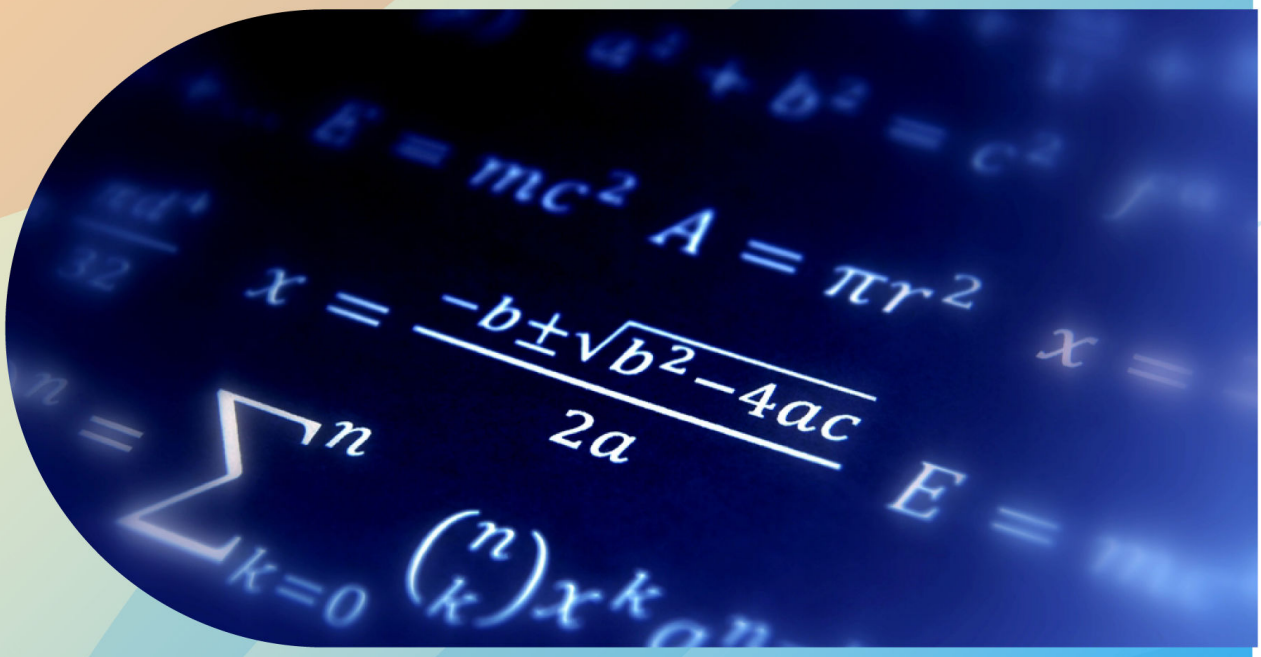
Quantitative Aptitude

for
Campus Placement Training
&
Competitive Exams



Department of Analytical Skills
School of Professional Enhancement

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NUMBER SYSTEM

Natural Numbers

The counting numbers are commonly called natural numbers.

For example Natural Number, N = {1, 2, 3 …}

- All natural numbers are positive.
- The smallest natural number is 1.
- Zero (0) is not a natural number.

Whole Numbers

All the natural numbers including Zero are called Whole Numbers. It is also known as non-negative integers.

For example Whole Numbers, W = {0, 1, 2, 3 …}.

Integers

Whole numbers as well as negative numbers form the set of integers. It can be classified into two types,

(i) Positive integers → {1, 2, 3…}

(ii) Negative integers → {– 1, – 2, – 3…}

(iii) Zero is neither a positive nor a negative integer.

Even Numbers

All the counting numbers which are divisible by 2 are called even numbers.

For example 2, 4, 6, 8, 10…2n

- Unit place of an Even number is 0, 2, 4, 6, or 8.

Odd Numbers

The numbers which are not divisible by 2 are called odd numbers.

For Example 1, 3, 5, 7, 9, 11 … (2n-1).

- Unit place of an odd number is 1, 3, 5, 7,or 9.

Odd * Odd = Odd

Even * Even = Even

Odd * Even = Even

Prime Numbers

The numbers which are having exactly 2 distinct factors namely itself and 1 are called Prime Numbers.

For Example: 2, 3, 5, 7, 11, 13 …

The number 5 is a prime number and the factors of 5 are 1 and 5. These are two distinct factors and so 5 is a Prime number.

- The smallest odd prime number is 3.
- 2 is the only even prime number.
- All prime numbers greater than 3 can be represented by **6n+1 or 6n-1,** where n is an integer.

How to check if a number is Prime or not?

If A is a given number,

(i) Find a number S, such that $S > \sqrt{A}$.

(ii) Consider all the prime numbers less than equal to S.

(iii) If none of these divides A, then A is prime.

Example: Find A= 137 is prime or not?

$$12 > \sqrt{137}$$

Prime numbers up to 12 are: 2, 3, 5, 7, and 11.

None of these divide 137 exactly, so 137 is a Prime number.

Composite Numbers

Composite numbers are non-prime natural numbers. They must have at least one factor except 1 and itself.

- 1 is neither prime nor composite.

Co Primes

Two natural numbers are said to be Co primes if the HCF of the two numbers is 1.

For example (7, 9) and (18, 19)

- Two composite numbers having no common factor except 1 are always co prime.
- Two consecutive numbers are always co prime.

DIVISIBILITY TESTS

Divisibility by 2

When the unit digit of a number is even, the number is divisible by 2.

For example

16, 98, 1000 etc., are divisible by 2.

Divisibility by 3

When the sum of the digits of a number is a multiple of 3, then the number is divisible by 3.

For example

$4518 = 4 + 5 + 1 + 8 = 18$ which is a multiple of 3, so 1233 must be divisible by 3.

Divisibility by 4

When the last two-digits of a number are a multiple of 4, then the number is divisible by 4.

For example

4596 is divisible by 4 as the last two digits 96 of the number are divisible by 4.

Divisibility by 5

Numbers having 0 or 5 at the unit place are divisible by 5.

For example

55, 2350, 22850 etc., are divisible by 5 as they have 0 or 5 at the unit place.

Divisibility by 6

When a number is divisible by both 3 and 2, then the number is divisible by 6 also.

For example

12, 1440 etc., are divisible by 6 as they are divisible by both 3 and 2.

Divisibility by 7

A number is divisible by 7 when the difference between twice the digit at the units place and the number formed by the other digits is either zero or a multiple of 7.

For example

679 is divisible by 7 because $67 - (2 \times 9) = 67 - 18 = 49$. As 49 is a multiple of 7, the number 679 is divisible by 7.

Divisibility by 8

When the number made by last three digits of a number is a multiple of 8, then the number is divisible by 8.

For example

2208, as 208 (the last three digits of 2208) is divisible by 8, the number 2208 is also divisible by 8.

Divisibility by 9

When the sum of all the digits of a number is a multiple of 9, then the number is also divisible by 9.

For example

936819 → 9+3 + 6 + 8 + 1 + 9= 36 which is divisible by 9. Therefore, 936819 is divisible by 9.

Divisibility by 10

When the digit at the unit place of a number is zero, then the number is divisible by 10.

For example

20, 40, 150, 123450, 478970 etc., are divisible by 10 as they all end with zero.

Divisibility by 11

When the difference between the sums of odd position digits of the number and the even position digits of the number are multiples of 11 or zero, the number is divisible by 11.

For example

661749 → Sum of digits at odd places (A) = 6 + 1 + 4 = 11

Sum of digits at even places (B) = 6 + 7 + 9 = 22 →A – B = 22 – 11 = 11.

661749 is divisible by 11.

Highest Common Factor or Greatest Common Divisor

HCF of a given set of numbers is the greatest common number that divides all the numbers of the set. Hence it is called HCF of the given set.

To find the HCF of the given numbers

- Factorize each of the given set of numbers into prime factors and their powers thereof
- Take the common prime factors that contain the minimum power available and multiply. The product is known as the HCF of the given set of numbers.

Least Common Multiple

LCM of any given set of numbers is the smallest such number which is divisible by each number of the given set.

To find the LCM of the given numbers,

- Factorize the number into prime factors and their powers thereof.
- Select all the prime factors, with their respective maximum power, and multiply them.

For Example, Consider 12, 24

$12 = 2 \times 2 \times 3 = 2^2 \text{ X } 3^1$

$24 = 2 \times 2 \times 2 \times 3 = 2^3 \text{ X } 3^1$

HCF of 12, 24 → $2^2 \text{ X } 3^1 = 12$

LCM of 12, 24 → $2^3 \text{ X } 3^1 = 24$

Important properties

i) Product of two numbers (a, b) = LCM (a, b) × HCF (a, b).

ii) HCF of fractions

$$= \frac{\text{HCF of numerators of all the fractions}}{\text{LCM of the denominators of all the fractions}}.$$

iii) LCM of fractions

$$= \frac{\text{LCM of numerators of all the fractions}}{\text{HCF of the denominators of all the fractions}}.$$

iv) LCM and HCF for negative integers do not exist.

v) HCF of two co prime numbers is 1.

vi) $\frac{LCM}{HCF}$ is always an integer value. Therefore HCF is a factor of the LCM.

Factors of Numbers

In order to find the factors of a number Nidentify the prime factors and their respective powers thereof and rewrite the number where a, band c are the prime factors and x, y and z are their respective powers as

$N=a^x * b^y * c^z$

(i) Number of factors = $(x+1)(y+1)(z+1)$

(ii) Sum of factor $=\left[\frac{a^{x+1}-1}{a-1}\right]\left[\frac{b^{y+1}-1}{b-1}\right]\left[\frac{c^{z+1}-1}{c-1}\right]$

Remainder theorem

The basic remainder theorem formula is:

Dividend = Divisor* Quotient + Remainder

If remainder = 0, then the number is divisible by the divisor and divisor is a factor of the number.

For example when 8 divides 40, the remainder is 0 and it can be said that 8 is a factor of 40.

Formulae:

- $\mathbf{R\left(\frac{a+b}{d}\right) = R\left(\frac{a}{d}\right) + R\left(\frac{b}{d}\right)}$
- $\mathbf{R\left(\frac{a\,X\,b}{d}\right) = R\left(\frac{a}{b}\right) X\, R\left(\frac{b}{d}\right)}$
- $\mathbf{R\left(\frac{a^n}{d}\right) = R\left(\frac{a^n}{d}\right)}$
- $\mathbf{R\left(\frac{a^n+b^n}{a+b}\right) = 0}$, when n is odd
- $\mathbf{R\left(\frac{a^n-b^n}{a-b}\right) = 0}$, when n – even, n-odd
- $\mathbf{R\left(\frac{a^n+b^n}{a-b}\right) = 0}$, when n – even, n-odd

Cyclicity of Remainders:

Cyclicity is the property of remainders, due to which the remainders start repeating after a certain point.

Euler's theorem

Euler's theorem states that for any co prime numbers P and Q,

$R\left(\frac{P^{\varphi(n)}}{Q}\right) = 1$. Where **φ (n) is Euler's totient.**

It is applicable only for co-prime numbers.

Euler's totient

φ (n) = n x (1 - 1/P_1) x (1 - 1/P_2) x (1 - 1/P_3) x....

Fermat's theorem

Remainder of $\frac{a^{p-1}}{p} = 1$, which is Fermat's little theorem, where p is a prime number and a and p are co

primes.

