5. If the sequence of the English alphabet is reversed then which letter is 7th to the left of second vowel from the right of English alphabet in the new series?
   (A) U (B) V (C) L (D) M
6. Q 2 3 B 9 V 5 L S R F P012
   If one is subtracted from each of the numbers, which of the following will be the fourth to the right of the thirteenth from the right ?
   (A)4 (B) 8 (C) 2 (D) 1
7. If the positions of the third and tenth letters of the word 'DOCUMENTATION' are interchanged, and likewise the position of the fourth and seventh letters, the second and sixth letters, is also interchanged, which of the following will be eleventh letter from the right end ?
   (A) U (B) C (C) T (D)I
8. How many letters are there in the word 'CREATIVE' which have as many letters between them in the word as in the alphabet ?
   (A) 1 (B) 2 (C) 3 (D) 4
9. If the last four letters of the word 'CONCENTRATION' are written in reverse order followed by next two in the reverse order and next three in the reverse order and then followed by the first four in the reverse order, counting from the end, which letter would be eighth in the new arrangement ?
   (A) E (B) N (C) R (D) T
10. If the position of the first letter of English alphabet is interchanged with the position of the fourteenth letter, second letter with fifteenth letter, and so on, in such a way that M is interchanged with Z, then which of the following letters will be 7th to the right of 13th letter from the right?
    (A) U (B) G (C) H (D) I
11. LAP BUT CAR SON HID If the positions of the first and the third alphabets of each of the words are interchanged, which of the following would form a meaningful word in the new arrangement?
    (A)HID (B) SON (C) LAP (D) BOTH LAP AND BUT
12. Of the six members of a panel sitting in a row X is to left of Q but on the right of P. Y is in the right of Q but is on the left of Z, Z is to the left of R. Find the members who are at the extreme?
    (A) QZ (B)PR (C) XY (D) AZ
13. C U B A E D E D A B E B A U C D B C A D B D U B C A C B E D A
    If all the A's are dropped from the above arrangement, which of the following will be

eleventh from the left end of the above arrangement?
(A)E (B) D (C) C (D)U

14. If it is possible to form a word with the first , fourth, seventh and eleventh letters in the word "SUPERFLUOUS" write the first letter of that word other wise x is the answer
(A) S (B) L (C) E (D) X
15. If it is possible to make a meaningful word from the third, fifth, sixth, eighth and tenth letters of the word PAROCHIALISM using each letter only once, third letter of the word would be your answer. If more than one such word can be formed, your answer would be 'y' and if no such word can be formed, answer is 'G'.
(A) Y (B) G (C) A (D) X
16. In the following Color sequence, R stands for Red, Y for Yellow , G for Green, B for Blue and W for white of the sequence is continued, which color will come next?
B B R B R W B R W G B R W G Y B R B R W B R W
(A)White (B)Yellow (C)Red (D)Green
17. How many pairs of letter are there in the word 'BUCKET' which have as many letters between them in the word as in the alphabet ?
(A)1 (B)3 (C) more than 3 (D) 2
18. If the positions of the fifth and twelfth letters of the word 'GLORIFICATIONS' are interchanged; and likewise the position of the fourth and fourteenth letters, the third and tenth letters, the second and eleventh letters and the first and thirteenth letters are interchanged, which of the following will be twelfth letter from the right end ?
(A) O (B)T (C) I (D) R
19. How many pairs of letters are there in the word 'SEQUENTIAL' which have as many letters between them as are in the alphabet ?
(A) 1 (B) 2 (C) 3 (D) 4
20. Select the combination of numbers so that the letters are arranged accordingly in the form of meaningful word.
T L P N A E
12 3 4 5 6
(A)3,2,5,4,1,6 (B)3,2,5,4,6,1 (C) 4,5,3,6,2,1 (D) 4,6,1,3,5,2

ARITHMETIC & GEOMETRIC PROGRESSION

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

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

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**
Inserting AM:
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 34d= (34-4)/4+1= 30/5= 6
∴ 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 generalform of a geometric sequence is

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

$$a_n = a\,r^{n-1}.$$

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 = √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 486r = (486/2)^(1/(4+1))= (243)^(1/5)= 3
∴ The 4 GM are 2x3 = 6, 6x3 = 18, 18x3 = 54 ,54x3 = 162.

Practice Problems

1. Find the number of terms in the series 8, 12, 16, . . .72?
   (a) 10 (b) 12 (c) 17 (d) 16
2. 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
3. Find 4 + 7 + 10 + 13 + 16 + . . . up to 20 terms?
   (a) 600 (b) 650 (c) 540 (d) 454
4. Find 5^{th} term in the series 5, 15, 45,.....?
   (a) 405 (b) 345 (c) 450 (d) 340
5. Given A = 2^{65} and B = (2^{64}+2^{63}+2^{62}+. +2^0). Which one is correct option?
   (a) B = 2^{64} + A (b) A =B (c) B = A + 1 (d) A = B + 1
6. If log 2, log (2^x -1) and log (2^x + 3) are in A.P, then x is equal to…?
   (a) 5252 (b) log25 (c) log32 (d) 32
7. Which term of the A.P. 3, 8, 13 ..... is 78?
   (a) 16^{th} (b) 17^{th} (c) 20^{th} (d) 25^{th}

8. Is (– 150) a term of the series 11, 8, 5, 2,…?
   (a) Yes (b) No (c) Can't be determined (d)Data Insufficient
9. 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
10. Which term of the A.P. 3, 15, 27, 39 … will be 132 more than its 54th term?
   (a) 82^{nd} (b) 75^{th} (c) 60^{th} (d) 65^{th}
11. Write down the 8th term in the Geometric Progression 1, 3, 9, ...
   (a) 2187 (b) 2185 (c) 2287 (d) 2021
12. Find the number of terms in the geometric progression 6, 12, 24, ...1536
   (a) 10 (b) 9 (c) 15 (d) 13
13. The sum of n terms of an A.P. is $3n^2 + n$, find the nth term.
   (a) 6n - 4 (b) 4n - 4 (c) 6n - 2 (d) 4n - 2
14. Find the sun of the following series: 3 + 7 + 11 + 15 +…….....to 30 terms.
   (a) 1830 (b) 1840 (c) 1800 (d) 1940
15. Find the position of 62 in the following series 2, 5, 8, ... ?
   (a) 26 (b) 21 (c) 23 (d) 20

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, $^{9}/_{25}$ of the birds are geese. Then there are (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 ration 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 **or** **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*b**
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
⇒ $x^2 = 1600$ ⇒ 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 fourthproportion 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 Btakes to do the same piece of work.
Solution: Ratio of efficiencies ofA and B=100 : 160 = 5 : 8
Since**, efficiency is inversely proportional to the number of days.**
Ratio of days taken to complete the job=8:5No. of days taken by B=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 secondquantity '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 an decrease in 'y'and decrease in 'x' causes 'y' to increase proportionally. Therefore, **x=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 jointvariation to y and z. It can be expressed as kyz, where k is constant of proportionality.
Example: Men doing a work in some number of days working certain hours a day

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Partnership

Persons two or more than two persons when start and run the new business jointly of their own choice, thepersons 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 themoney 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 distributedamong 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 isdistributed 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 oftime and investment.
Suppose A and B invest ` p and ` q for x months and y months respectively, **thenShare 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 theprofit 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 theend 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.

3b = 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.

Class Practice Problems

Type 1 – Percentage & Ratio

1. The salaries of A, B, C are in the ratio 2:3:5. If the increments of 15%, 10% and 20% are allowed respectivelyin 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

2. In a class of 125, 20% students can dance.2/5 of the total students can sing and 2/5 of the remaining students are good at sports. What is the respective ratio of the students who can dance to students who aregood at sports?
   A. 5:4 B. 3:2 C. 4:5 D. 3:7

3. 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

4. Rate of income tax is increased from 4% to 5%. However, the total tax liability of a person remains the sameas 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

5. 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 hiswife?
   A. 2.5 Lakhs B. 2.7 Lakhs C. 2.2 Lakhs D. 3.2 Lakhs

Type 2 - Coin Based Problem

6. 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 pcoins is?
   A. 48 B. 54 C. 56 D. 60
7. A bag contains Rs 410 in the form of Rs 5, Rs 2 and Rs 1 coins. The numbers of coins are in the ratio4:6: 9. So, find the number of 2 Rs coins.
   A. 40 B. 50 C. 60 D. 70
8. 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 coinsof each type respectively.
   A. 360, 160, 200 B. 160, 360, 200 C. 200, 360, 160D. 200,160,300
9. A bag contains some coins in the denominations 50, 20 and 10 paisa coins in the ratio 4:2:1. If their totalvalue is Rs 12.50, then the number of 10 paisa coins is?
   A. 10 B. 5 C. 20 D. 15
10. 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 pcoins are there?
   A. 50 B. 100 C. 150 D. 200

Type 3 - Income and Expenditure

11. Share of Rs.4200 among Rahul, Vijay and Mahinder in the ratio of 2:4:6.Find the amount received byMahinder?
   A. 3100 B.2500 C.2100 D.4200
12. 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 is84,000.Find the difference of the incomes of B and D?
   A. 5000 B.7000 C.6000 D.8000
13. 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. Findthe income of A and B.
   A. Rs 500,600 B. Rs 600,800 C.Rs 600,900 D.Rs 800, 1000
14. The salary of two friend's 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

15.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

16.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

17.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

18.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

19.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 2/3 of the original fraction. The numerator of the original fraction is?

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

20.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

21.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.35000, A receives?

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

22.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

23.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 ratio2:3. The capital of B is?

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

24.A and B starts 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 2/7 of the profit. How much money was contributed by B?

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

25.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

26.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

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

A. 7 months B.9 months C. 5 months D.7.5 months

Type 6 - Partnership with Ratio

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

A. 64:49:20 B.49:64:20 C.20:49:64 D.20:64:49

29.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

30In a business, A and C invested amounts in the ratio 2:1, whereas the ratio between amount invested by Aand 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

31.A and B are partners. A contributes ¼ of the capital for 15 months and B received 2/3 of the profit. For howmany months B's money was used?

A. 15 months B. 18months C.10 months D.8 months

32.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 theratio 5:3:12 find the ratio of time for which they had contributed their capitals?

A. 2:1:3 B. 1:2:3 C. 2:3:1 D. 2:3:3

Type 7 - Partnership and Shares

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

A. 2000 B. 1500 C. 2500 D. 1000

34.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 inprofit by?

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

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

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

Tutorial Practice Problems

1. The total number of students in a school is 2140. If the number of girls in the school is 1200, then what is the respective ratio of the total number of boys to the total number of girls in the school?

a) 26 : 25 b) 47 : 60 c) 18 : 13 d) 31 : 79 e) None of these

2. 48% of the first number is 60% of the second number. What is the ratio of the first number to the second number?

a) 4 : 7 b) 3 : 4 c) 5 : 4 d) Can't be determined e) None of these

3. If a: b = 2 : 3 and b : c = 5 : 7, find the value of a : b : c ?

a) 5 : 7 : 13 b) 10 : 15 : 17 c) 10 : 15 : 21 d) 7 : 15 : 13 e) None of these

4. The ratio of zinc and copper in a brass pieces is 13 : 7. How much zinc will be there in 100 kg of such a piece?

a) 20 kg b) 35kg c) 55kg d) 65kg e) None of these

5. The ratio of number of men and women in a factory of 720 workers is 7:5. How many more women should be joined to make the ratio 1:1?

a) 80 b) 100 c) 120 d) 150 e) None of these

6. What is the ratio whose terms differ by 40 and the measure of which is 2/7 ?

a) 12 : 56 b) 16 : 56 c) 23 : 58 d) 18 : 58 e) None of these

7. Three numbers A, B and C are in the ratio of 12 : 15 : 25. If sum of these numbers is 312, ratio between the difference of B and A and the difference of C and B is –

a) 3 : 7 b) 10 : 3 c) 3 : 10 d) 5 : 7 e) None of these

8. If sum of two numbers is 1210 and if 4/15 of one number is 2/5 of the other. Then one of the two numbers is:

a) 284 b) 362 c) 482 d) 726 e) None of these

9. Sujitha bought 108 Bangles. While carrying she slipped the bangles down. By this, some them were broken. What cannot be the ratio of broken and unbroken bangles?

a) 1:2 b) 4:3 c) 7:5 d) 7:11 e) 13:5

10. In a school the number of boys and girls are in the ratio of 4:7. If the number of boys are increased by 25% and the number of girls are increased by 15%. What will be the new ratio of number of boys to that of girls?

a) 100:131 b) 100:151 c) 100:161 d) 100:181 e) None of these

11. When 40% percent of a number is added to another number the second number increases to its 20%. What is the ratio between the first and second number?

a) 2:1 b) 1:2 c) 2:3 d) 3:4 e) None of these

12. Two friend A and B invested in a business together Rs. 45000. At the end of 6 months, A withdraws half of his investments but B added 3 times of A's initial investments. At the end of one – year, the share of B in the profit was 50% more than that of A. The initial investment of A was how much more than/less than that of B?

A. Rs. 36000 more B. Rs. 18000 more C. Rs. 3000 less D. Rs. 27000 more E. None of these

13.A, B and C start a business. A invests four times as much as B invests and the investment of C was x% less than that of B. At the end of one – year, out of total profit of Rs. 5700, A's share was Rs. 4000. What was the difference between B's share and that of C's share?

A. Rs. 1200 B. Rs. 1500 C. Rs. 200 D. Rs. 300 E. None of these

14. A and B enter into a partnership with amount of Rs. 7200 and Rs 4800 respectively. A withdraws 25% of the amount after 3 months and then 4 months after that he withdraws 50% of the remaining amount. B withdraws 50% of the amount after 2 months and then 6 months after that he withdraws 25% of the remaining amount. If the profit at the end of one year is Rs. 33402 what is the difference between the profit received by A and B?

A. Rs. 9750 B. Rs. 9720 C. Rs. 9860 D. Rs. 9690 E. None of these

15. Ram and Shyam invest in a partnership. Ram invests Rs. 7200 but 4 months later withdraws 25% of it , while Shyam invests Rs. 5400 and 6 months later invests 11.11% more. What is the profit of Shyam at the end of the year out of a total profit of Rs. 3042?

A. Rs. 1472 B. Rs. 1642 C. Rs. 1542 D. Rs. 1482 E. None of these

16. A gets Rs. 6750 out of the total profit of Rs. 9000 when he invested Rs. 10500 more than his partner, for a period of 8 months. His partner, B invested his capital for the whole year. What was the amount invested by A?

A. Rs. 13500 B. Rs. 15300 C. Rs. 13050 D. Rs. 12500 E. Rs. 15200

17. Annie, Vishal and Rani started a business with their capital Rs. 2000, Rs. 3000 and Rs. 4000 respectively. They invested for X, (X – 2) and (12 – X) months respectively. At the end of the year, if the ratio of the profit share of Vishal to that of Rani is 9 : 8, then find the value of X?

A. 6 B. 10 C. 8 D. 9 E. 7

18. Jainendra and Divya invest Rs. 40,000 and Rs. 60,000 to start a business. After 1 year they pay 30% of their profit as corporate taxes. The rest of the profit is distributed among them according to their investment share. Jainendra got Rs. 14,000 as his share. What is the total profit?

A. Rs. 20000 B. Rs. 36000 C. Rs. 50000 D. Rs. 14000 E. None of these

19. A, B, and C entered into a partnership. The investments of A and B was Rs. 2250 and Rs. 2750 respectively. At the end of one year they gained Rs. 1215 out of which A got Rs. 405. Find the investments of C?

A. Rs. 1700 B. Rs. 2500 C. Rs. 1850 D. Rs. 1750 E. None of these

20. Mohan, Sohan and Sunil enter into a partnership with a capital in which Mohan's contribution is Rs. 17400. If out of a total profit of Rs. 1500, Mohan gets Rs. 750 and Sohan gets Rs. 500, then Sohan's capital is?

A. Rs. 11600 B. Rs. 5800 C. Rs. 12600 D. Rs. 6300 E. None of these

Competition Level

1. 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

2. 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

3. 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

4. The ratio of cooper 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

5. 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

6. 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

7. 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

8. 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

9. 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 is the school become 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

10. 555 Rs. was to be divided among A, B and C in the ratio of 1/4 :1/5 :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

11. 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

12. 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) 21/125 (b) 2/25 (c) 4/75 (d) 14/125

13. 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

14. 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

15. 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

16. Sudhir and Tushar invested Rs. x and Rs. 3x respectively in a business. The time periods of Sudhir and Tushar is in the ratio 2 : 3. If the profit share of Tushar is Rs. 270000, then find the total profit if they continue the business for 3 more years?