CLASSWORK PROBLEMS

1. Find the rational form of the recurring rational 0.2333333333
(a)11/99
(b) 1/3
(c) 7/30
(d) 13/30

2.Find the unit digit of 2354^{1048}
(a) 4
(b) 6
(c) 8
(d) None of these

3. Find the LCM of 12, 15, 72 and 75
(a)1800
(b) 1500
(c) 1440
(d) 1040

4. 6 bells of a Church toll at different intervals of 5seconds, 8 seconds, 10 seconds, 6 seconds, 12 seconds and 15 seconds respectively. If they toll together at 12 noon, how many times will they toll together till 1 pm?
(a) 15 times
(b) 20 times
(c) 31 times
(d) None of these

5. If HCF and LCM of two numbers 15 and 1440 respectively, one of the numbers is 75 find the other number.
(a) 240
(b) 288
(c) 250
(d) NO Such number

6. If 24586 and 22584 both leave a same remainder when divided by a divisor which of the following can be the maximum possible value of the divisor?
(a) 143
(b) 77
(c) 91
(d) 2

7.When a two digit number is reversed it gets decreased by 72, what is the number?
(a)81
(b) 72
(c) 91
(d) 64

8. What two numbers have a product of 48 and, when the larger number is divided by the smaller, a quotient of 3?
(a) 4 and 12
(b) 6 and 12
(c) 6 and 12
(d) 5 and 10

9. Find the remainder when 171054 is divided by 15.
(a) 9
(b) 11
(c) 12
(d) 13

10 Find the remainder when 2145123 is divided by 6.
(a) 0
(b) 3
(c) 4
(d) 5

11 Find the number of zeroes in 154!.
(a) 35
(b) 31
(c) 34
(d) 37

12 Find the number of trailing zeroes in 56!
(a) 13
(b) 11
(c) 12
(d) 6

13. Find the remainder when 234! is divided by 560.

(a) 2
(b) 0
(c) 1
(d) 13

14.Find the first non zero digit in 100!
(a)6
(b) 8
(c) 4
(d) 3

15. Find the HCF 2/4, 10/8, 4/12, 6/15
(a) 1/60
(b) 12
(c) 2/56
(d) 4/60

16. Find the number of 7's between 100 and 700.
(a) 120
(b) 101
(c) 121
(d) 100

17. A group of friends goes for dinner and gets bill of Rs 2400. Two of them says that they have forgotten their purse so remaining make an extra contribution of Rs 100 to pay up the bill. Tell the no. of person in that group.
(a) 8 persons
(b) 7 persons
(c) 12 persons
(d) None of these

18.Find the unit digit of 248^{1587}.
(a) 2
(b) 4
(c) 8
(d) 6

19 Rahul scored 78, 56 and 89 marks in Science, Social and Mathematics. Later it was found that his marks were reversed and entered. How much marks should be added to get correct total?
(a) 18
(b) 24
(c) 27
(d) 15

20 If all the 6 are replaced by 9, then the algebraic sum of all the numbers from 1 to 100 (both inclusive) varies by ___.
(a) 500
(b) 360
(c) 450
(d) 330

21.Let N = 80pq2pq (7digit number). If N is exactly divisible by 120 then the sum of the digits in N is equal to:
(a) 18
(b) 22
(c) 24
(d) 12

22. If 21pq33pq is a 8-digit number which is divisible by 12 then how many 2 digit numbers as pq are possible?
(a) 8
(b) 18
(c) 12
(d) 28

23. If 14p0p0p4 which is a 8 digit number and is divisible by 12 then the number of possible values of p is:
(a) 2
(b) 3
(c) 4
(d) 5

24. If 53p26p3 is a 7 digit number divisible by 9 and if 757qp is divisible by 8 then the minimum value of p + q is:
(a) 4
(b) 12
(c) 16
(d) 8

25. In how many ways can 840 be written as the product of 2 numbers?
(a)6
(b) 16
(c) 18
(d) 32

26. Find the number of factors of 120
(a) 4
(b) 8
(c) 12
(d) 16

27. Find the number of factors of 1000.
(a) 12
(b) 16
(c) 10
(d) 18

28. Find the number of factors of 1560.
(a) 6
(b) 16
(c) 12
(d) 32

29. Find the number of factors of 35.
(a) 4
(b) 6
(c) 8
(d)10

30. Find the number of factors of 330.
(a) 2
(b)8
(c) 16
(d) 32

31.In how many ways can 200 be written as a product of two numbers?
(a) 4
(b) 6
(c) 8
(d) 10

32. In how many ways can 120 be written as a product of two numbers?
(a) 12
(b) 8
(c) 16
(d) 10

33. In how many ways can 450 be written as a product of two numbers?
(a) 12
(b) 16
(c) 18
(d) 9

34.In how many ways 12 can be written as a product of two co-prime factors?
(a) 2
(b) 6
(c) 8
(d) 6

35. In how many ways 320 can be written as a product of two co-prime factors?
(a) 2
(b) 6
(c) 1
(d) 5
36. In how many ways 540 can be written as a product of two co-prime factors?
(a) 1
(b) 2
(c) 3
(d) 4

37. In how many ways 1024 can be written as a product of two co-prime factors?
(a) 2
(b) 1
(c) 3
(d) 4
38.How many factors of 340 are even?
(a) 12
(b) 16
(c) 8
(d) 6

39. How many factors of 1024 are even?
(a) 12
(b) 10
(c) 8
(d) 6

40. How many factors of 408 are even?
(a) 12
(b) 16
(c) 8
(d) 10

ASSIGNMENT PROBLEMS

1. What minimum number must be added to 454 so that the number is divisible by both 5 and 7?
(a) 1
(b) 5
(c) 34
(d) 35

2. What minimum number must be added to or subtracted from 261 so that the number is exactly divisible by 2, 6 and 8?
(a) 1
(b) 2
(c) 3
(d) 21

3. What is the smallest number which gives a remainder of 2 when divided by 3, 6 and 5?
(a) 5
(b) 8
(c) 32
(d) None

4.Which is the smallest number greater than 1000 that gives a remainder of 5 when divided by both 6 and 8?
(a) 1008
(b) 1001
(c) 1013
(d) 1012

5. What is the largest number smaller than 300 which when divided by both 4 and 7 gives a remainder of 3?
(a) 3
(b) 31
(c) 283
(d) 308

6. Find the largest 4 digit number that will give a remainder of 6 when divided by 8 and 7?
(a) 9974
(b) 9984
(c) 99 69
(d) none of these

7. In a leap race ram takes a leap of 6 feet and shyam takes a leap of 8 feet. Find the distance of the point (from starting point) where both will land at the same spot 3rd time. (Assume their average speed is same)
(a) 24 feet
(b) 72 feet
(c) 36 feet
(d) 144 feet

8.What is the maximum possible length of a thread required to exactly measure 352 cm, 220 cm and 308 cm?
(a) 22
(b) 44
(c) 11
(d) 88

9.A number 1245674567 is divided by 11. What will be the remainder?
(a) 8
(b) 9
(c) 10
(d) 5

10. what will be the last digit of 48^{67}?
(a) 2
(b) 4
(c) 8
(d) 6

11.Find the last digit of $456^{87}*307^{42}$
(a) 1
(b) 4
(c) 5
(d) 7

12. What is the remainder when $(259^{19}+34^{17})$ is divided by 10?
(a) 3
(b) 5
(c) 7
(d) 9

13. Find the number of factors of 72.
(a) 9
(b) 10
(c) 11
(d) 12

14. Find the largest number which will divide 458, 515 and 648 leaving same remainder in all cases.
(a) 19
(b) 57
(c) 38
(d) 133

15.Find the number of prime factors of 300.
(a) 2
(b) 3
(c) 4
(d) 5

16.LCM of three numbers are in the ratio 7:3:12 is 2016. What is the HCF of these numbers?
(a) 4
(b) 8
(c) 12
(d) 24

17. Find the largest 4 digit number which when divided by 42 and 24 leaves 33 and 15 as remainders respectively.
(a) 9921
(b) 9903
(c) 9912
(d) 9901

18.Alarms of three clocks ring at the interval of 4 minutes, 8 minutes and 6 minutes respectively. All of them rang together at 8.00 a.m. Now, find the number of times they will ring together before 9.45 a.m.
(a) 5
(b) 4
(c) 6
(d) 8

19.In a circular race, A completes 1 round in 15 minutes and B completes 1 round in 25 minutes. After making how many rounds will A meet B again at the starting point, if they start running together from the starting point?
(a) 3
(b) 5
(c) 6
(d) 2.5

20.Find the number of composite factors of 42.
(a) 1
(b) 4
(c) 5
(d) 6

Answer Key – Assingment Problems

Q.No	Option	Q.No	Option
1	A	11	B
2	C	12	A
3	C	13	D
4	C	14	A
5	C	15	B
6	A	16	D
7	B	17	B
8	B	18	B
9	D	19	B
10	A	20	B

AVERAGE

An average or more accurately an arithmetic mean is, in crude terms, the sum of n different data divided by n.

Averages of a group are defined as the ratio of sum of all the items in the group to the number of items in the group.

Average = (Sum of all items in the group)/ Number of items in the group

Some Important Concepts:

Average =total of data/No. of data

If the value of each item is increase by the same value a, then the average of the group or items will also increase by a.

If the value of each item is decreased by the same value a, then the average of the group of items will also decrease by a.

If the value of each item is multiplied by the same value a, then the average of the group or items will also get multiplied by a.

If the value of each item is multiplied by the same value a, then the average of the group or items will also get divided by a.

If we know only the average of the two groups individually, we cannot find out the average of the combined group of items.

- **Average of n natural no's = (n+1)/2**
- **Average of even No's = (n+1)**
- **Average of odd No's = n**

CLASSWORK PROBLEMS

1.The average weight of 39 Students in a class is 23 kg. Among them Sita is the heaviest while Tina is the lightest. If both of them are excluded from the class still the average remains same. The ratio of weight of Sita to Tina is 15:8.Then what is the weight of the Tina?
(a) 15
(b) 16
(c) 18
(d) 19

2.The ages of Four members of a family are in the year 2010 are „X", "X+12", "X+24" and „X+36". After some years Oldest among them was dead then average reduced by 3 After how many years from his death, the average age will same as in 2010?
(a) 2 Years
(b) 3 Years
(c) 4 years
(d) 6 Years

3.The average of four numbers is 24.5. First number is 3/2 times the second, the second is 1/3 rd of the third, and the third is 2 times the fourth number. Then what is smallest of all those numbers?
(a) 21
(b) 12
(c) 14
(d) 7

4.There are 459 students in a hostel. If the number of students increased by 36, the expenses of the mess increased by Rs .81 Per day while the average expenditure per head reduced by 1 Find the original expenditure of the mess?
(a) 7304
(b) 7314
(c) 7324
(d) 7344

5.The average cost of 32 different Mobiles is Rs. 9000. Among them, Oppo

which is the costliest is 70% higher price than the cheapest Mobile Lava. Excluding these mobiles, the average ost of the remaining mobiles is Rs.8880. Then what is the cost of Oppo Mobile?
(a) Rs. 10000
(b) Rs. 11600
(c) Rs. 12400
(d) Rs.13600

6.The average age of a family of 9 members is 22 years. Surya is the youngest and his age is 6 years, then what was the average age of the family just before Surya was born?
(a) 15
(b) 16
(c) 18
(d) 20

7.Dhoni scored 8000 runs in a certain number of innings. In the next five innings, he was out of form and hence, could make only 85 runs, as a result his average reduced by 1 run. How many innings did he play in total?
(a) 160
(b) 165
(c) 170
(d) 175

8.The weights of 19 people are in Arithmetic progression. The average weight of them is 19. If the heaviest is 37 Kgs. Then what is the weight of the Lightest?
(a) 1 Kg
(b) 2 Kg
(c) 3 Kg
(d) 4 kg

9.The average weight of 40 Students is 32 If the Heaviest and Lightest are excluded the average weight reduces by 1 If only the Heaviest is excluded then the average is 31
Then what is the weight of the Lightest?
(a) 30
(b) 31
(c) 32
(d) 33

10.Average of 17 students in a class is X. When their marks are arranged in ascending order it was found to be in Arithmetic Progression. The class teacher found that rank the students who ranked 15th, 11th, 9th and 7th had copied the exam and hence they are suspende(d) Now the average of the remaining class is Y. Then
(a) X =Y
(b) X >Y
(c) X<Y
(d) X = 2Y

11.The average price of 80 mobile phones is Rs.30,000. If the highest and lowest price mobile phones are sold out then the average price of remaining 78 mobile phones is Rs. 29,500. The cost of the highest mobile is Rs.80,000. The cost of lowest price mobile is?
(A) Rs. 18000
(B) Rs. 15000
(C) Rs. 19000
(D) Can't be determined

12.In a Company the average income of all the employees is Rs. 20000 per month. Recently the company announced increment of Rs. 2000 per month for all the employees. The new average income of all the employees is?
(A) 22000
(B) 24000
(C) 28000
(D) 26000

13.Pranav went to the bank at the speed of 60 kmph while returning for his home he covered the half of the distance at the speed of 10 kmph, but suddenly he realized that he was getting late so he increased the speed and reached the home by covering rest half of the distance at the speed of 30 kmph.The average speed of the Pranav in the

whole length of journey is?
(A) 24 kmph
(B) 14 kmph
(C) 16 kmph
(D) 10 kmph

14.The average expenditure of Sharma for the January to June is Rs. 4200 and he spent Rs. 1200 in January and Rs.1500 in July. The average expenditure for the months of February to July is:
(A) 2750
(B) 3250
(C) 4250
(D) 4500

15.The average weight of all the 11 players of CSK is 50 kg. If the average of first six lightest weight players of CSK is 49 kg and that of the six heaviest players of CSK is 52 kg. The average weight of the player which lies in the sixth position in the list of players when all the 11 players of CSK are arranged in the order of increasing or decreasing weights.
(A) 54 kg
(B) 50 kg
(C) 53 kg
(D) 56 kg

16.The average presence of students of a class in a College on Monday, Tuesday and Wednesday is 32 and on the Wednesday, Thursday, Friday and Saturday is 30. if the average number of students on all the six days is 26 then the number of students who attended the class on Wednesday is?
(A) 50
(B) 40
(C) 60
(D) 70

17.Suresh started his journey from P to Q by his bike at the speed of 40 kmph and then, the same distance he travelled on his foot at the speed of 10 kmph from Q to R. Then he returned from R to P via Q at the speed of 24 kmph. The average speed of the whole trip is:
(A) 18.5 kmph
(B) 19.8 kmph
(C) 18.2 kmph
(D) 19.2 kmph

18.Ramesh walked 6 km to reach the station from his house, then he boarded a train whose average speed was 60 kmph and thus he reached his destination. In this way he took a total time of 3 hours. If the average speed of the entire journey was 32 kmph then the average speed of walking is:
(A) 5 kmph
(B) 8 kmph
(C) 2 kmph
(D) 4 kmph

19.Bala travels first one-third of the total distance at the speed of 10 kmph and the next one-third distance at the speed of 20 kmph and the last one – third distance at the speed of 60 kmph. What is the average speed of Bala?
(A) 18 kmph
(B) 19 kmph
(C) 16 kmph
(D) 12 kmph

20.The average income of Arun, Bala and Chitra is Rs. 12,000 per month and average income of Bala, Chitra and David is Rs. 15,000 per month. If the average salary of David be twice that of Arun, then the average salary of Bala and Chitra is in Rs?
(A) 15,000
(B) 20,000
(C) 14500
(D) 13500

21.The average monthly expenditure of Mr.Ravi‟s family for the first three months is Rs 2,750, for the next three months is Rs 2,940 and for the last three months Rs 3,150. If his family saves Rs

4980 for nine months, find the average monthly income of the family for the 9 months?
(A) Rs. 3800
(B) Rs. 3500
(C) Rs. 3400
(D) Rs. 4200

22.The average age of a family of 8 members is 24 years. If the age of the youngest member be 6 years, the average age of the family at the birth of the youngest member was?
(A) 23.42 years
(B) 21.42 years
(C) 27.42 years
(D) 26.42 years

23.Mr. Ravi‟s family has 10 males and a few females, the average monthly consumption of rice per head is 8 kg. If the average monthly consumption of rice per head be 10 kg in the case of males and 6 kg in the case of females, find the number of females in Ravi‟s family?
(A) 2
(B) 4
(C) 6
(D) 10

24.In a famous hotel the rooms were numbered from 201 to 230, each room gives an earning of Rs. 5000 for the first fifteen days of a month and for the latter half, Rs. 3000 per room. Find the average income per room per day over the month. (September)?
(A) 2000
(B) 3000
(C) 4000
(D) 5000

25.In a famous hotel, the rooms are numbered from 101 to 130 on the first floor, 201 to 220 on the second floor and 301 to 330 on the third floor. In the month of September, the room occupancy was 50% on the first floor, 80% on the second floor and 40% on the third floor. If it is also known that the room charges are Rs 200, Rs. 250 and Rs. 300 on each of the floors respectively, then find the average income per room in the hotel for the month of September?
(A) Rs. 123.75
(B) Rs. 132.50
(C) Rs. 128.50
(D) Rs. 143.50

26.There were 46 students in a Boys hostel. Due to the admission of eight new students the expenses of the hostel mess were increased by Rs.42 per day while the average expenditure per head diminished by Rs 1 What was the original expenditure of the hostel mess?
(A) Rs.562
(B) Rs.542
(C) Rs.532
(D) Rs.552

27.The average salary of the entire staff in a office is Rs 250 per month. The average salary of officers is Rs 520 and that of non-officers is Rs. 200. If the number of
officers is 15, then find the number of non–officers in the office
(A)823
(B) 81
(C) 87
(D) 56

28. Mr.Suresh’s average monthly expenditure for the first four months of the year was Rs.260 For the next five months, the average monthly expendi ture was Rs.40 more than what it was during the first four months. If he spent Rs.560 in all during the remaining three months of the year, Find what percentage of his annual income of Rs.5000 did he save in the year?
(A) 42%
(B) 48%
(C) 38%

(D) 24%

29.The average age of a group of persons going for tour to Shimla is 22 years. 25 new persons with an average age of 10 years join the group and their average age becomes 12 years. The number of persons initially going for tour is?
(A) 10
(B) 8
(C) 7
(D) 5

30.In English exam, the average of Class "A" was found to be "x" marks. After deducting a computational error, the average marks of 100 candidates got reduced from 74 to 54 The average thus came down by 25 marks. The total numbers of candidates who took the English exam were?
(A) 50
(B) 20
(C) 80
(D) 70

31.The average salary of 90 employees in an organization is Rs.14500 per month. If the no of executive is twice the no of clerks, then find the average salary of clerk ?
(a)11,500
(b)12,000
(c)13,200
(d)Can't be determined

32.The average value of property of Agil, Mugilan and Anitha is Rs.130cr.The Property of Agil is 20cr greater than the property value of Mugilan and Anitha property value is 50cr greater than the Agil property value. The value of property of Anitha is
(a)120cr
(b)170cr
(c)100cr
(d)150cr

33.If the average marks of 1/5th of class is 70% and 2/5th class is 45% and the average mark of remaining class is 60%, then the average % of the whole class is
(a)73%
(b)45%
(c)62%
(d)56%

34.The average price of 100 mobiles in an electronic shop is Rs.27,000. If the highest and lowest mobiles are sold out then the remaining 98 mobiles average price is 26,400.The cost of lowest mobile is Rs.18,000.Find the cost of highest mobile price
(a)76500
(b)94800
(c)96400
(d)82000

35.There are 10 compartments in passenger train carries on average 15 passengers per compartment. If atleast 15 passengers were sitting in each compartment, no any compartment has equal no of passengers , and any compartment does not exceed the number of average passengers except 10th compartment.Find how many passengers can be accommodated in 10thcompartment ?
(a)38
(b)51
(c)47
(d)50

36.There are five times the number of two wheelers as there are three wheelers. The no of four wheelers are equal to the number of two wheelers. Find the average number of wheel per vehicle ?
(a)5
(b)4
(c)2
(d)3

37.In a particular week the average number of people visited the museum is 70. If we exclude the holidays then the average number is increased by 28. Further if we exclude the day which the maximum of 210 visitors visited the museum, then the average become 40.Find the no of holidays in the week
(a)None
(b)One
(c)Three
(d)Two

38.The average salary of 120 employees in the bank is Rs.15,000 per month. If the no of assistant is thrice the no of POs and average salary of assistant is 1/3rdof the average salary of POs then find the average salary of POs ?
(a)18,000
(b)25,000
(c)36,000
(d)30,000

39.In a class of 60 students 23 are girls. The average mark of boys is 45 and average mark of girls is 5(b) What is the average mark of the class?
(a)42.7
(b)52.2
(c)47.7
(d)62.1

40.Arjun gets 62 marks out of 100 in English, 81 out of 120 in Chemistry and 75 out of 150 in maths. The average marks of Arjun(in %) in all the three subjects is
(a)60%
(b)53%
(c)47%
(d)72%

ASSIGNMENT PROBLEMS

1.The average age of 30 students is 16years. If the age of the teacher is also included then the average age increased by 1 year, find the age of the teacher.
(a) 45 year
(b) 46 year
(c) 47 year
(d) 49 year

2. The present average age of a family of 5 members is 40 years. If the youngest member of the family is 12 years old, then find the average age of the family at the time of birth of the youngest member.
(a) 32
(b) 33
(c) 34
(d) 35

3. The average age of a husband and wife at the time of marriage is 22 years. After 3 years, they have a one year old child. Find the average age of the family of three at the time of birth of the child.
(a) 14 years
(b) 15 years
(c) 16 years
(d) 17 years

4.In a certain year the average monthly salary of a person is 5000 rupees. If for the first 7 months the average salary is 5300 and for the last 6 months, the average salary is 4600 rupees. Find the income of the person in 7th month.
(a) 3700
(b) 4700
(c) 5700
(d) can't be determined

5.The average age of a husband and his wife was 25 years when they were married 7 years ago. Now the average age of husband, wife and his son is 23 years. Find the age of son now.
(a) 3yr
(b) 4yr
(c) 5yr
(d) 6yr

6.The average of 10 reading is 25.5. In this the average of first three is 20 and

the next four is 26. If the eight reading is 5 less than the night one and also 8 less than the tenth one, then find the eight reading?
(a) 22
(b) 24
(c) 26
(d) 28

7.The average of first and second number is 25 more than the average off the second and third number. Find the difference between the first and the third number
(a) 20
(b) 30
(c) 40
(d) 50

8.In a hostel there are 30 students and if the number of students increased by 5 then the expense is increased by 40 per day. But the average expenditure diminishes by 3. Find the original expenditure.
(a) 810
(b) 870
(c) 910
(d) 950

9.The average age of a class is 19 years. While the average age of boys is 20 and the average age of girls is 17. If the number of boys is 20 then find the number of girls in the class
(a)10
(b)15
(c)16
(d)18

10.The average age of a family of 4 members 3 years ago is 21 years. A baby is born and now the average age of the family is same as before. Find the age of baby.
(a) 8yrs
(b) 9yrs
(c) 10yrs
(d) 11yrs

11.The average height of 50 students in a class is 165cm. On a particular day, three students P,Q and R are absent, so the average of the remaining students becomes 163cm. If the height of P and Q is equal and height of R is 2 cm less than P, then find the height of P.
(a) 187
(b)192
(c) 197
(d)198

12. The average age of a committee of 12 members is 48 years. A member of the committee age 62 retired and in place of him a new person aged 26 joined the committee. Find the new average of the committee.
(a) 44
(b) 45
(c) 46
(d) 48

13.The average weight of 12 people gets increased by 3.5kg when a person weighs 56 kg got replaced by another man. Find the weight of the new man
(a) 90kg
(b) 92kg
(c) 96kg
(d) 98kg

14.In an examination the average marks of risha is 74. If she got 16 more marks in hindi and 20 more marks in English then her average would have been 78. Find the total number of subjects he studied?
(a) 7
(b) 8
(c) 9
(d) 10

15.While calculating the weight of a group of men, the weight of 63 kg of one of the member was mistakenly written as 83 kg. Due to this the average of the weights increased by half kg. What is the number of men in the group?
(a) 25
(b) 20
(c) 40
(d) 60

16.A cricketer had an average number of runs as 32 after playing 10-innings. If he wants to make his average run rate increased by 4, then how much runs will he have to take in his next inning?
(a) 66
(b) 84
(c) 62
(d) 76

17.The average temperature in Delhi for the first four days of the month was reported as 58. It reported as 60 for 2nd, 3rd, 4th and 5th days. The ratio of the temperatures of 1st and 5th day was 7 : 8. Find the temperature on the first day. (All temperatures are in degree celcius)
(a) 42
(b) 46
(c) 63
(d) 56

18.For three successive years, the cost of petrol were Rs 20 per litre, Rs 22 per litre and Rs 23.50 per litre respectively. If a man spent an average of Rs 8000 per year on petrol, then he spent what average cost of petrol per litre for the three years?
(a) Rs 20
(b) Rs 25.3
(c) Rs 28.2
(d) Rs 21.7

19.In a group of 8 boys, 2 men aged at 21 and 23 were replaced two new boys. Due to this the average cost of the group increased by 2 years. What is the average age of the 2 new boys?
(a) 17
(b) 30
(c) 28
(d) 23

20.The average age of the group having 3 members is 84. One more person joins the group and now the average becomes 80. Now a fifth person comes whose age is 3 years more than that of fourth person replaces the first person. After this the average age of the group becomes 79. What is the weight of the first person?
(a) 75
(b) 65
(c) 68
(d) 82

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	C	11	C
2	D	12	B
3	C	13	D
4	B	14	C
5	C	15	C
6	C	16	D
7	D	17	D
8	B	18	D
9	A	19	B
10	B	20	A

A.P and G.P

Arithmetic progression

Arithmetic progression(AP) or arithmetic sequence is a sequence of numbers in which each term after the first is obtained by adding a constant, d to the preceding term. The constant d is called common difference.

An arithmetic progression is given by a, (a + d), (a + 2d), (a + 3d), ...
where a = the first term , d = the common difference

If a, b, c are in AP, 2b = a + c

Examples

1, 3, 5, 7, ... is an arithmetic progression (AP) with a = 1 and d = 2

7, 13, 19, 25, ... is an arithmetic progression (AP) with a = 7 and d= 6

n^{th} term of an arithmetic progression

$t_n = a + (n - 1)d$

where $t_n = n^{th}$ term, a= the first term , d= common difference

Number of terms of an arithmetic progression

$$N = [(l-a)/d]+1$$

where n = number of terms, a= the first term , l = last term, d= common difference

Sum of first n terms in an arithmetic progression

$Sn=n/2[\ 2a+(n-1)d\ ]$

$Sn=(n/2)(a+l)$

where a = the first term,
d= common difference,
$l = t_n = n^{th}$ term = a + (n-1)d

Arithmetic Mean

If a, b, c are in AP, b is the Arithmetic Mean (AM) between a and c. In this case, b=(a+c)/2

The Arithmetic Mean (AM) between two numbers a and b = (a+b)/2

Geometric Progression

Geometric Progression(GP) or Geometric Sequence is sequence of non-zero numbers in which the ratio of any term and its preceding term is always constant.

A geometric progression(GP) is given by a, ar, ar^2, ar^3, ...
where a = the first term , r = the common ratio

If a, b, c are in GP, $b^2 = ac$

Examples

1, 3, 9, 27, ... is a geometric progression(GP) with a = 1 and r = 3

2, 4, 8, 16, ... is a geometric progression(GP) with a = 2 and r = 2

n^{th} term of a geometric progression(GP)

$tn=ar^{(n-1)}$

where $t_n = n^{th}$ term, a= the first term , r = common ratio, n = number of terms

Sum of first n terms in a geometric progression(GP)

$Sn = a(r^n - 1)/ (r-1)$ when $r \neq 1$

Sn = na When r = 1

a= the first term , r = common ratio, n = number of terms

Sum of an infinite geometric progression(GP)

$S_\infty = a/(1-r)$ (if $-1 < r < 1$)

where a= the first term , r = common ratio

Geometric Mean

If three non-zero numbers a, b, c are in GP, b is the Geometric Mean(GM) between a and c. In this case, $b = \sqrt{ac}$

The Geometric Mean(GM) between two numbers a and b = $\sqrt{ab}$ab

(Note that if a and b are of opposite sign, their GM is not defined.)