A. Rs. 330000 B. Rs. 660000 C. Rs. 1320000 D. Rs. 1640000 E. Rs. 1240000

17. R, Q and P start a business together with initial investment of Rs. 20000, Rs. 30000 and Rs. 25000 respectively. After 8 months, R and Q take out Rs. 10000 each from the investment. Total profit earned at the end of the year is Rs. 16400. Find out P's share of profit.

A. Rs. 5500 B. Rs. 6500 C. Rs. 4000 D. Rs. 6000 E. Rs. 5000

18. A, B, C and D invest Rs. 5000, Rs. 4500, Rs. 4000 and Rs. 8000 respectively in a business. After one year, A withdraws his entire money, B withdraws his after 2nd year, C withdraws his money after 3rd year. If at the end of the 4th year they earned a total profit of Rs. 14500, find A's share in the profit?

A. Rs. 2500 B. Rs. 4500 C. Rs. 8000 D. Rs. 3500 E. None of these

19. A and B start a business. A invests Rs 'X' and B invests Rs 45000. 9 months later A withdraws half the amount. The profit received by A at the end of 1 year is 22.22% less than that of B. What is the value of 'X'?

A. 40000 B. 45000 C. 42000 D. 48000 E. 36000

20. Siraj and Hiten started a business with investment of Rs. 15000 and Rs. 18000, respectively. After one year, Siraj increased his investment by 10% while Hiten decreased his investment by 10%. At the end of two years, total profit made by the business is Rs. 13140. Find the share of profit of Hiten.

A. Rs. 6220 B. Rs. 6840 C. Rs. 6280 D. Rs. 7480 E. Rs. 6530

21. Dhawan and Satish started a start-up by investing Rs. 35000 and Rs. 21000 respectively. The ratio of months invested by Dhawan to Satish is "p : q" and the number of months for which Satish invested into the business was 4 less than the number of month for which Dhawan invested. If the ratio of the total profit to the share of Dhawan was 7 : 5, then find p : q.

A. 2 : 5 B. 1 : 3 C. 1 : 2 D. 3 : 4 E. 3 : 2

22. Three businessman M, Q and P started a joint venture together with their initial investments in the ratio 4x : 2x : x respectively. After 6 months, P added 50% of the initial investment, Q invested twice the amount more as before while M withdrew 25% of his investment. Find the ratio of the profits of M, Q and P respectively at the end of the year.

A. 14 : 5 : 16 B. 16 : 5 : 14 C. 5 : 14 : 16 D. 14 : 16 : 5 E. None of these

23. In a joint venture company, A and B invested Rs. 32000 and Rs. 56000 respectively. A received Rs. 1000 per month as salary for managing the business and the remaining profit was divided in the ratio of their investments. At the end of year A received a total of Rs. 20000. How much did B get?

A. Rs. 14000 B. Rs. 16000 C. Rs. 22000 D. Rs. 35000 E. None of these

24. Vijay and Mamta entered into a partnership with Rs 30000 and Rs 36000 respectively. Shubhash joined them after 'm' months and contributes Rs 48000 and Mamta left 'm' months before the end of year. If end of the year Vijay, Mamta and Shubhash share profit in the ratio 10 : 9 : 12, then find the value of 'm'.

A. 3 B. 4 C. 1 D. 2 E. 5

25. Three persons A, B, and C invest in a business in the ratio of 5 : 6 : 4. If A and C invested for one year, then B should invest for how many months if he wants to receive 25% of the total profit at the end of one year?

A. 4 months B. 6 months C. 3 months D. 9 months E. None of these

AGES

Class Practice Problems

1. The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?
a)4 years b)8 years c)10 years d)None of these

2. Present ages of Sameer and Anand are in the ratio of 5 : 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. What is Anand's present age in years?
a) 24 b)27 c)40 d)Cannot be determined

3. A man is 24 years older than his son. In two years, his age will be twice the age of his son. The present age of his son is:
a) 14 years b)18 years c)20 years d)22 years

4. Six years ago, the ratio of the ages of Kunal and Sagar was 6 : 5. Four years hence, the ratio of their ages will be 11 : 10. What is Sagar's age at present?
a)16 years b)18 years c)20 years d)Cannot be determined

5. The sum of the present ages of a father and his son is 60 years. Six years ago, father's age was five times the age of the son. After 6 years, son's age will be:
a) 12 years b)14 years c)18 years d)20 years

6. At present, the ratio between the ages of Arun and Deepak is 4 : 3. After 6 years, Arun's age will be 26 years. What is the age of Deepak at present ?
a) 12 years b)15 years c)19 and half d)21 years

7.Sachin is younger than Rahul by 7 years. If their ages are in the respective ratio of 7 : 9, how old is Sachin?
a) 16 years b)18 years c)28 years d)24.5 years

8.Q is as much younger than R as he is older than T. If the sum of the ages of R and T is 50 years, what is definitely the difference between R and Q's age?
a) 1 year b)2 years c)25 years d)Data inadequate

9.The age of father 10 years ago was thrice the age of his son. Ten years hence, father's age will be twice that of his son. The ratio of their present ages is:
a) 5 : 2 b)7 : 3 c)9 : 2 d)13 : 4

10.The sum of the present ages of a father and his son is 60 years. five years ago, father's age was four times the age of the son. so now the son's age will be:
a) 5 b)10 c)15 d)20

11.Father is aged three times more than his son Ronit. After 8 years, he would be two and a half times of Ronit's age. After further 8 years, how many times would he be of Ronit's age?
A] 2.2 times B] 2.5 times C] 2 3/2 times D] 3 times

12. A is two years older than B who is twice as old as C. If the total of the ages of A, B and C be 27, than how old is B?
A] 7 years B] 8 years C] 9 years D] 10 years

13. The age of father 10 years ago was thrice the age of his son. Ten years hence, father's age will be twice that of his son. The ratio of their present ages is:
A] 5 : 2 B] 7 : 3 C] 9 : 2 D] 13 : 4

14.The ratio of ages of a father and son is 17:7 respectively. 6 years ago the ratio of their ages was 3:1 respectively. What is the father's present age (in years)?
A] 64 B] 51 C] 48 D] 54

15. If 1 added to the age of the elder sister, then the ratio of the ages of two sisters becomes 0.5 : 1, but if 2 is subtracted from the age of the younger one, the ratio becomes 1: 3, the age of the younger sister will be ?
A] 7 years B] 5 years C] 8 years D] 10 years

16. The ages of Ram and Shyam differ by 16 years. 6 years ago, Shyam's age was thrice as that of Ram's. Find their present ages?
A] 14 years, 30 years B] 12 years, 28 years C] 16 years, 34 years D] 18 years, 38 years
17. One year ago, the ratio between Samir and Ashok's ago was 4: 3. One year hence the ratio of their ages will be 5 : 4. What is the sum of their present ages (in years)?
A] 12 years B] 15 years C] 16 years D] 14 years
18. The average age of a husband and wife was 23 years at the time of their marriage. After 5 years they have a one year old child. The average age of the family now is:
A] 28.5 years B] 19 years C] 29.9 years D] 23 years
19. The ratio of the present ages of Anju and Sandhya is 13 : 17. Four years ago, the ratio of their ages was 11 : 15. What will be the ratio of their ages 6 years hence?
A] 3 : 4 B] 7 : 8 C] 5 : 4 D] 4 : 5
20. Karthik's brother is 4 years elder to him. His mother was 28 years of age when he was born, while his father was 30 years of age when his sister was born. If his sister was 5 years of age when his brother was born, what were the respective age of Karthik's mother and father when his brother was born?
A] 24 yrs and 35 yrs B] 24 yrs and 30 yrs C] 32 yrs and35yrs D] 24 yrs and 32 yrs