CLASSWORK PROBLEMS

1.How many terms are there in the AP 20, 25, 30, ..., 130?
(a)21
(b)22
(c)23
(d) 24

2.Find the first term of an AP whose 8^{th} and 12^{th} terms are 39 and 59 respectively.
(a)3
(b)4
(c)5
(d)6

3.A number of squares are described whose perimeters are in GP. Then their sides will be in
(a)AP
(b)GP
(c)HP
(d)Nothing can be said

4.1,3,5,.....Which term of this AP is 55?
(a)25^{th}
(b)26^{th}
(c)27^{th}
(d)28^{th}

5.How many terms are identical in the two APs 1,3,5,.....upto 120 terms and 3,6,9,,,,upto 80 terms?
(a)38
(b)39
(c) 40
(d)41

6.Find the lowest term of an AP whose sum of all terms is 105 and greatest term is 6 times the lowest term.
(a)5
(b)10
(c) 5 or 10
(d) Cannot be determined

7.Find the 15^{th} term in the series 20,15,10,.....
(a)-45
(b)-50
(c)-55
(d)0

8.A sum of money amounts to Rs.1240 in 4 years and Rs.1600 in 10 years at simple interest. Find the sum.
(a)Rs.800
(b)Rs.900
(c)Rs.1150
(d)Rs.1000

9.A number 15 is divided into three parts which are in AP and the sum of their squares is 83. Find the smallest number.
(a)3
(b)5
(c)6
(d)8

10.The sum of the first 16 terms of an AP whose first term and third term are 5 and 15 respectively is
(a)600
(b)765
(c)640
(d)680

11.The number of terms of the series 54+51+48+ .....such that the sum is 513 is
(a)18
(b)19
(c)15
(d) Both a and b

12.The least value of n for which the sum of the series 5+8+11.....n terms is not less than 670 is
(a)19
(b)20
(c)21
(d)22

13.A man receives Rs.60 for first week and Rs.3 more for every week than the preceding week. How much does he earn by the 20th week?
(a)Rs.1770
(b)Rs.1790
(c)Rs.1890
(d)Rs.1620

14.How many terms are there in the GP 5,20,80,320,.....20480?
(a)5
(b)6
(c)7
(d)8

15.Bobby was appointed to KFC in the pay scale of Rs.7000-500-12500. Find how many years he will take to reach the maximum of the scale.
(a)8 years
(b)9 years
(c)10 years
(d)11 years

16.A boy agrees to work at the rate of one rupee on the first day, two rupees on the next day and four rupees on the subsequent day and so on. If he starts 1st February and finishes the work by 20th February, how much will he receive?
(a)2^{20}
(b)2^{19}
(c)$2^{20}-1$
(d)$2^{19}-1$

17.If the first term and fifth term of a GP are 16 and 81 respectively, find the fourth term.
(a)18
(b)24
(c)36
(d)54

18.The seventh term of a GP is eight times the fourth term. Find the 1st term if 5th term is 48.
(a)2
(b)3
(c)4
(d)5

19.Sum of three terms of a GP is 14 and the sum of their squares is 84. Find the largest among them.
(a)4
(b)6
(c)8
(d)12

20.1st term of an AP is 1 and common difference is 4, which of the following will be the term of this AP?
(a)4551
(b)7881
(c)10091
(d)13531

21.How many natural numbers between 300 and 500 are divisible by 7?
(a)27
(b)28
(c)29
(d)30

22.Sum of the first and third terms of a GP is 20 and sum of the first three terms is 26. Find the GP.
(a)2,6,18
(b)18,6,2
(c) both a and b
(d)None of these

23.If a man saves Rs.4000 more than previous year's savings and he saves Rs.20000 on the first year, after how many years can he save more than Rs.10 lacs?
(a)18 years
(b)19 years
(c)20 years
(d)21 years

24.The 4th term and 10th term of a GP are 1/3 and 243 respectively. Find the 2nd term.
(a)1
(b)3
(c)1/27
(d)1/9

25.The 7th and 21st terms of an AP are 6 and -22 respectively. Find the 26th term.
(a)-34
(b)-32
(c)-12

(d)-10

26.Sum of 5 terms of an AP is 30 and the sum of their squares is 220. Which of the following is the third term?
(a)5
(b)6
(c)8
(d)10

27.Find the sum of all numbers from 10 to 50 excluding the numbers which are divisible by 8?
(a)1070
(b)1320
(c)1220
(d)1160

28.Sum of first 4 terms of an AP is 28 and first 8 terms is 88, find the sum of first 16 terms of that AP.
(a)268
(b)304
(c)340
(d)346

29.Find the general term of an GP with third term 1 and seventh term 8.
(a)$(2^{3/4})^{n-3}$
(b)$(2^{3/2})^{n-3}$
(c) $(2^{3/4})^{3-n}$
(d) $(2^{3/4})^{2-n}$

30.Find the number of terms of the series 1/81,-1/27,1/9.....-729.
(a)10
(b)11
(c)12
(d)13

31.Four geometric means are inserted between 1/8 and 128. Find the third geometric mean.
(a)4
(b)8
(c)16
(d)32

32.A and B are two terms whose AM is 25 and GM is 7. Which of the following may be the value of A?
(a)10
(b)25
(c)49
(d)20

33.Two number A and B, whose GM is 20% lower than their AM. Find the ratio of A to B.
(a)2:1
(b)3:1
(c)4:1
(d)3:2

34.A man saves Rs.100 in Jan 2018 and increases his savings by Rs.100 than preceding months. What is the annual savings for the man in 2018?
(a)Rs.6400
(b)Rs.4800
(c)Rs.8400
(d)Rs.7800

35.How many zeroes are there at the end of $(2!)^{2!}+(4!)^{4!}+(8!)^{8!}+(9!)^{9!}+(10!)^{10!}+(11!)^{11!}$?
(a)$(0!)^{0!}$
(b)$(10!)^{10!}$
(c)$(2!)^{2!}$
(d) None of these

36.1^{st} , 8^{th} and 22^{nd} terms of an AP are three consecutive terms of a GP. Find the common ratio of the GP if sum of first 22 terms of the AP is 385.
(a)1
(b)2
(c) 1/2
(d)Either 2 or ½

37.The internal angle of a polygon are in AP and smallest angle is 100 and the common difference is 10. Find the number of sides of the polygon.
(a)8
(b)9
(c) Either 8 or 9
(d) None of these

38.After striking a floor, a ball bounces back to $7/8^{th}$ of its previous height, find the distance it travels before coming to rest. Intially the ball was dropped from a height of 420 m.
(a)2940 m
(b)6300 m
(c) 1080 m
(d)3360 m

39.Each of the series 13+15+17 .....and 14+17+20 ..... are continued till 100 terms. Find how many terms are identical between the two series.

(a)32
(b)33
(c)34
(d)35

40.How many terms of the series 1+3+5+7+.....amount to 123454321?
(a)10111
(b)11011
(c)11101
(d)11111

ASSIGNMENT PROBLEMS

1. Find the n^{th} term of the following sequence : $5 + 55 + 555 + \ldots . T_n$
(a) $5(10^n - 1)$
(b) $5^n(10^n - 1)$
(c) $(5/9)*(10^n - 1)$
(d) $(5/9)^n *(10^n - 1)$

2. The first term of an Arithmetic Progression is 22 and the last term is -11. If the sum is 198, the number of terms in the sequence are:
(a)8
(b)9
(c)10
(d)12

3. A bacteria gives birth to two new bacteria in each second and the life span of each bacteria is 5 seconds. The process of the reproduction is continuous until the death of the bacteria. initially there is one newly born bacteria at time t = 0, then find the total number of live bacteria just after 10 seconds :
(a)$3^{10}/2$
(b)$3^{10}-2^{10}$
(c)$3^5(3^5-1)$
(d) None of these

4. After striking the floor, a rubber ball rebounds to $4/5^{th}$of the height from which it has fallen. Find the total distance that it travels before coming to rest if it has been gently dropped from a height of 120 metres.
(a)540 m
(b)960 m
(c)1080 m
(d)None of these

5. What is the sum of all 3 digit numbers that leave a remainder of '2' when divided by 3?
(a)164850
(b)164749
(c)149700
(d) None of these

6. What is the sum of all positive integers up to 1000, which are divisible by 5 and are not divisible by 2?
(a)10050
(b)5050
(c)5000
(d)50000

7. The sum of the three numbers in A.P is 21 and the product of the first and third number of the sequence is 45. What are the three numbers?
(a)5,7 and 9
(b)9,7 and 5
(c) 3,7 and 11
(d)Both a and b

8. A piece of equipment cost a certain factory 600,000. If it depreciates in value, 15% the first year, 13.5 % the next year, 12% the third year, and so on, what will be its value at the end of 10 years, all percentages applying to the original cost?
(a)200000
(b)105000
(c)405000
(d)650000

9. 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 these

10. Given $A = 2^{65}$ and $B = (2^{64}+2^{63}+2^{62}+...+2^0)$, which of the following is true?
(a) B is 2^{64} larger than A
(b)A and B are equal
(c)B is larger than A by 1
(d)A is larger than B by 1

11. Find the number of 2 digit numbers which are divisible by 4 or 9?
(a)32
(b)33
(c)31
(d)34

12. If a rubber ball consistently bounces back ⅔ of the height from which it is dropped, what fraction of its original height will the ball bounce after being dropped and bounced three times without being stopped?
(a)16/81
(b)16/27
(c) 4/9
(d)37/81

13. What is the sum of the following series? -64, -66, -68, ... , -100
(a) -1458
(b)-1558
(c)-1568
(d)-1664

14. If log 2, log $(2^x - 1)$ and log $(2^x + 3)$ are in A.P, then x is equal to ___
(a)$\log_2 5$
(b)$\log_3 2$
(c)Either a or b
(d)None of these

15. Two travelers set out on a long odyssey. The first traveler starts from city X and travels north on a certain day and covers 1 km on the first day and on subsequent days, he travels 2 km more than the previous day. After 3 days, a second traveler sets out from city X in the same direction as the first traveler and on his first day he travels 12 km and on subsequent days he travels 1 km more than the previous day. On how many days will the second traveler be ahead of the first?
(a)2 days
(b)6 days
(c)From the 2nd day after the 2nd traveler starts
(d)From the 3rd day after the 2nd traveler starts

16.Find the average of 17 arithmetic means which are inserted between 20 and 60.
(a)40
(b)32
(c)36
(d)44

17.What is the geometric mean of 12,16 and 21 1/3.
(a)12
(b)16
(c)18
(d)24

18.Find the sum of first 200 terms of the even numbers.
(a)40000
(b)40200
(c)10100
(d)20200

19.Find the average of first 999 odd numbers.
(a)999
(b)1001
(c)1000
(d)500

20.Find the sum of first 23 odd numbers.
(a)576
(b)529
(c)525
(d)None of these

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	c	11	A
2	d	12	A
3	c	13	B
4	c	14	A
5	a	15	D
6	d	16	A
7	d	17	B
8	b	18	B
9	a	19	A
10	d	20	B

PERCENTAGE

A percentage is a ratio expressed in terms of a unit being 100. A percentage is usually denoted by the symbol **"%".**

To express a% as a fraction, divide it by 100 ⇒ a% = a/100

To express a fraction as %, multiply it by 100 ⇒ a/b = [(a/b) × 100] %

x% of y is given by (y × x/100)

Point to remember for faster Calculation

1 = 100%	1 /2= 50%
1 /3= 33.33%	1/4 = 25%
1/5 = 20%	1 /6= 16.66%
1/7 = 14.28%	1/8 = 12.5%
1/9 = 11.11%	1/10 = 10%
1/11 = 9.09%	1/12 = 8.33%

Some Short tricks based on Condition

If A's income is r% more than B's income, the B's income is less than A's income by

$$[r / (100+r)] * 100\%$$

If A‟s income is r% less than B‟s income, the B‟s income is more than A‟s income by

$$[r / (100-r)] * 100\%$$

If 'A' is x% of 'C' and 'B' is y% of 'C' **then 'A' is (x/y) * 100% of 'B'.**

If the sides of the triangle, rectangle, square, circle, rhombus etc is

(i) Increased by x%. Then its area is increased by $2x+(x^2/100)$

(ii) If decreased by x%. Then its areas is decreased by, $-2x+(x^2/100)$

If a number x is successively changed by a%, b%, c%. then final value

$$x (1+a/100) (1+b/100) (1+c/100)$$

The net change after two successive changes of a% and b% is

$$(a+ b+ab/100) \%$$

The population of a town is 'P'. It increased by x% during 1st year, increased by y% during 2nd year and again increased by z% during 3rd year. Then the population after 3 years will be,

$$P * [(100+x)/100] * [(100+y)/100] * [(100+z)/100]$$

Mixture problems

If x% of a quantity is taken by the first person, y% of the remaining quantity is taken by the second person, and z% of the remaining is taken by the third person and if A is left, then initial quantity was

$$A/(1-x\%)(1-y\%)(1-z\%)$$

The same concept we can use, if we add something, then the initial quantity was

$$A/(1+x\%)(1+y\%)(1+z\%)$$

CLASWORK PROBLEMS

1. 33.33% of a value is 41. What is 60% of the same number?
   (a) 73.8
   (b) 72.6
   (c) 75.4
   (d) None of these