Tutorial Practice Problems

1.Nisha is 15 years elder to Romi. If 5 years ago, Nisha was 3 times as old as Romi, then find Nisha's present age.
a) 32.5 years b)27.5 years c)25 years d)24.9 years
2.One year ago, the ratio of Honey and Piyush ages was 2: 3 respectively. After five years from now, this ratio becomes 4: 5. How old is Piyush now?
a) 5 years b)25 years c)10 years d)15 years
3.Ten years ago, the age of mother was three times the age of her son. After ten years, mother's age will be twice that of his son. Find the ratio of their present ages.
a) 11 : 7 b)9 : 5 c)7 : 4 d)7 : 3
4.Saransh is 50 years old and Nazma is 40 years old. How long ago was the ratio of their ages 3:2?
a) 20 years b)30 years c)40 years d)25 years
5.The ratio of the present ages of Pranav and Qureshi is 4:5. Five years ago, the ratio of their ages was 7:9. Find their present ages? (In years)
a) 40, 50 b)18, 25 c)40, 60 d)20, 25
6.Present ages of Sameer and Anand are in the ratio of 5 : 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. What is Anand's present age in years?
a) 22 b)24 c)26 d)30
7.The total age of A and B is 12 years more than the total age of B and C. C is how many years younger than A?
a) 12 b)13 c)14 d)15
8.Dinesh is younger to Roshan by 9 years. If their ages are in the respective ratio of 4:5, how old is Dinesh?
a) 36 years b)23years c)29 years d)Cannot be determined
9.A man said to his son, "I was one-third of your present age when you were born". If the present age of the man is 48 years, find the present age of the son.
a) 25.7 years b)28 years c)29.3 years d)36 years
10.The ratio of the present ages of Pranav and Qureshi is 4:5. Five years ago, the ratio of their ages was 7:9. Find their present ages? (In years)
a) 40, 50 b)18, 25 c)40, 60 d)20, 25
11. Difference between the ages of anitha and rahul is same as the difference between the ages of rahul and karthik. If the difference between the ages of anitha and karthik is 8 years.if the sum of ages of all is 48, then what are the ratio of ages of anitha, karthik and rahul ?
A] 5:3:5 B] 5:3:3 C] 5:3:4 D] 5:6:4

12.Four years ago, the age of father is twice the ages of his 4 daughters and four years hence the age of the father is sum of ages of 4 daughters. What is the present age of father?

A] 54 B] 52 C] 55 D] 48

13. Suba got married 7 years ago. Her present age is 8/7 times of her age at the time of marriage. At the time of her marriage, her brother 5 years younger to her. What is the age of her brother after 10 years?

A] 61 years B] 53 years C] 55 years D] 50 years

14. Average age of 20 boys and 40 girls is 12. If the number of boys decreased by half and the number of girls increased by half the average remains same. Then the total number of ages of one boy and one girl is?

A] 12 years B] 13 years C] 24 years D] 15 years

15. At the time of birth of Harish , his Grandfather's age was 48 years older than his cousin Krishna and his Grandmother was 45 years older than his brother. Difference between the ages of his brother and his cousin is 5 years. After 10 years, the average ages of these people is 49. At the time of his birth, what is the age of Harish grandmother?

A] 58 years B] 60years C] 71 years D] 65 years

16. Age of Umesh will be 4 times the age of Reena in 6 years from today. If ages of Umesh and Mahesh are 7 times and 6 times the age of Reena respectively, what is present age of Umesh?

A. 64 years B. 30 years C. 48 years D. 42 years

17. Rohan's age is five times Ajay's and seven-eighteenth of Meena's age. The sum of the ages of all three of them is 132 years. How much younger is Ajay to Meena?

A. 56 years B.83 years C)27 years D)Cannot be determined

18. The average age of 10 students and their teacher is 15 years. The average age of the first seven students is 15 yr and that of the last three is 11 yr. What is the teacher's age?

A. 33 years B.30 years C.27 years D.24 years

19. My father was 30 years of age when my sister was born. My mother was 38 years of age when I was born. My sister was 6 years of age when my brother was born who is 3 years elder to me. What was the age of my father and mother during the birth of my brother?

A. 41, 36 B.24, 28 C.28, 24 D.36, 35

20. The ratio of the current ages of Ajay and Vijay is 7:4. The ratio between Ajay's age 6 years ago and Vijay's age 6 years from now is 1:1. Find the ratio between Ajay's age 12 years hence and Vijay's age 12 years ago.

A. 12:1 B.10:1 C.1:1 D.None of these

ALLIGATION AND MIXTURES

ALLIGATIONS

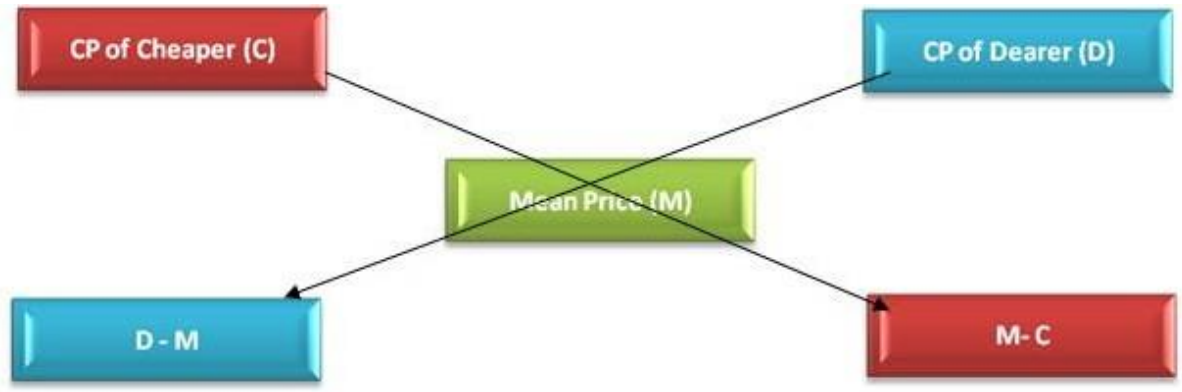
The technique of alligation is applicable in all the cases where two extreme values are given and one average value is given. It is a very useful technique which can be applied in chapters like Percentage, Simple interest, Ratio & proportion, Average etc.

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,

$$\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}} = \frac{\text{(C.P. of dearer) - (Mean Price)}}{\text{Mean Price - CP of cheaper}}$$

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 then 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 750 ml milk. That means, ¼ of mixture is water and ¾ 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 ofalcohol 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 Contentof 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 isrequired to increase the percentage of water to 50%?

Solution:
Total mixture = 50 litres Milk = 80% of 50 = 40 litres Water = 20% of 50 = 10 litresLet 'x' litres of water is added.
Now, milk = 40 litresWater = 10+x
Total = 50+x
Now, 50% of total = Water
½ x (50 + x) = 10 + xx = 30 litres

Concept 3: Quantity of Ingredient to be Added to Change the Ratio ofIngredients 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 newmixture containing milk and water in the ratio of 7 : 3?
Solution:
Milk and water in the original liquid = 7/9 × 729 = 567 and water = 2/9 × 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 litresof mixture is withdrawn and replaced by water and this operation is replaced n times in all, then

Quantity of milk left after n^{th} operation)

nitial 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 =

$$\text{Initial Amount} \times \left(\frac{\text{Vol. after removal}}{\text{Vol. after replacing}}\right)^n$$

Class Practice Problems

Type 1- Alligation

1. 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

2. 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

3. 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

4. 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

5. 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

6. 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

7. 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

8. 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

9. 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

10. 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 B. 80 C. 72.9 D. 80.9

11. 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

12. 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

13. 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

14. 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

15.Two equal glass having milk & water in ratio 3:2 & 4:1. Both glasses get mixed in third glass, than ratio of milk & water in third glass is?

A. 3:7 B. 7:3 C. 7:2 D. 2:7

16. 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

17. Two equal glass having milk & water in ratio 4:3 & 3:2 respectively. If content of both glasses are mixed in third glass, than ratio of milk & water in third glass is?

A. 41:29 B. 29:41 C. 40:15 D. 15:40

18. 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

19. Zinc and copper in two ports A&B are in ratio 1:2 & 2:3. In what ratio zinc & copper from both the ports can be mixed to obtain the new mixture in port C, in the ratio of 5:8?

A. 10:3 B. 3:10 C. 5:10 D. 10:5

20. A vessel contain 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, than 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

21. 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%

22. 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. 1/15 litres B.6/13 litres C.2/15 litres D.6/19 litres

Type 5- Applications

23. 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

24. 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

25. In what ratio must water be mixed with milk to gain 16 2/3% on selling the mixture at cost price?

A. 1:6 B. 6:1 C. 2:3 D. 4:3

26. 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 ¼ % C. 20 % D. 25 %

27. A man purchased, 150 pen at the rate 12 Rs/pen, out of them he sold 50 pen @ 10 % profit, remaining pen should be sold at what profit, if he earns a total profit of 15 %?