2. Find the value 12.66% of 600.
   (a) 76
   (b) 66
   (c) 77
   (d) 67

3. Manish saves $3/11^{th}$ of his salary and spends 28% on food grains. He invests the remaining amount in mutual funds and stocks in the ratio 7:5 respectively. What is his monthly salary, if he has invested Rs.22176 in mutual funds?
   (a) Rs.82995.11
   (b) Rs.87995.13
   (c) Rs.84995.12
   (d) Rs.83995.13

4. Ayesha's income is Rs.12,000 per month. She pays 20% tax on her monthly income and spends 30% for her living expenses. How much does she save annually?
   (a) Rs.70, 000
   (b) Rs.72,000
   (c) Rs.74,000
   (d) Rs.76,000

5. Neha scored 1.2 times as many marks in Maths as in History. In Biology, she scored 20 more marks than in Maths. If she secured in aggregate 85.5% out of a total of 600, what was her score in Biology?
   (a) 174
   (b) 194
   (c) 170
   (d) 185

6. The turnover of a company increased by 10%, when the price of the product sold increased by 10%. Find the change in the quantity sold.
   (a)11%
   (b) 10%
   (c) 20%
   (d) No change

7. A, B, C and D wrote an exam for a total of 500 marks. A scored 25% more marks than B, B scored 40% more marks than C and C scored 60% more marks than D. If A got 320 marks, what percentage of marks did D score?
   (a) 22.8
   (b)21.7
   (c) 15.6
   (d) 23

8. If the area of a rectangle is increased by 32% and its breadth increased by 20%, what is the percentage increase in its length?
   (a) 32%
   (b) 10%
   (c) 12%
   (d) 15%

9. The population of a town at the end of the year 2015 was 2, 45,000. It increased by 15% in the year 2016 and 12% in the year 2017. What is the current population of the town in the beginning of the year 2018?
   (a) 315590
   (b) 315560
   (c) 316650
   (d) 320000

10. Ruby scored 32% marks in History and failed by 16 marks. Robin scored 48% marks and scores 16 marks more than the pass mark. Find the maximum marks in the subject.
    (a)160
    (b) 200
    (c) 320
    (d) 400

11. A businessman purchased 600 ICs and 400 Arduinos. He discovered 15% of the ICs and 8% of Arduinos were defective. Find the percentage of instruments that are in working condition.
    (a) 87.8%
    (b) 85%
    (c) 82.8%
    (d) 80.5%

12. A number is reduced by 10%. Its present value is 270. What was its original value?
    (a) 300

(b) 253
(c) 297
(d) 303

13. The weight of a cow is 25 % more than that of the calf. By what percentage is the weight of the calf less than that of the cow?
(a) 75%
(b) 50%
(c) 30%
(d) 20%

14. A mineral contains 26 % copper. What quantity of the mineral is required to extract 260 g of copper?
(a) 260g
(b) 500g
(c) 1000g
(d) 1500g

15. The price of a pair of sweaters was decreased by 22% and was sold at $30. What was the original price of the pair of sweaters?
(a) $35
(b) $36.5
(c) $38.5
(d) $40

16. What percentages of numbers between 1 and 90 both inclusive have 2 or 9 in the unit digit?
(a) 10%
(b) 50%
(c) 17%
(d) 20%

17. If A= 11.11% of 72 and B= 8.33% of 84, then which of the following is true?
(a) A is greater than B
(b) B is greater than A
(c) A = B
(d) Cannot be determined

18. Two numbers A and B are such that the sum of 7% of A and 6% of B is three-fourth of the sum of 5% of A and 11% of B. Find the ratio of A: B.
(a) 9:13
(b) 2:3
(c) 5:12
(d) 7:11

19. Rajesh bought a pair of headphones costing Rs.1848 including the sales tax of 12%. He asked the shopkeeper to reduce the price of the headphones so that he could save the amount now equal to the tax. Find the reduction in the price of the headphones.
(a) Rs.190
(b) Rs.195
(c) Rs.198
(d) Rs.203

20. Initially, Swetha has Rs.600 in her Paytm wallet. She initially increases the amount by 30% and the next day it is further increased by 15%.Find the percentage by which her wallet grows.
(a) 42.5%
(b) 45.5%
(c) 49.5%
(d) 52.5%

21 In a school of strength 2000, 36% consists of girls. The monthly tuition fees of a boy are Rs.480 and that of a girl is 25% less than that of a boy. What are the total fees per month paid by the girls and the boys to the school?
(a) Rs.873600
(b)Rs.863700
(c) Rs.867700
(d)Rs.876300

22. Mr. Samanth earns Rs.579600 per annum. He spends 32% of his monthly income on payment of bills, 12% on rent and donates 10% to an NGO; he further invests 50% of his remaining income on stocks. Find his monthly savings?
(a)Rs.43308
(b) Rs.23308
(c) Rs.11109
(d) Rs.35480

23. In an examination A scored 25% of the total marks but failed by 56 marks while B scored 50% of the total marks which were 144 marks more than the minimum passing mark. Find the minimum passing mark?
(a) 256
(b) 196
(c) 284
(d)180

24. The difference between a single discount of 35% and two successive

discounts of 20% each on a certain bill was Rs.22. Find the bill amount.
(a)Rs.3200
(b) Rs.2200
(c) Rs.3300
(d) Rs.2800

25. Mahi's salary increases every year by 10% in June. If there is no other increase or deduction in the salary and his salary in June 2017 was Rs.22,385, what was his salary in June 2015?
(a) Rs.18650
(b) Rs.18000
(c) Rs.19250
(d) Rs.18500

26. The product of 1/3 of a number and 150% of a second number is what percent of the product of the two numbers?
(a) 80
(b) 50
(c) 70
(d) 90

27. Given that the product of two consecutive even numbers is 7568, what is 150% of the sum of the two numbers?
(a) 204
(b) 261
(c) 304
(d)198

28. Sum of three consecutive numbers is 2262. What is 41% of the highest number?
(a) 301.51
(b) 309.55
(c) 308.73
(d) 303.14

29. Dev invested 20% more than Ratul. Ratul invested 10% less than Mohit. If the total sum of their investments is Rs.17880, what was the investment of Mohit?
(a) Rs.5000
(b) Rs.6000
(c) Rs.7000
(d) Rs.8000

30. The male and female ratio was 6:7 in the year 2014 in a village. After a year the male and female population of the village increased by 15% and 12% respectively. The population stood at 5896 in the year 2015.. Find the female population in the village for the year 2015.
(a) 3136
(b) 2564
(c) 2760
(d) 3240

31. Rajkumar won a competition and received some prize money. He gave Rs. 2000 less than the 50% of the prize money to his son and Rs. 1000 more than two – third of the remaining to his daughter. Both his son and the daughter received the same amount. He saved the remaining amount. What percentage of the amount did he save?
(a) 9.09%
(b) 11.11%
(c) 13.95%
(d) 15.38%

32. Balaji spends 40% of his wage on transport, 20% on stationary materials, and 60% of the remaining on food. He saves Rs. 450, which is half of the remaining amount after spending on the transport, stationary materials and food. How much is his wage?
(a)Rs.1258
(b) Rs.2625
(c) Rs.5625
(d) Rs.6525

33. Bas a percentage ofAis equal toAas a percentage of(A+B).How much percent of A is B?
(a) 60%
(b) 62%
(c) 64%
(d) 66%

34. The cost of crude material and the processing cost of a product increase by 30% and 20% respectively, whereas the selling price increases by 60%. The crude material and the processing cost, initially contributed 40% and 60% of the aggregate cost respectively. If the original profit was one-fourth the original processing cost, find the new profit percentage.

(a) 48.38%
(b)45%
(c) 43.88%
(d) 36.36%

35. Among a group of pilots, the ratio of category-A and category-B pilots is 4:1. If 10 category-B pilots are asked to leave, then the percentage of category A pilots becomes 96. What was the initial number of pilots in the group?
(a) 100
(b) 80
(c) 60
(d) 50

36. An apple vendor sells 75% of the apples and discards 20% of the remaining fruit. Next day, he sells 50% of the remaining, and discards 20%. On the third day, he sells 75% of the remainder and discards the rest. Find the percentage of the discarded apples.
(a)8%
(b)7%
(c)9%
(d)10%

37. In an election between two candidates, one has got 48% of the total valid votes. 30% of the votes were invalid. If the total number of votes was 7500, find the number of valid votes that the other candidate got.
(a) 2250
(b) 2530
(c) 2730
(d) 2850

38. 62.5% of the voters decide to vote for candidate A and the rest assure to vote for B. On the day of polling, 50% of the voters who envisaged voting for A voted for B and 30% of voters who promised to vote for B voted for A. B won by 30000 votes. Find the total number of voters.
(a) 200000
(b) 210000
(c) 215000
(d) 205000

39. An organization wanted to raise money for a blind school. They invited their selected donors who on paying an average of Rs500 make up the entire amount. If 75% of the donors who have been invited have promised to pay but during the course of events only 65% of the donors turn up with an average donation of Rs.600, then what should be the amount to be paid per head by the remaining 10% donors so that they raise the entire amount?
(a) Rs.800
(b) Rs.1000
(c) Rs.1100
(d) Rs.900

40. A grocer buys 60 articles at Rs.60 each. He sells 'n' articles at a profit of n% and the remaining at a profit of (100 – n) %. What is the minimum profit the grocer could derive from this transaction?
(a) Rs.1240
(b) Rs.1680
(c) Rs.1440
(d) Rs.1860

ASSIGNMENT PROBLEMS

1.Veena bought a watch costing Rs. 1404 including sales tax at 8%. She asked the shopkeeper to reduce the price of the watch so that she can save the amount equal to the tax. The reduction of the price of the watch is?
(a) Rs.108
(b) Rs.104
(c) Rs.112
(d) Rs.120

2.A Sales Executive gets a commission on total sales at 8%. If the sale is exceeded Rs.10,000 he gets an additional commission as a bonus of 4% on the excess of sales over Rs.10,000. If he gets the total commission of Rs.950, then the bonus he received is?
(a) 40
(b) 50
(c) 36
(d) 48

3.In a College there are 1800 students. Last day except 4% of the boys all the students were present in the college. Today except 5% of the girls all the students are present in the college, but

in both the days number of students present in the college, were same. The number of girls in the college is?
(a) 1000
(b) 400
(c) 800
(d) 600

4.In a library 60% of the books are in Hindi, 60% of the remaining books are in English rest of the books are in Malayalam. If there are 4800 books in English, then the total number of books in Malayalam are?
(a) 3400
(b) 3500
(c) 3100
(d) 3200

5.80% of a small number is 4 less than 40% of a larger number. The larger number is 125 greater than the smaller one. The sum of these two numbers is
(a) 325
(b) 345
(c) 355
(d) 365

6.In a private company 60% of the employees are men and 48% of the employees are Engineer and 66.6% of Engineers are men. The percentage of women who are not engineers is?
(a) 60%
(b) 50%
(c) 55%
(d) 65%

7.Initially, Suresh has Rs.200 in his paytm wallet then he increased it by 20%. Once again he increased his amount by 25%. The final value of money in his wallet will be how much % greater than the initial amount?
(a) 40%
(b) 50%
(c) 80%
(d) 60%

8.Mr.Ramesh gives 10% of some amount to his wife and 10% of the remaining to hospital expenses and again 10% of the remaining amount to charity. Then he has only Rs.7290 with him. What is the initial sum of money with that person?
(a) Rs.8000
(b) Rs.9000
(c) Rs.10000
(d) Rs.20000

9.Initially, a shopkeeper had "x" pens. A customer bought 10% of pens from "x" then another customer bought 20% of the remaining pens after that one more customer purchased 25% of the remaining pens. Finally, shopkeeper is left with 270 pens in his shop. How many pens were there initially in his shop?
(a) 200
(b) 800
(c) 400
(d) 500

10.The cost of packaging of the oranges is 20% the cost of fresh oranges themselves. The cost of oranges increased by 30% but the cost of packaging decreased by 50%, then the percentage change of the cost of packed oranges, if the cost of packed oranges is equal to the sum of the cost of fresh oranges and cost of packaging
(a) 14.5%
(b) 16.66%
(c) 14.33%
(d) 13.66%

11.Cost Price of two laptops is same. One of the laptops is sold at a profit of 15% and the Selling Price of another one laptop is Rs. 3400 more than the first one. The net profit is 20%. What is the Cost Price of Each laptop?
(a)36000
(b)40000
(c)48000
(d)34000

12.In an office there are 40% female employees. 50% of the male employees are UG graduates. The total 52% of employees are UG graduates out of 1800 employees. What is the number of female employees who are UG graduates?
(a) 362
(b) 412
(c) 396
(d) 428