A. 4 % B. 17.5 % C. 20 % D. 25 %

28. A man purchased, 200 pen at the rate Rs. 15/pen, out of them he sold 75 pen @ 5 % loss, remaining penshould be sold at what percent to gain 10% on the whole transaction?

A. 16 % B. 17 % C. 19 % D. 20 %

29. In a class there are 65 students & 39 Rs is distributed among them in such a way that each boy gets 80paise 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

30. In a class there are 75 students & 48 Rs is distributed among them in such a way that each boy get 1 Rs andeach girl gets 40 paise. Find the number of boys and girls?

A. 30, 20 B. 20, 30 C. 45, 30 D. 30, 45

Tutorial Practice Problems

1. In what proportion must water be mixed with spirit to gain 12 ½ % by selling it at CP?

A. 2:7 B. 1:8 C. 1:9 D. 2:9

2. A mixture of 45 L of spirit and water contains 20% of water in it. How much water must be added to it make the water 25% in the new mixture?

A. 5 L B. 3 L C. 4 L D. 6 L

3. 5 kg of rice at Rs. 6 per kg is mixed with 4 kg of rice to get a mixture costing Rs. 7 per kg. Find the price of costlier rice ?

A. Rs. 7.00 B. Rs. 7.50 C. Rs. 8.00 D. Rs. 8.25

4. A sum of Rs. 7.50 is made up of 21 coins which are either 25 paise or 50 paise coins. How many coins are there of 50 paise?

A. 9 B. 12 C. 7 D. 10

5. In a zoo, there are some pigeons and some rabbits. If their heads are counted these are 100 and if their legs are counted these are 320. How many pigeons are there?

A. 66 B. 60 C. 40 D. 45

6. In what ratio a grocer mix tea at Rs. 22 per kg and Rs. 32 per kg, so that by selling that mixture at Rs. 28, he may gain 12%?

A. 3:5 B. 7:3 C. 8:3 D. 3:11

7. In what ratio should water be added to a liquid costing Rs. 15 a litre so as to make a profit of 20% by selling the diluted liquid at Rs. 15 per litre?

A. 5:2 B. 2:5 C. 2:3 D. 1:5

8. A trader has 320 kg of tea, a part of which he sells at 18% profit and the rest at 26% profit. He gains 21% on the whole. What is the quantity sold at 18% profit?

A. 215 kg B. 200 kg C. 120 kg D. 165 kg

9. A trader has 280 L of oil, a part of which he sells at a profit of 18% and the rest at 10% loss. He gains 14% on the whole. What is the quantity sold at 10% loss?

A. 40L B. 110L C. 240L D. 160L

10. A merchant lent out Rs. 6440 in two parts, one at 8% and the other at 12% interest. If the yearly average interest comes out to be 9%. Find the amount lent at 12% interest?

A. Rs. 1610 B. Rs. 4830 C. Rs. 2640 D. Rs. 3610

11. In a mixture of 60 L, the ratio of milk and water is 2 : 1. If the ratio of milk and water is to be 1 : 2, then the amount of water to be further added must be:

A. 40 L B. 30 L C. 20 L D. 60 L

12. One alloy contains lead and tin in the ratio 5:1. Another alloy contains lead and tin in the ratio 7:2. What weights of the 2 alloys should be melted to form a third alloy weighing 100 kgs with 20% tin?

A. 60kg, 40kg B. 40kg, 60kg C. 20kg, 30kg D. None of these

13. 5 litres of water is drawn from a cask full of water and is filled with a magic potion. 5 litres are again drawn out and filled with the magic potion. The quantity of water left in the cask is to that of magic potion is now 144:25. What is the capacity of the cask?

A. 45L B. 25L C. 65L D. 60L

14. The total cost price of two watches is Rs. 840. One is sold at a profit of 16% and the other at a loss of 12%. There is no loss or gain in the whole transaction. The cost price of the watch on which the shopkeeper gains is:

A. Rs. 360 B. Rs. 370 C. Rs. 380 D. Rs. 390

15. How many litres of water should be added to a 30 litre mixture of milk and water containing milk and water in the ratio of 7 : 3 such that the resultant mixture has 40% water in it?

A. 6 L B. 5 L C. 10 L D. 12 L

16. In an objective examination of 200 questions 1 marks are allotted for every correct answer and 0.25 marks are deducted for every wrong answer. After attempting all the 200 questions a student got a total of 120 marks. The number of questions attempted wrong were:

A. 60 B. 80 C. 70 D. 64

17. Tea worth Rs. 126 per kg and Rs. 134 per kg are mixed with a third variety in the ratio 1:1:2. If the mixture is worth Rs. 120 per kg, the price of the third variety per kg will be:

A. Rs. 110 B. Rs. 130 C. Rs. 115 D. Rs. 120

18. A jar full of whisky contains 40% alcohol. A part of this whisky is replaced by another containing 19% alcohol and now % of alcohol was found to be 26%. The quantity of whisky replaced is:

A. 1/3 B. 2/3 C. 1/2 D. ¼

19. 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. 15 B. 21 C. 12 D. 18

20. A container contains 40 litres of milk. From this container 4 litres of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container(in litres)?

A. 31.23 B. 29.16 C. 28.38 D. 32.84

Competition Level

1. 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

2. 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

3. A container contained 80 L milk. Fro 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

4. 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 alloys is?

(a) 3 : 10 (b) 3: 7 (c) 10: 3 (d) 7: 3

5. 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

6.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 & 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

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

= n!/p! q! r! ...
(Where, p+q+r…<= 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, when k < n

= 1, 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

Dearrangement

Number of arrangements of n distinct things in a row, such that none of them occupies its original place is

$= n! [1/0! – 1/1! + 1/2! –1/3!+ ..... + (-1)^n/n!]$

Dearr.(2) = 1, 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)

Dearr.(4) = 9, Dearr.(5) = 44

Miscellaneous

$$^nC_r = \frac{n!}{r!\ (n-1)!} \qquad (0 < r < n)$$

Number of ways 4 different letters can be posted in 7 different letter boxes = $_47$

Number of ways n identical things can be arranged among r different places = $_rn$

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 .6 .7. 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… r times) $^nP_{r-1}$

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… r 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 ,
$(x + y + z + \ldots$ (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, $(x + y + z + \ldots$ (r variables) $=(n) = {}^{n-1}C_{r-1}$

Number of selections out of n distinct objects

= (Select None) + (Select One)+ (Select Two)

$= {}^nC_0 + {}^nC_1 + {}^nC_2 + \ldots + {}^nC_n = 2^n$

Number of ways in which a selection can be made by taking some or all out of $p + q + r + \ldots$ things where p are alike of one kind, q alike of second, r alike of third and so on is $(p+1)(q+1)(r+1)\ldots - 1$

Number of zero or more selections out of n same objects $= 1 + 1 + 1 + \ldots + 1 = n + 1$

Number of one or more selections out of n same objects $= 1 + 1 + 1 + \ldots + 1 = n$

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) $nC0 = 1 = nCn$
b) $nC1 = n = nCn-1$
c) $nCn-r = nCr$
d) $nCa = nCb \Rightarrow a + b = n$
e) $nCr + nCr-1 = n+1Cr$
f) $nC0 + nC1 + nC2 + \ldots + nCn-1 + nCn = 2^n$
g) $nC0 + nC2 + nC4 + \ldots = nC1 + nC3 + nC5 + \ldots = 2^{n-1}$

GROUPING & DISTRIBUTION

Number of ways in which n distinct objects can be distributed equally among r people
$= n!/ p!\, q!\, r! \ldots$ $(n = p + q + r\ldots)$

Number of ways in which n distinct objects can be distributed equally among r groups
$= n!/ [(n/r)!]^r$ (if groups are distinct)
$= n!/ r! [(n/r)!]^r$ (if groups are not distinct)

Class Practice Problems

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 person of same nationality sits 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

Direction (8 –9) There are 6 players in a cricket which is to be sent to Australian tour. The total number of members is 12.

8. If 2 particular member is always included
   a) 210 b) 270 c) 310 d) 420
9. If 3 particular player is 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 1/3. Then how many numbers 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

Tutorial Practice Problems

1.In how many ways can 4 books be selected out of 10 books on different subjects?

A.210 B.320 C.716 D.5040

2.In how many ways can 5 boys and 4 girls can be seated in a row so that they æ in alternate position.

a) 2780 b) 2880 c) 2800 d) 2980

3.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!

4.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

5.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

6.There are 15 points in a plane out ofwhich 6 are collinear. Find the number of lines that can be formed from 15 points.

a) 105 b) 90 c) 91 d) 95

7.In party there is a total of 120 handshakes. If all the persons shakes hand with every other person. Then findthe number of person present in the party.

a)15 b) 16 c) 17 d) 18

8.There are 8 boys and 12 girls in a class. 5 students have to be chosen for an educational trip. Find the number ofways in which this can be done if 2 particular girls are always included

a) 812 b) 816 c) 818 d) 820

9.In how many different ways the letters of the world INSIDE be arrangedin such a way that all vowels always come together

a)64 b)72 c) 84 d) 96

10.How many 3 digit number can be formed by 9, 2, 5, 3, 7 which is divisibleby 5 and none of the digit is repeated.

a)20 b) 36 c) 48 d) 60

11.In how many ways can the letters of the word SPECIAL be arranged using all the letters?

A. 5010 B. 5020 C. 5040 D. 5080

12.In how many ways can the letters of the word SPECIAL be arranged using only 4 letters at a time?

A. 810 B. 850 C. 830 D. 840

13.How many distinguishable permutations of the letters in the word BANANA are there?

A. 720 B. 120 C. 60 D. 360

14.How many ways a 6 member team can be formed having 3 men and 3 ladies from a group of 6 men and 7 ladies?

A. 700 B. 720 C. 120 D. 500

15.The value of 75C2 is:

A. 2775 B. 2315 C. 1215 D. 1675

16.What is the number of possible words that can be made using the word “EASYQUIZ” such that the vowels always come together?

A. 120 B. 720 C. 2880 D. 4320

17.What is the number of possible words that can be made using the word “QUIZ” such that the vowels never come together?

A. 8 B. 12 C. 16 D. 24

18.How many words can be made from the word “APPLE” using all the alphabets with repetition and without repetition respectively?

A. 1024, 60 B. 60, 1024 C. 1024, 1024 D. 240, 1024

19.In how many different ways can the alphabets of the word ‘SCORING’ be arranged so that the vowels always come together?

A. 120 B. 720 C. 240 D. 1440

20.In how many ways can the alphabets of the word ‘DERAIL’ be arranged so that the vowels come at the odd positions only?

A. 12 B. 18 C. 24 D. 36

PROBABILITY

Probability or chance is acommon term used in day-to-day life. For example, we generally say, 'it may rain today'. This statement has a certain uncertainty.

Probability is 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 willbe 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 equallylikely.

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 facedcards whereas Spades and Clubs are black faced cards.

Kings, Queens and Jacks are called face cards

Taking a ball randomly from a bagcontaining 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, $A \cap\cap B$ = $\phi\phi$ where $\phi\phi$ 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 $A \cap B \neq \phi$. 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 U B is the event that either A or B or Both occur. (i.e., at least one of A or B occurs)

A ∩ 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 ≤ P (E) ≤ 1

P(ϕ) = 0

Addition theorem

Let A and B be two events associated with a random experiment. Then

P(A U B) = P(A) + P(B) – P(A ∩ B)

If A and B are mutually exclusive events, then P(A U B) = P(A) + P(B) because for mutually exclusive events, P(A ∩ B)
= 0

If A and B are two independents events, then P(A ∩ B) = P(A).P(B)
Let A be any event and A^{-} be its complementary event (i.e., A^{-} is the event that A does not occur). Then $P(A^{-}) = 1 - P(A)$
Let E be an event associated with a random experiment. Let xx 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
$P(E) = x/x+y$ $P(E^{-}) = y/x+y$

Class Practice Problems

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 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) 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) ¼ 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) ½ 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 I'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 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) 93/264 b) 95/264 c) 91/264 d) 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. 4/3 B. 7/3 C. 1/3 D. 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. 15/28 B. 13/28 C. 17/28 D. 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. 7/91 B. 8/91 C. 2/91 D. 4/91

24. A basket contains 5 red 4 blue 3 green marbles. If three marbles picked up random, What is the probability thateither all are green or all are red?

A. 1/20 B. 7/20 C. 3/20 D. 9/20

25. A basket contains 5 red 4 blue 3 green marbles. If three marbles picked up random, What is the probability thatat least one is blue?

A. 41/55 B. 53/55 C. 47/55 D. 49/55

26. A basket contains 5 red 4 blue 3 green marbles. If two marbles picked uprandom, What is the probability that both are red?

A. 4/33 B. 5/33 C. 7/33 D. 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 isthe probability that two are red and oneis green?

A. 22/55 B. 15/81 C. 10/91 D. 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 isthe probability that two are red, one is blue and one is green?

A. 22/1001 B. 80/1001 C. 21/1001 D. 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 isthe probability that none is green?

A. 2/13 B. 3/13 C. 1/13 D. 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 ofdifferent colours?

a) 7/99 b) 11/99 c) 14/99 d) 19/99

Tutorial Practice Problems

1. P and Q are sitting in a ring with 11 other persons. If the arrangement of 11persons is at random, then the probability that thereare exactly 4 persons between them?

a) 1/3 b) ¼ c) 1/5 d) 1/6

2. 10 persons are seated around a round table. What is the probability that4 particular persons are always seated together?

a) 1/21 b) 4/21 c) 8/21 d) 11/21

3. A box contains 4 red, 5 black and 6green balls. 3 balls are drawn at random. What is the probability that all the balls are of same colour?

a) 33/455 b) 34/455 c) 44/455 d) 47/455

4. An apartment has 8 floors. An elevator starts with 4 passengers and stops at 8 floors of the apartment. Whatis the probability that all passengers travels to different floors?

a) 109/256 b) 135/256 c) 105/256 d) 95/256

5. A speak truth in 60% cases and B in80% cases. In what percent of cases they likely to contradict each other narrating thesame incident?

a) 9/25 b) 7/25 c) 11/25 d) 13/25

6. A box contains 30 electric bulbs, outof which 8 are defective. Four bulbs arechosen at random from this box. Find the probability that at least one of themis defective?

a) 432/783 b) 574/783 c) 209/784 d) 334/784

7. Two person A and B appear in an interview. The probability of A's selection is 1/5 and the probability ofB's selection is 2/7. What is the probability that only one of them is selected?

a) 11/35 b) 12/35 c) 13/35 d) 17/35

8. 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) 1/5 b) 2/5 c) 3/5 d) 4/5

9. A bag contains 6 red balls and 8 green balls. 2 balls are drawn at randomone by one. Find the probability that both the balls are green

a) 16/49 b) 25/49 c) 12/49 d) 21/49

10. 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 beboth hearts. Find the Probability of the lost card being a heart?

A. 12/50 B. 8/50 C. 11/50 D. 9/50

11. There are four hotels in a town. If 3 men check into the hotels in a day then what is the probability
that each checks into a different hotel?

A. 6/7 B. 1/8 C. 3/8 D. 5/9

12. Two teams Arrogant and Overconfident are participating in a cricket tournament. The odds that team Arrogant will be champion is 5 to 3, and the odds that team Overconfident will be the champion is 1 to 4. What are the odds that either Arrogant or team Overconfident will become the champion?

A. 3 to 2 B. 5 to 2 C. 6 to 1 D. 33 to 7

13. A box contains 100 balls, numbered from 1 to 100. If three balls are selected at random and with replacement from the box, what is the probability that the sum of the three numbers on the balls selected from the box will be odd?

A. 1/2 B. ¾ C. 3/8 D. 1/8

14. A bag contains 3 white balls and 2 black balls. Another bag contains 2 white and 4 black balls. A bag and a ball are picked random. The probability that the ball will be white is:

A. 7/11 B. 7/30 C. 5/11 D. 7/15

15. I forgot the last digit of a 7-digit telephone number. If 1 randomly dials the final 3 digits after correctly dialling the first four, then what is the chance of dialling the correct number?

A. 1/1001 B. 1/1000 C. 1/999 D. 1/990

16. In his wardrobe, Dexter has three trousers. One of them is black the second is blue, and the third brown. In his wardrobe, he also has four shirts. One of them is black and the other 3 are white. He opens his wardrobe in the dark and picks out one shirt and one trouser pair without examining the colour. What is the likelihood that neither the shirt nor the trouser is black?

A. 1/12 B. 1/2 C. 1/4 D. 1/6

17. A man can hit a target once in 4 shots. If he fires 4 shots in succession, what is the probability that he will hit his target?