13.Ravi got 70% in English and 56% in Biology and the maximum marks of both papers is 100. What percent does he score in Maths, if he scores 60% marks in all the three subjects?. Maximum

Marks of Maths paper is 200.
(a) 30%
(b) 40%
(c) 45%
(d) 57%

14.Ankita is 25 years old. If Rahul's age is 25% greater than that of Ankita then how much percent Ankita's age is less than Rahul's age?
(a) 40%
(b) 35%
(c) 10%
(d) 20%

15.Mr.Ravi's salary was reduced by 25% for three months. But after the three months, his salary was increased to the original salary. What is the percentage increase in salary of Mr.Ravi?
(a) 33.33%
(b) 42.85%
(c) 28.56%
(d) 16.66%

16.In an election only two candidates A and B contested 30% of the voters did not vote and 1600 votes were declared as invali(d) The winner, A got 4800 votes more than his opponent thus he secured 51% votes of the total voters on the voter list. Percentage votes of the loser candidate, B out of the total voters on the voter list is:
(a) 3%
(b) 4%
(c) 5.6%
(d) 4.6%

17.In a school there are 2000 students. On January 2nd, all the students were present in the school except 4% of the boys and on January 3rd, all the students are present in the school except 28/3% of the girls, but in both the days number of students present in the school, were same. The number of girls inthe school is?
(a) 400
(b) 1200
(c) 800
(d) 600

18.A school has raised 75% of the amount it needs for a new building by receiving an average donation of Rs. 1200 from the parents of the students. The people already solicited represents the parents of 60% of the students. If the School is to raise exactly the amount needed for the new building, what should be the average donation from the remaining students to be solicited?
(a) Rs.800
(b) Rs.900
(c) Rs.850
(d) Rs.600

19.The monthly income of Shyama and Kamal together is Rs.28000. The income of Shyama and Kamal is increased by 25% and 12.5% respectively. The new income of Kamal becomes 120% of the new salary of Shyam(a) What is the new income of Shyama?
(a) Rs.12000
(b) Rs.18000
(c) Rs.14000
(d) Rs.15000

20.500 kg of ore contained a certain amount of iron. After the first blast furnace process,200 kg of slag containing 12.5% of iron was removed.The percentage of iron in the remaining ore was found to be 20% more than the percentage in the original ore. How many kg of iron were there in the original 500 kg ore?
(a) 54.2
(b) 58.5
(c) 46.3
(d) 89.2

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	B	11	D
2	B	12	C
3	C	13	D
4	D	14	D
5	C	15	A
6	A	16	A
7	B	17	D
8	C	18	D
9	D	19	D
10	B	20	D

Profit Loss Discount

Cost Price (CP):

The amount paid to purchase a product or the cost incurred in manufacturing a product is known as the **Cost Price**.

Selling Price (SP):

The amount at which a product is sold is called the **Selling Price**.

Profit or Gain:

When the selling price is greater than the cost price, then the seller makes **Profit or Gain.**
Profit = SP – CP

Loss:

When the selling price is less than the cost price, then the seller incurs **Loss**.
Loss = CP – SP

Marked Price (MP):

The initial amount labelled as selling price on the product is called the **Marked Price.**

Discount:

The reduction extended on the marked price of a product in effecting its sale is called **Discount**. When there is no discount, selling price is equal to the marked price.

Mark-up:

The amount increased from the actual cost price to the listed price is called the Mark-up.

Percentage Calculation:

The change in percentage can be calculated as

$$\%C = \frac{\text{Final Value} \sim \text{Initial Value}}{\text{Initial Value}} * 100$$

1. Profit percentage (%P)

$$\%P = \frac{SP-CP}{CP} * 100$$

2. Loss percentage (%L)

$$\%L = \frac{CP-SP}{CP} * 100$$

3. Discount percentage (%D)

$$\%D = \frac{MP-SP}{MP} * 100$$

4. Mark-up percentage (%M)

$$\%M = \frac{MP-CP}{CP} * 100$$

Profit, loss and mark-up percentage are always calculated **over the cost price** and discount percentage is calculated over the marked price.

Types of Discount:

There are two types of discount.

1. **Flat discount:**

The discount given at once on the whole amount is called as **Flat discount**.

2. **Successive discount:**

Successive percentage reduction on previously discounted prices is called as **Successive discount**.

Note:

The total discount in case of 2 successive-discounts can be calculated using the formula below.
If the first discount is x% and second discount is y% then,

Total discount $= (x + y + \frac{(xy)}{100})\%$

In general, if there are successive increases or decreases of P%, Q% and R% to a value, the effective multiplication factor is

$$\left\{\left(\frac{100 \pm P}{100}\right)\left(\frac{100 \pm Q}{100}\right)\left(\frac{100 \pm R}{100}\right)\right\}\%$$

CLASSWORK PROBLEMS

1.If the cost price of a pen is Rs.150 and its selling price is Rs.137.50, then calculate the percentage loss on the pen.
(a) 8.33%
(b) 12.5%
(c) 12%
(d) 15%

2. If the cost price of 15 pencils is equal to the selling price of 20 pencils, find the loss percentage.
(a)20%
(b)25%
(c)30%
(d)33.33%

3. Selling price of an article is Rs.120. If the gain is 50%, then what is the cost price of the given article?
(a)Rs.100
(b)Rs.120
(c)Rs.80
(d)Rs.60

4. A watch was priced at Rs.800. After 2 successive discounts, it was sold for Rs.640. If the first discount was 10%, find the rate of the second discount.
(a)11.11%
(b)12%
(c)33.33%
(d)33%

5. Alan marks up the price of an article by 20%. If he decreases the discount from 10% to 5%, he gains Rs.12 more. What is the profit, if the discount is 15%?
(a)Rs.8
(b)Rs.12
(c)Rs.6
(d)Rs.4

6. Find the single discount equivalent to successive discounts of 30% and 50%.
(a) 60%
(b)75%
(c)70%
(d)65%

7. A shopkeeper sells 2 shirts at the same price; on one he makes a profit of 20% and on the other, a loss of 20%. Find the loss or gain percentage on the whole transaction.
(a) 4% loss
(b) 5% gain
(c) No loss, No gain
(d) Data Inadequate

8. A Shopkeeper sells sugar using false weights and gains $\frac{120}{9}\%$. He claims that he sells the product at its cost price. What weight would the customer receive insteadofone kilogram?
(a) 882.35 grams
(b) 880 grams
(c) 881.33 grams
(d) 885 grams

9.A vendor sells a product for Rs.1800 after a discount of 25%. What is the list price of the product?
(a) Rs.2000
(b) Rs.2300
(c) Rs.2400
(d) Rs.2500

10. Anitha sold her bike at 30% discount still she makes 20% profit. Find the cost price of bike if marked price is Rs.60000.
(a) Rs.37000
(b) Rs.36000
(c) Rs.32000
(d) Rs.35000

11. Suresh sold 20 pens for Rs.160.The loss incurred was equal to cost price of 4 pens. Find the cost price of 1 pen.
(a) Rs.30
(b) Rs.25
(c) Rs.10
(d) Rs.15

12. A shopkeeper allows a discount of 37.5% on the marked price of a certain article which costs Rs.500.If the profit is 30% then what is the marked price of the article?

(a) Rs.1000
(b) Rs.1020
(c) Rs.1040
(d) Rs.990

13.In a business transaction, the profit earned is 80% of the cost price. If the cost price is increased by 20% and the selling price remains unchanged, findthe decrease in profit percentage.
(a) 30%
(b) 20%
(c) 35%
(d) 40%

14. Devi purchased 10 dozens of mangoes at Rs.750 a dozen. She sold each mango for Rs.65. What is her profit percentage?
(a) 4%
(b) 5%
(c) 8%
(d) 10%

15.A man bought 10 apples and 10 oranges for Rs.400 and sold them for Rs.430. If he gains 15% on apples and loses 15% on oranges, find the cost prices of apples and oranges.
(a) Rs.40,Rs.10
(b) Rs.40,Rs.20
(c) Rs.30, Rs.10
(d) Rs.30, Rs.20

16.On selling 10 toys at Rs.525 there is a loss equal to the cost price of 3 toys. Find the cost price of each toy.
(a) Rs.60
(b) Rs.75
(c) Rs.65
(d) Rs.70

17. If the shopkeeper allows 20% discount for an article, he earns 16% profit. What would be his profit percentage if he allows 12% discount?
(a)17.6%
(b) 15%
(c)20%
(d)27.6%

18. The marked price of a book is Rs.150. After allowing 20% discount, the loss incurred on the book is 4% .Find the cost price of the book.
(a) Rs.125
(b) Rs.110
(c) Rs.140
(d) Rs.135

19. The selling price of a shirt is Rs.1700 after giving two successive discounts of 20%, 15%.What is the marked price of the shirt?
(a)Rs.3000
(b) Rs.2500
(c) Rs.2000
(d) Rs.4000

20. The selling price of an article is one and half times its cost price. If the selling price is 90% of the marked price, what is the mark- up percentage?
(a) 66.66%
(b) 50%
(c) 33.33%
(d) 37.5%

21. A shopkeeper sells 100 watches for Rs.3,02,400/- for the entire year. For the first 6 months he sells the watches at a profit of 30% and the next 6 months he sells at a profit of 20%. If the number of watches sold for the first and the second 6 months gets interchanged, then the total selling price becomes Rs.2,97,600/-. Find the cost price of one watch.
(a) Rs.1600
(b) Rs.1800
(c) Rs.2000
(d) Rs.2400

22. The selling price of two articles is same, when one article is sold at 10% profit and the other at 5% loss. If the sum of their cost price is Rs.8200, then find the cost price of each article.
(a) Rs.4000, Rs.4200
(b) Rs.3800, Rs.4400
(c) Rs.3600, Rs.4600
(d) Rs.5400, Rs.2800

23. Ram purchased a few books at the rate of 6 for Rs.150 and next time the same number of books at the rate of 5 for Rs.150. He combined both and then sold them at the rate of 11 for Rs.300. In this exchange he suffered a loss of Rs.400. What is the total number of books he purchased?
(a) 1770
(b) 1760
(c) 880
(d) 1990

24. John purchased a piece of open land at a price of Rs.1,20,000. He sells 3/5th of the land at a loss of 7%. If he intends to make an overall profit of 15% by selling the entire land, at what percentage of profit should he sell the rest of his land?
(a) 48%
(b) 50.58%
(c) 43%
(d) 57.12%

25. A product was sold at a profit of 6%. But due to general price increase, the manufacturing cost of the product increased by 40%. As a normal measure to watch the market trend, the company decided not to increase the price of the product for five months. What percentage of loss would the company suffer on the product during this five month period?
(a) 24.28%
(b) 34%
(c) 28.23%
(d) 25%

26. Ramesh purchased 300 books at Rs.24 each. He sold 150 books at a gain of 15%.Find the gain percentage at which he should sell the rest of the books in order to make 20% profit on the entire transaction.
(a) 25%
(b) 29%
(c) 35%
(d) 20%

27. AShopkeeper purchases 90 smart phones and marks up the price by 40%. He allows a discount of 20% on themarked price for each cash purchase and 10% discount for each card purchase. If three-fifth of the phones are sold by cash and the remaining by card and the total profit earned is Rs.1,42,560, what is the cost price of a phone?
(a) Rs.6000
(b) Rs.8500
(c) Rs.9000
(d) Rs.7100

28. Two persons invested some amount of money in the ratio 2:5 for the same period in a business venture. At the end of the year, they decided that 25% profit was to be set aside for donations. One third of the remaining was reinvested and the rest of the profit was to be shared in the ratio of their investments. If the difference in their final share of the profit is Rs.3000, find the total profit.
(a) Rs.14000
(b) Rs.42000
(c) Rs.35000
(d) Rs.24000

29. A dealer marked the price of an air conditioner at Rs.64000. He offers a 20% discount and also gives a gift voucher worth Rs.1200 along with it. If he receives a profit of 15%, what is the approximate cost price of the air conditioner?
(a) Rs.45000
(b) Rs.43321
(c) Rs.50000
(d) Rs.55000

30. Kumar is a dishonest shopkeeper and uses a 940gm weight instead of 1kg. His cost price and selling price per unit kg of a commodity are Rs.32 and Rs.38 respectively. What is his profit % if he sells 15kg of the commodity?
(a) 26.32%
(b) 29.33%
(c) 30.25%
(d) 32.52%

31. A man sells his computer at a profit of 22.5% and his printer at a loss of 15% but on the whole he gains Rs.4500. On the other hand, if he sells the computer at a loss of 15% and the printer at a profit of 22.5%, then has no gain or loss. Find the cost price of the computer.
(a) Rs.36000
(b) Rs.45000
(c) Rs.59000
(d) Rs.67000

32. Guhan purchased a banquet hallthe cost of which is Rs.15000 per square foot He also lays a new carpet which costs Rs.1000 per square foot. Guhan sold the hall along with the carpet to Kumar at 30% profit. When Kumar was in need of money, he sold it to Kathir at aloss of30%. Kathir acquired the new hall at an amount Rs.6912000 less than Guhan.Find the area of the hall.
(a) 4800 sq.ft
(b) 4500 sq.ft