A. 175/256 B. 1/256 C. 81/256 D. 1

18. The letters B, G,I,N and R are rearranged to form the word 'Bring'. Find its probability:

A. 1/120 B. 1/54 C. 1/24 D. 1/76

19. Abhishek has 9 pairs of dark blue socks and 9 pairs of black socks. He keeps them all in the same bag. If he picks out three socks at random, then what is the probability that he will get a matching pair?

A. 1 B. $2\times{}^{9}C_{2}\times{}^{9}C_{1} / {}^{18}C_{3}$ C. ${}^{9}C_{3}\times{}^{9}C_{1}/{}^{18}C_{3}$ D. None of these

20. Four boys and three girls stand in queue for an interview. The probability that they stand in alternate positions is:

A. 1/17 B. 1/34 C. 1/35 D. 1/68

Competition Level

1. 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
2. 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
3. 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

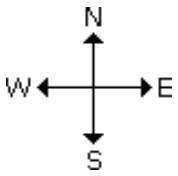
4. In how many ways can be select 5 cards from a card pack such that all 4 suits appear?
   a. 52728 b. 405646 c. 685464 d. 4056
5. Find all 3-digit numbers such that sum of their digits is a whole number less than 5?
   a. 18 b. 20 c. 19 d. 17
6. Of 22 points on a plane, 8 are on a straight line, 7 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
7. 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
8. 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
9. 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
10. How many 3-digit numbers greater than 500 contain the digit 9 appearing at least once?
   a. 191 b. 176 c. 153 d. 189
11. 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
12. What is sum of all rearrangements of the 4-digit number 3214?
   a. 66660 b. 55554 c. 60048 d. 65024
13. 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
14. 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. 7C3 b. 20C3 c. 20C3 / 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. 52C3 b. 52C3 – 36C3 c. 52C3 – 40 C3 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! *5! b. 6! *6! c. 5! *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. ½ c. ¾ 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. 93/264 b. 95/264 c. 91/264 d. 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. 31/128 b. ½ c. 93/256 d. 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. 2/5 b. 7/15 c. 11/30 d. 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. 5/9 b. 4/9 c. 3/7 d. 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. ½ b. 49/101 c. 50/101 d. 51/101
35. I forgot the last digit of a 7-digit telephone number. If 1 randomly dials the final 3 digits after correctly dialing the first four, then what is the chance of dialing the correct number?
    a. 1/1001 b. 1/1000 c. 1/999 d. 1/990
36. The probability that a man can hit a target is 3/4. He tries 5 times. The probability that he will hit the target at least three times is:
    a. 291/364 b. 371/464 c. 471/502 d. 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. ¼ b. 1/5 c. 2/5 d. 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. 3/25 b. 1/6 c. 4/25 d. 81/400

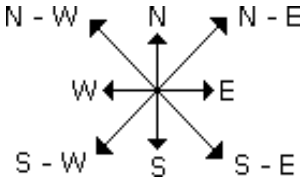
39. A biased die has a probability of 1/4 of showing a 5, while the probability of any of 1, 2, 3, 4, or 6 turning up is the same. If three such dice are rolled, what is the probability of getting a sum of at least 14 without getting a 6 on any die?
a. 5/24 b. 9/160 c. 1/30 d. 7/160
40. A box contains 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. 4/19 b. 7/19 c. 12/19 d. 21/95

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.

Class Practice Problems

1.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

2.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

3.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

4. 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

5. 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

6. 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

7. 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

8. 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

9. 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

10. 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

11. 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 clock wise & 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

12. Ravi started walking from his house east direction on Bus stop which is 3km away. Then he set off in thebus 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

13. Debu walks towards East then towards North and turning 45º 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

14. 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

15. 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 of6 km, and then turned left again and proceeded straight for another 10 km. In which direction is Mohan fromhis starting point?

A. East B. West C. North D. South

16. 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

17. 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

18. 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

19. 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

20. 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 degree and to cover 30 m. In which direction should he go?

A. West B. South C. South-West D. South-East

21. 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

22. 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

23. 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

24. Rajat walked 20 m towards north. Then he turned right and walks 30 m. Then he turns right and walks 35m. 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

25.A child is looking for his father. He went 90 meters in the east before turning to his right. He went 20 meters before turning to is right again to look for his father at his uncle's place 30 meters from this point. His father was not there. From there, he went 100 meters to his north before meeting his father in a street. How far did the son meet his father from starting point?

A. 80 metre B. 90 metre C. 100 metre D. 110 metre

26. Rohit walked 25 metres towards South. Then he turned to his left and walked 20 metres. He then turned to his left and walked 25 metres. He again turned to his right and walked 15 metres. At what distance is he from the starting point and in which direction?

A. 35 metre, North B. 30 metre, South C. 35 metre, East D. 30 metre, North

27. Starting from a point P, Sachin walked 20 metres towards South. He turned left and walked 30 metres. He then turned left and walked 20 metres. He again turned left and walked 40 metres and reached a point Q. How far and in which direction is the point Q from the point P?

A. 30 metres, West B. 10 metres, West C. 30 metres, North D. 10 metres, North

28. Amit starts from a point A and walks 5 m towards North-East direction and reaches point B .From here he travels 8 m in East direction and reaches point C. From C he travels towards South-West direction and reaches point D after traveling a distance equal to AB. At last, he turns towards West direction and reaches point A. How much distance has been covered by Amit and which geometrical figure has been formed by path travelled by him?

A. 26m, square B. 26m, parallelogram C. 26m, trapezium D. 16m, parallelogram

29. Vinod starts from his house and travels 4 km in East direction, after that he turns towards left and moves 4 km. Finally, he turns towards left and moves 4 km. At what distance and in which direction he finally stands from his original point?

A. North, 4 km B. North-East, 4 km C. South, 12 km D. West, 4 km

30. A and B starts from a point in opposite directions. A travels 3 km and B also travels 3 km. Then, A turns towards right and travels 4 km and B turns towards right and travels 4 km. What is the distance between A and B?

A. 8 km B. 10 km C. 12 km D. 14 km

Tutorial Practice Problems

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° in the clockwise direction and then 145° in the anticlockwise diretion. Which direction am I facing now?

a) North b) North-east c) East d) South-west

16. Siva Reddy walked 2 km west of his house and then turned south covering 4 km. Finally, He moved 3 km towards east and then again 1 km west. How far is he from his initial position?

A. 10 km B. 9 km C. 2 km D. 4 km

17. A man went 10 kms towads South. Then turned East and covered 10 kms and turned to the right. Again after 10 kms, he turned to left and covered 10 kms to reach the destination. How far is he from his starting point?

A. 18.8 km B. 28.28 km C. 16 km D. 20 km

18. Rajesh's school bus is facing North when reaches his school. After starting from Rajesh's house, it turning twice right and then left before reaching the school. What direction the bus facing when it left the bus stop in front of Rajesh's house?

A. East B. North C. South D. West

19. Anil wants to go the university. He starts from his house which is in the East and comes to a crossing. The road to his left ends in a theatre, straight ahead is the hospital. In which direction is the University?