(c) 3000 sq.ft
(d) 3500 sq.ft

33. A certain type of alloy is made up of two metals A and B. Metals A and B account for 45% and 35% of the total cost of the alloy respectively. The remaining 20% is the manufacturing cost which remains constant. The alloy is sold at 65% above the cost price. Find the percentage profit, if the cost price of the metals A and B increase by 8% and 9% respectively and the selling price of the alloy remains unchanged.
(a) 42%
(b) 41 %
(c) 41.02%
(d) 42.02%

34. Nirmal purchased a guitar and sold it at a loss of 30%. If he had bought it for 15% less and sold it at Rs.1225 more than the previous selling price, he would have made a profit of 40%. Find the original cost price of the guitar.
(a) Rs.2000
(b) Rs.2500
(c) Rs.3000
(d) Rs.4000

35. A Shopkeeper buys 3 bundles of garmentsworth Rs.150000. He makes a profit of 15% by sellingthe first bundle of worth Rs.30000 and a profit of 25% for the next bundle worth Rs.60000. He plans to make an overall profit of 20%. Find the profit that he must make on the third bundle.
(a)Rs.11000
(b)Rs.10000
(c)Rs.10500
(d)Rs.12000

36. An unscrupulous vegetable merchant weighs 25% less than the actual weight of vegetables. For a particular customer, he weighs $\frac{1}{3}^{th}$ more than the quantity he usually weighs. If the percentage profit in this transaction is 28.56%, then what would be the profit if he had weighed correctly at the same price?
(a) 10.25%
(b) 12%
(c) 12.5%
(d) 15%

37. By selling two books for Rs.90 each, a shopkeeper gains 20% on one and loses 20% on the other book. Find the overall percentage profit or loss.
(a)4% profit
(b) 4% loss
(c) 5% loss
(d) 5% profit

38. A man sells three articles, one at a loss of 25%, another at a profit of 60% and the third one at a loss of 20%. If the selling prices of all the three are same, find by how much percentage is their average CP lower than or higher than their average SP.
(a) 6.94%
(b) 7.14%
(c) 8.33%
(d) 10%

39.Tom and John both sell similar products which have a labelled price of Rs.33,000. Tom gives a discount of 9.09% on the whole, while John gives a discount of 11.11% on the first Rs.27000 and one-fifth on rest. What is the difference between the two selling prices?
(a) Rs.950
(b) Rs.1200
(c) Rs.1800
(d) Rs.800

40. The ratio of selling price of 3 shirts is 5:7:9 and the ratio of percentage profit is 1:5:3 respectively. If the profit percentage of shirt 1 is 11.11% and cost price of shirt 2 is Rs.600, what is the overall percentage gain?
(a) 26.36%
(b) 33.31%
(c) 30.23%
(d) 20.19%

ASSIGNMENT PROBLEMS

1.A dishonest shopkeeper sells his goods at cost price. But he uses a false weight and thus gains 8.1%(approx). Find the weight he uses in place of the 1kg.weight.
(a) 900gm
(b) 850gm
(c) 925gm
(d) 870gm

2.If a refrigerator is sold for Rs.40000, the retailer incurs a loss of20%. At what price must he sell the refrigerator in order to gain 20%?
(a) Rs.60000
(b) Rs.55000
(c) Rs.65000
(d) Rs.50000

3.100 pens are purchased at the rate of Rs.500 and 12 pens are sold for Rs.48. What is the profit or loss percentage?
(a) 20% gain
(b) 10% loss
(c) 20% loss
(d) 10% gain

4. Ranjith bought a second hand bike for Rs.25000 and spent Rs.4000 on repairs. He then sells it for Rs.43500. Find his profit %.
(a) 40%
(b) 30%
(c) 45%
(d) 50%

5.A floristmarks up the price of a bouquet by 15% over the cost price. He offers a discount of 5% on the bouquet. Find his profit percentage.
(a) 9.25%
(b) 9%
(c) 9.6%
(d) 9.85%

6.A fruit seller sold 2kgs of orange for Rs.200 at a loss of 20%. At what price must he sell a kg of orange to gain 25%?
(a) Rs.156.25
(b) Rs.176.25
(c) Rs.159.25
(d) Rs.136.25

7. A book seller marks a book up by 40% of its cost. What % of discount musthe offer to his customers so that he ends up selling it at 10% profit?
(a) 21.42%
(b) 20%
(c) 37.5%
(d) 32.85%

8. A merchant sells rice to a customer using false weights and gains 150/7% on selling at cost. What weight would a customer receiveinstead of a kilogram?
(a) 891.91 grams
(b) 930 grams
(c) 942.66 grams
(d) 823.53 grams

9. The cost of manufacturing a perfumecomprises the cost of materials, labour and overheads in the ratio 5:4:3. The labour cost is Rs.200. If the perfume is sold at a price one-third more than the cost price, find the profit.
(a) Rs.250
(b) Rs. 150
(c) Rs.200
(d) Rs.300

10. The selling price of a watch is Rs.2100 after giving three successive discounts of 20%, 33.33%, and 25%. What is the marked price of the watch?
(a) Rs.5000
(b) Rs.5250
(c) Rs.4500
(d) Rs.4000

11.A shopkeeper offers 30% discount on cash purchase but offers additional 20% discount if the customer uses a gift coupon for payment. A customer pays Rs.5600 using a gift coupon. Find the marked price of the article.
(a) Rs.11000
(b) Rs.13000
(c) Rs.10000
(d) Rs.12000

12. A manufacturer allows 20% discount to his clients and still earns 28% profit. As the manufacturing cost of the goods increased by 14%, he issued a new list price which is 15% higher than the previous list price. If he still allows the same percentage of discount to his clients, find the new profit or loss percentage.
(a) 29.12%
(b) 28.43%
(c) 26.23%
(d) 25.9%

13. A merchant marks the price of 25kg of rice at Rs.1200. A customer bargains with the merchant and receives 20% discount but the merchant cheats him by giving 6% less quantity of rice. What is the actual discount the customer received?
(a) 28.25%
(b) 14.89%
(c) 38.52%

(d) 42.56%

14. The Maximum Retail Price (MRP) of a product is 65% above its manufacturing cost. The productis sold through a retailer, who earns 27% profit on his purchase price. What is the profit percentage for the manufacturerwho sells his product to the retailer? The retailer gives 10% discount on MRP.
(a) 15.7%
(b) 17.5%
(c) 16.9%
(d) 18.1%

15. If books bought at prices ranging from Rs.200 to Rs.350 are sold at prices ranging from Rs.300 to Rs.425, what is the greatest possible profit that might be made in selling eight books?
(a) Rs.1800
(b) Rs.1600
(c) Rs.2400
(d) Rs.1200

16. The cost price of 20 articles is the same as selling price of 15 articles. The profit percent in the transaction is
(a) 33.33%
(b) 20%
(c) 25%
(d) 30%

17. A man sells 320 mangoes at the cost price of 400 mangoes. His gain perecent is
(a)25%
(b) 30%
(c) 35%
(d) 12%

18. If the cost price of 12 tables is equal to the selling price of 16 tables, the loss percent is
(a) 25%
(b) 20%
(c) 33%
(d) 12%

19. If the selling price of 18 articles is equal to the CP of 21 articles the loss or gain percent is
(a) 16.66%
(b) 12%
(c) 10%
(d) 15%

20. A man sold 250 chairs and had a gain equal to selling price of 50 chairs. His profit percent is
(a) 25%
(b) 20%
(c) 33%
(d) 35%

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	C	11	C
2	A	12	A
3	C	13	C
4	D	14	C
5	A	15	A
6	A	16	A
7	A	17	A
8	D	18	A
9	C	19	A
10	B	20	A

SIMPLE & COMPOUND INTEREST

Simple interest

It is money paid by the borrower for using the lender's money for a specified period of time. Denoted by I.

Principal

The original sum borrowed. Denoted by P.

Time

Time is a period for which the money is borrowed. Denoted by n

Rate of Interest

The rate at which interest is calculated on the original sum. Denoted by r.

Amount

Sum of Principal and Interest and is denoted by A.

Simple Interest

The interest calculated every year on original principal, i.e. the sum at the beginning of the first year. It is denoted by SI.

SI = Pnr

A=P+SI

Compound Interest

The interest is added to the principal at the end of each period to arrive at the new principal for the next period.

OR

The amount at the end of year will become principal for the next year and so on.

Let P be principal borrowed at the beginning of period 1.

Amount at end of period n=1 is

A= P (1+r/100)

Then,

New Principal at the beginning of period 2 will be A i.e.

P (1+r/100) = P*R where
R=(1+r/100).

Installments under Simple Interest

$P + Pnr/100 = (A+ (n-1)Ar/100) (A+ (n-2)Ar/100)+.....+ (A+ 1.Ar/100)+A$

P – Principal r - rate of interest per annum n – number of installments A – EMI amount

Installments under Compound Interest

$P(1+r\%)^n = A (1+r\%)^{n-1} + A (1+r\%)^{n-2} + A (1+r\%)^{n-3}+.....+ A (1+r\%)^1+ A$

P – Principal r - rate of interest per annum n – number of installments A – EMI amount

CLASSWORK PROBLEMS

1.If the simple interest on Rs. 1120 for 2 years is Rs.8000/-, what is the rate of interest percent per annum?
A) 4%
B) 7%
C) 8%
D) 5%

2.If the simple interest on Rs.4000 for 3 years is Rs.400/-, what is the rate of interest percent per annum?
A) 4 1/3%
B) 3 1/4%
C) 3 1/3%
D) None of these

3.Find the principle, if interest on the principle is Rs.900/- at 6% p.a. for 3 years?
A) Rs.5000/-

B) Rs.4500/-
C) Rs.3500/-
D) Rs.2200/-

4.In how many years will sum of Rs 4000 yield an interest of Rs.1080/- at 9% p.a?
A) 1 year
B) 3 years
C) 4 years
D) 2 years

5.In how many years will sum of Rs.6000/- yield an interest of Rs.1200/- at 8% p.a?
A) 2 1/2 years
B) 2 years
C) 1 1/2 years
D) 3 years

6.At what rate of percent per annum will a sum of money double in 8 years?
A) 13 ¼%
B) 12 ½%
C) 11 ½%
D) None of these

7.Simple interest on a certain sum 16/25 of the sum. if both the rate of interest and time are same. then what is the rate of interest?
A) 12%
B) 10%
C) 8%
D) 13%

8.Find the simple interest on Rs.7300/- at 12% p.a. for the period from jan-2007 to 18- april-2007?
A) 247.20
B) 247
C) 346
D) 347

9.Find simple interest on Rs.4000/- at 15% p.a. for 9months?
A) Rs.350/-
B) Rs.450/-
C) Rs.125/-
D) Rs.450/-

10.Find simple interest on Rs.6000/- at 10% p.a. for 2years 3 months?
A) Rs.1350/-
B) Rs.1250/-
C) Rs.2350/-
D) None of these

11.Find simple interest on Rs.5000/- at 12% p.a. for 73days?
A) Rs.220/-
B) Rs.120/-
C) Rs.210/-
D) None of these

12.Find the principle, if the interest on principle is Rs.1200 at 8% p.a. for 2 years?
A) Rs.6500/-
B) Rs.7500/-
C) Rs.5500/-
D) None of these

13.The borrow taken by a man, for every 6 years it will be 3 times, then how much will it take to become 11 times?
A) 20 years
B) 21 years
C) 22 years
D) 25 years

14.Anitha buy a t.v for Rs.9000/- with down payment Rs.3600 and 10% simple interest for 5 years on an installment basis. Then How much amount he paid for each installment?
A) Rs.1200/-
B) Rs.1500/-
C) Rs.1400/-
D) Rs.1350/-

15.Find simple interest on Rs.5000/- at 12% p.a, for 2 years?
A) Rs.1300/-
B) Rs.1400/-
C) Rs.1200/-
D) Rs.1000/-

16.Find simple interest on Rs.6000/- at 7 ½% p.a. for 3years?
A) Rs.1250/-
B) Rs.1350/-
C) Rs.1200/-
D) Rs.1400/-

17.Find the simple interest on Rs.3000/- at 5 1/3% p.a. for 2 ½ years?
A) Rs.150/-
B) Rs.200/-
C) Rs.400/-
D) None of these

18.A person took some amount with some interest for 3 years, but the rate

of interest increases from 7% to 9%. So he paid Rs. 240 extra, find the amount borrowed by the person?
A) Rs.7000/-
B) Rs.4000/-
C) Rs.5500/-
D) Rs.6000/-

19.A borrow took by a man, for every 5 years it will be doubled, then what is the rate of the interest?
A) 15%
B) 20%
C) 22%
D) 23%

20.A borrow took by a man, for every 8 years it will be 3 times, then what is the rate of the interest?
A) 15%
B) 20%
C) 25%
D) 28%

21.A borrow took by a man, for every 12 years it will be 5 times, then what is the rate of the interest?
A) 33 1/3%
B) 18 1/3%
C) 33 2/3%
D) 34%

22.A sum of money invested under simple interest doubles in 5 years then how much time will it take to become 4 times itself
A) 12 years
B) 15 years
C) 16 years
D) 13 years