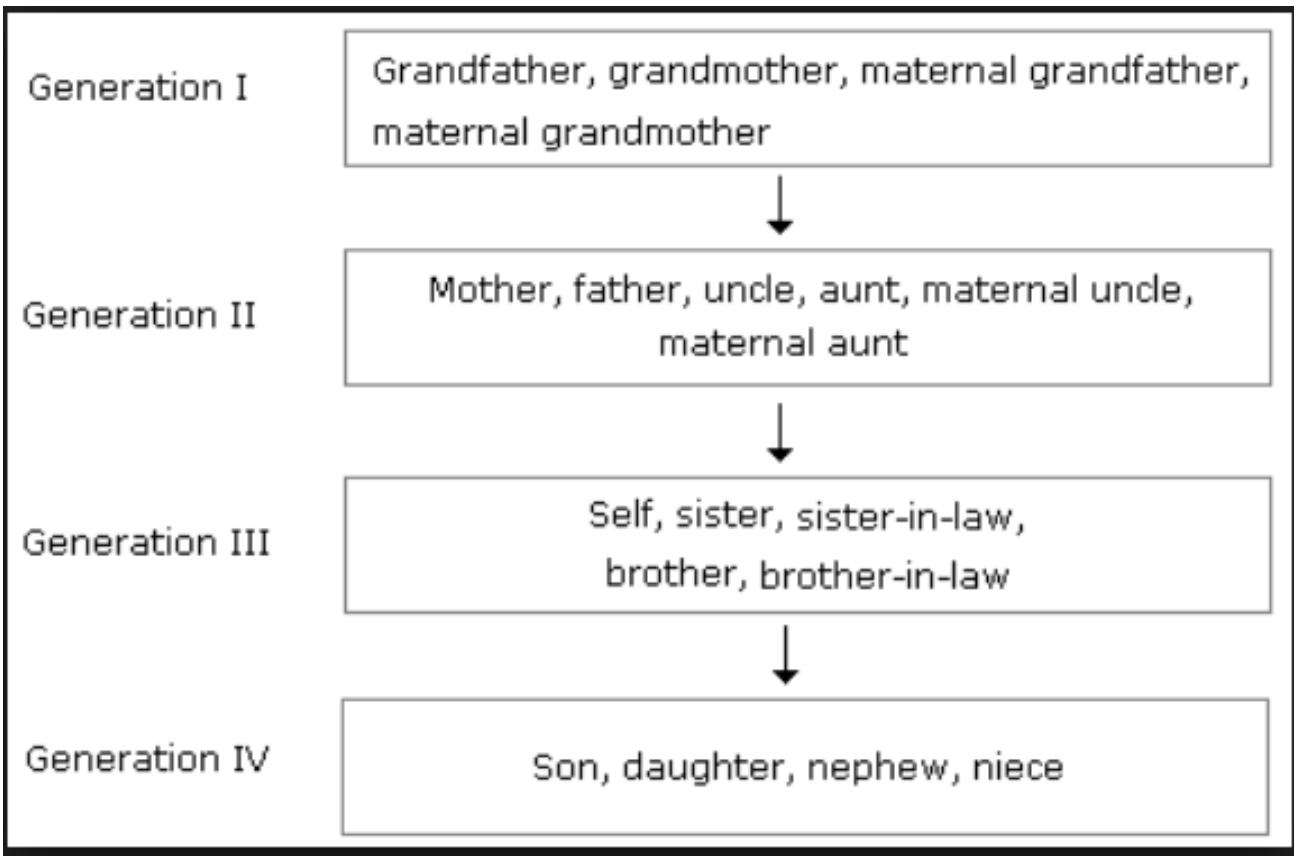
A. East B. North C. South D. West

20. If South-East becomes North, North-East becomes West and so on, what will West become?

A. North B. East C. South-East D. North-West

BLOOD RELATION

COMMON RELATIONS-



How To Solve Questions:

1. • Read the Data Quickly to get the Feel of the Question
2. • Use Special Symbols for different relations while drawing family Tree. Put + sign before male & - sign before female. Use = sign to represent brother or sister relationship and ↔ to represent marriages
3. • Start with last Information and proceed backwards
4. • It is advicable to begin with a sentence that gives information about Parent-Child Relationship in Complex Question.

Class Practice Problems

1. 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

2. Pointing to a man, a woman said, "His mother is the only daughter of my mother." How is the womanrelated to the man?

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 Vipulrelated to the girl in the photograph?

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?

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 isgentleman related to Deepak?

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?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?

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 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

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?

A. A B. F C. B D. D

10. R is the brother of G. Q is the sister of R. 0 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

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?

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 maternal uncle. How is Raghav relatedto Sia?

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 onlyson." How is the woman related to Nisha?

A. Grandmother B. Sister-in-law C. Sister D. CND

14. 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

15. Anupam said to a lady sitting in a car, "The only daughter of the brother of my wife is the sister-in-law ofthe 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

16. Pointing to Varman, Madhav said, "I am the only son of one of the sons of his father." How isVarman 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 relatedto 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 thatwoman 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". Whatrelation did the boy bear to the man?

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?

A. Son B. Father C. Brother D. Uncle

Directions (21--25): Study the following information carefully and answer the questions that follow:

A ÷ B means A is son of B
A × B means A is sister of B
A + B means A is brother of B
A – B means A is mother of B

21.How is G related to H in the expression 'G × R + V ÷ H'?

A. Sister B. Daughter C. Son D. Mother

22.Which of the following expressions represents 'B is the husband of A'?

A. A × I – E + B B. A – I + E ÷ B C. A + I ÷ E × B D. A ÷ I × E + B

23.How is V related to T in the expression 'T ÷ R + V × N'?

A. Niece B. Father C. Uncle D. Aunt

24.How is P related to J in the expression 'J × K ÷ M – P'?

A. Sister B. Brother C. Father D. Either (a) or (b)

25.Which of the following expressions represents 'J is wife of E'?

A. E ÷ F × G + H – J B. E × G ÷ H + F – J C. J – H × G ÷ E + F D.Both(a)and(b)

Directions (26-30): A, B, C, D, E, F, G and H are sitting around a circle facing the centre but not necessarily in the same order. Each of them has a relationship with A.
G is sitting second to the left of father of A. F is immediate neighbour of A. D, mother of A is sitting opposite to the sister of A. B is sitting to the immediate right of wife of A. E who is a male is sitting second to the right of mother of C. Brother of A is sitting third to right of B. Daughter of A is sitting to third to right of sister of A. A is sitting second to the right of daughter of E. E is sitting to the immediate left of sister of A.

26. Who is the mother of H?

A. F B. G C. C D. D

27. Who is the grand-daughter of E?

A. B B. C C. D D. G

28. Who is sitting second to the right of F' sister?

A. wife of A B. brother of C C. daughter of A D. father of B

29. How many persons are sitting between A's wife and D's husband when counted from right of A's wife?

A. None B. One C. Two D. Three

30. What is the position of G's daughter with respect to D's daughter?

A. third to left B. second to left C. third to right D. second to right

Tutorial Practice Problems

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 × K

b) B ÷ H – A + D

c) B ÷ G – A ÷ R

d) B + T × A ÷ 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

16. 1. Rohan walked 50 m towards East, took a right turn and walked 30 m. Which direction is he now from his starting position ?

(a) South-West (b) North-East (c) North-West (d) South-East (e) None of these

17. 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?

(a) West (b) North (c) East (d) South (e)Cannot be determined

18. 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 ?

(a) North-West (b) North (c)South-West (d) Cannot be determined (e)None of these

19. 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?

(a) West (b) East (c) North (d) South (e) None of these

20. 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?

a) South-East b) North c)North-East d) East e) None of these.

Answer Key

	Number System

Class Practice Problem

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

Tutorial Practice Problems

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

Average

Class Practice Problems

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

Tutorial Practice Problems

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

Competitive level

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

Simplification

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

PERCENTAGE

Class Practice Problems

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					

Tutorial practice Problems

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

Competition Level

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

Class Practice Problems

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	

Tutorial Practice Problems

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

21. C	22. C	23. B	24. A	25. D	26. C	27. C	28. A	29. B	30. A

Competition Level

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

Class Practice Problems

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	

Tutorial Practice Problems:

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

Competition Level

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

NUMBER SERIES

Class Practice Problems

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

Tutorial Practice Problems

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

Competition Level

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

Coding Decoding

Class Practice Problems

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						

Tutorial Practice Problems

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

ALPHABET TEST

Class Practice Problems

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

TUTORIAL PRACTICE PROBLEMS

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

ARITHMETIC & GEOMETRIC PROGRESSION

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

RATIO AND PROPORTION

Class Practice Problems

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					

Tutorial Practice Problems

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

Competition Level

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	*16.* C	*17.* D	*18.* E	*19.* A	*20.* B
21. E	*22.* D	*23.* A	*24.* A	*25.* B					

AGES

Class Practice Problems

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

Tutorial Practice Problems

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

ALLIGATION AND MIXTURES

Class Practice Problems

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

Tutorial Practice Problems

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

Competition Level

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					

PERMUTATION AND COMBINATION

Class Practice Problems

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

Tutorial Practice Problems

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

PROBABILITY

Class Practice Problems

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

Tutorial Practice Problems

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

Competition Level

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

DIRECTION SENSE

Class Practice Problems

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	25. D	26.D	27. C	28. B	29. D	30. B

BLOOD RELATION

Class Practice Problems

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. B	22. B	23. D	24. D	25. C	26. D	27. B	28. D	29. B	30. C

Tutorial Practice Problems

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	16. A	17. C	18. D	19. E	20. C
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	16. D	17. B	18. D	19. B	20. C