23.A man borrowed some amount, after 3 years he paid Rs.10,400/- with 10% interest, then how much Amount he borrowed?
A) Rs.7000/-
B) Rs.8000/-
C) Rs.9000/-
D) Rs.1000/-

24.A man took some money for borrowed, for 3 years the total will be Rs.4000 and 5 years it will be Rs.5000/-. Then how much amount he borrowed?
A) Rs.500/-
B) Rs.1500/-
C) Rs.2500/-
D) Rs.1000/-

25.A man took some money for borrowed, for 2 years the total will be Rs.9000/- and 5 years it will be13, Rs.500/-. Then how much amount he borrowed?
A) Rs.4500/-
B) Rs.6000/-
C) Rs.5000/-
D) Rs.5500/-

26.A person took some amount with some interest for 1 years, but increase the interest for 2%, he paid Rs.60/- extra, then how much amount he took?
A) Rs.3000/-
B) Rs.4000/-
C) Rs.2900/-
D) Rs.2000/-

27.A person took some amount with some interest for 2 years, but increase the interest for 1%, he paid Rs.120/- extra, then how much amount he took?
A) Rs.5500/-
B) Rs.6000/-
C) Rs.4000/-
D) Rs.7000/-

28.A principal of $2000 is placed in a savings account at 3% per annum compounded annually. How much is in the account after one year, two years and three years?.
A) 2185.45
B) 2175.50
C) 2180.50
D) 2150.25

29.What would $1000 become in a saving account at 3% per year for 3 years when the interest is not compounded (simple interest)? What would the same amount become after 3 years with the same rate but compounded annually?
A)1092.73
B) 1106.78
C) 1086.34
D) 1104.56

30.An amount of $1,500 is invested for 5 years at the rates of 2% for the first two years, 5% for the third year and 6% for the fourth and fifth years all

compounded continuously. What is the total amount at the end of the 5 years?
A) 1850.51
B) 1860.45
C) 1560.25
D) 1650.25

31. In one year, the population of a village increased by 10% and in the next year, it decreased by 10%. If the end of the 2nd year, the population was 7920, what was it in the beginning?
(a) 8500
(b) 8000
(c) 8100
(d) 8400

32. If the amount is 2¼ times the sum after 2 years at compound interest, the rate of interest per annum is
(a) 25%
(b) 45%
(c) 40%
(d) 50%

33. A sum of money grows to Rs 200 after 1st year and to Rs 220 after 2nd year, at compound interest. The rate % is
(a) 15
(b) 10
(c) 25
(d) 12

34. How much more would Rs 20,000 fetch, after two years, if it is put at 20% p.a. compound interest Payable half yearly than if it is put at 20% p.a. compound interest payable yearly?
(a) 482
(b) 424
(c) 842
(d) 512

35. Find the principal of the interest compounded at the rate of 10% per annum for the two years is Rs. 420.
A. Rs. 2000
B. Rs. 2200
C. Rs. 1000
D. Rs. 1100

36. At what percentage per annum, will Rs 10,000 amount to 17, 280 in three years?(Compound interest being reckoned)
A. 20%
B. 14%
C. 24%
D. 11%

37. What is the rate of simple interest for the first 4 years if the sum of Rs. 360 become Rs. 540 in 9 years and the rate of interest for the last 5 years in 6%?
A. 4%
B. 5%
C. 3%
D. 6%

38. A sum of money doubles itself in 5 years. In how many years will it become four fold (if interest is compounded)
A. 15
B. 10
C. 20
D. 12

39. Rakesh took a loan for 6 years at the rate of 5% p.a. S.I. if the total interest paid was Rs. 1230. the principal was:
A. Rs 4100
B. Rs 4920
C. Rs 5000
D. Rs 5300

40.A sum of money was lent at simple interest at 11% p.a. for 3½ years and 4½ years respectively. If the difference in interest for two periods was Rs. 41250, the sum is.
A. Rs. 3250
B. Rs. 3500
C. Rs. 3750
D. Rs. 4250

ASSIGNMENT PROBLEMS

1. A sum of Rs. 10,000 is borrowed at 8% per annum compounded annually. If the amount is to be paid in three equal installments, the annual installment will be(approx)
A) Rs 3520
B) Rs 3883
C) Rs 4200
D) Rs 4530

2. A sum was put at simple interest at a certain rate for 5 years. Had it been put at 2% higher rate, it would have fetched Rs. 450 more. Find the sum?
A) Rs 4500
B) Rs 3200
C) Rs 3800

D) Rs 4200

3. Stephen borrowed some money at 6% for the first 4 years, 8% for the next 6 years and 11% for the period beyond 2 years. If the total interest paid by him at the end of eleven years is Rs 5640, how much money did he borrow?
A) Rs 10000
B) Rs 6000
C) Rs 8000
D) Rs 9000

4. A financier lend money at simple interest, but he includes the interest every six months for calculating the principal. If he is changing an interest of 10%, the effective rate of interest becomes?
A) 10%
B) 11.5%
C) 10.25%
D) 12%

5. Ragav purchases a coat for Rs.2400 cash or for Rs.1000 cash down payments and two monthly installments of Rs.800 each. Find the rate of interest.
A) 180%
B) 170%
C) 160%
D) 120%

6. The difference between simple interest and compound interest on Rs. 1200 for one year at 10% per annum reckoned half-yearly is:
A) Rs.3
B) Rs.3.5
C) Rs.4
D) Rs.5

7. A borrows 5000 at simple interest. At the end of 3 years, he again borrows 3000 and finally pays 2340 as interest after 6 years from the time he made the first borrowing. Find the rate of interest per annum.
A) 4%
B) 5.5%
C) 6%
D) 4.5%

8. Arav fixes the rate of interest 5% per annum for first 3 years and for the next 4 years 6 percent per annum and for the period beyond 7 years, 7 percent per annum. If Mr. Kumar lent out Rs.2500 for 11 years, find the total interest earned by him?
A) 1650
B) 1565
C) 1840
D) 1675

9. A certain sum of money amounts to rupees 2900 at 4% per annum in 4 years. In how many years will it amount to rupees 5000 at the same rate?
A) 30
B) 25
C) 22
D) 18

10. Rs.100 doubled in 5 years when compounded annually. How many more years will it take to get another Rs.200 compound interest?
A) 5
B) 6
C) 8
D) 10

11.Out of a sum of Rs 850, a part was lent at6% SI and the other at 12% SI. If the interest on the first part after 2 years is equal to the interest on the second part after 4 years, then the second sum is
A) Rs350
B) Rs280
C) Rs170
D) Rs220

12. A sum of Rs. 550 was taken as a loan. This is to be paid back in two equal installments.
If the rate of interest be 20% compounded annually, then the value of each installment
is :
A) Rs360
B) Rs280
C) Rs250
D) Rs320

13. A certain sum of money amounts to Rs.1300 in 2 years and to Rs. 1525 in 3.5 years. Find the sum and the rate of interest.
A) Rs850, 10%
B) Rs900, 12%
C) Rs800, 13%
D) Rs1000,15%

14. The simple interest on a certain sum of money for 3 years at 8% per annum is half
the compound interest on Rs. 4000 for 2 years at 10% per annum. The sum placed on simple interest is:
A) Rs1800
B) Rs1750
C) Rs2000
D) Rs1655

15. A Woman took a loan of Rs. 15,000 to purchase a mobile. She promised to make the payment after three years. The company charges CI at 20% per annum for the same. But, suddenly the company announces the rate of interest as 25% per annum for the last one year of the loan period. What extra amount she has to pay due to the announcement of new rate of interest?
A) Rs1230
B) Rs1135
C) Rs1080
D) Rs1100

16. The ratio of the amount for two years under compound interest annually and for one
year under simple interest is 6:5. When the rate of interest is same, then the value of rate of interest is:
A) 20%
B) 15%
C) 18%
D) 22%

17. An automobile financier claims to be lending money at simple interest, but he includes the interest every six months for calculating the principal. If he is charging an interest of 10%, the effective rate of interest becomes:
A) 9.5%
B) 8%
C) 10.25%
D) 10%

18. A person borrows Rs. 3000 for 2 years at 5% p.a. simple interest. He immediately lends it to another person at 6 ¼ %p.a for 2 years. Find his gain in the transaction per year.
A) Rs42
B) Rs39.25
C) Rs35
D) Rs37.5

19. If the difference between CI and SI earned on a certain amount at 20% pa at the end of 3 years is Rs.640, find out the principal.
A) Rs5500
B) Rs6500
C) Rs4500
D) Rs5000

20. If the simple interest on a certain sum of money is 4/25 of the sum and the rate per cent equals the number years, then the rate of interest per annum is:
A) 4%
B) 5%
C) 8%
D) 10%

Answer key – Assignement Problems

Q.No	Option	Q.No	Option
1	B	11	C
2	A	12	A
3	B	13	D
4	C	14	B
5	B	15	C
6	A	16	A
7	C	17	C
8	D	18	A
9	B	19	D
10	A	20	A

RATIO & PROPORTION - AGES

A Ratio is comparison of two quantities by division.

A Proportion is a statement that two ratio or equivalent.

A Proportion is considered to be true if the ratios on the both side are equivalent.

If a: b = c: d, we write a: b :: c : d and we say that a, b, c, d are in proportion.

$$a : b :: c : d \Rightarrow (b \times c) = (a \times d)$$

Fourth Proportional:

If a : b = c : d, then d is called the fourth proportional to a, b, c.

Third Proportional:

a : b = c : d, then c is called the third proportion to a and b.

Mean Proportional:

Mean proportional between a and b is ab.

Properties of Proportion: If a/b = c/d then,

$$b/a = d/c$$

$$a/c = b/d$$

$$a \times d = b \times c$$

CLASSWORK PROBLEMS

1. Seats for Maths, Physics and Biology are in the ratio of 5 : 7 : 8 respectively. There is a proposal to increase these seats by 40%, 50% and 75% respectively. What will be the respective ratio of increased seats ?
(1) 2 : 3 : 4
(2) 6 : 7 : 8
(3) 6 : 8 : 9
(4) Cannot be determined

2. DVDs at a rent of Rs. 578. If they used it for 8 hours, 12 hours and 14 hours respectively, what is Kiara‟s share of rent to be paid ?
(1) Rs. 238
(2) Rs. 204
(3) Rs. 192
(4) Rs. 215

3. persons in the ratio of 2 : 3 : 4 : 5. Out of the four, one person gets Rs. 200 more than the other and Rs. 100 less than another. What is the sum ?
(1) Rs. 2800
(2) Rs. 1400
(3) Rs. 4200
(4) Cannot be determined

4. In a college the number of students studying Arts, Commerce and Science are in the ratio of 3 : 5 : 8 respectively. If the number of students studying Arts, Commerce and Science is increased by 20%, 40% and 25% respectively, what will be the new ratio of students in Arts, Commerce and Science respectively ?
(1) 18 : 35 : 50
(2) 3 : 10 : 10
(3) 4 : 8 : 5
(4) 32 : 35 : 25

5. 20 boys and 25 girls form a group of social workers. During their membership drive, the same number of boys and girls joined the group (e.g. if 7 boys joined, 7 girls joined). How many members does the group have now, if the ratio of boys to girls is 7 : 8 ?
(1) 75
(2) 65
(3) 70
(4) 60

6. A sum of money is divided among A, B, C and D in the ratio of 3 : 4 :9 : 10 respectively. If the share of C is Rs. 2,580 more than the share of B, then what is the total amount of money of A and D together ?
(1) Rs. 5,676
(2) Rs. 6,192
(3) Rs. 6,708
(4) Rs. 7,224

7. Production of company A is 120% of the production of company B and 80%

of the production of company C. What is the ratio between the productions of companies A, B and C respectively ?
(1) 6 : 5 : 9
(2) 6 : 5 : 4
(3) 12 : 10 : 15
(4) 10 : 12 : 15

8. Number of students in Arts and Science faculties in an institute are in the ratio of 5 : 8 respectively. If 150 more students join Art faculty while 80 more students join Science faculty, the respective ratio becomes 3 : 4. Originally what was the total number of students in both faculties together ?
(1) 1200
(2) 1400
(3) 1150
(4) None of these

9. 75% of a number is equal to th of another number. What is the ratio between the first number and the second number respectively ?
(1) 5 : 4
(2) 6 : 5
(3) 4 : 5
(4) 5 : 6

10. In a test, a candidate secured 336 marks out of maximum marks „x". If the maximum marks „x" were converted into 400 marks, he would have secured 192 marks. What were the maximum marks of the test ?
(1) 700
(2) 750
(3) 500
(4) 650

11. Which of the following represents ah = 64?
(1) 8 : a = 8 : b
(2) a : 16 = b : 4
(3) a : 8 = b : 8
(4) 32 : a = b : 2

12. The ratio of the number of students studying in schools A, B and C is 5 : 8 : 4 respectively. If the number of students studying in each of the schools is increased by 20%, 25% and 30% respectively, what will be the new respective ratio of the students in schools A, B and C ?
(1) 13 : 25 : 15
(2) 20 : 25 : 13
(3) 15 : 25 : 13
(4) Cannot be determined

13. When 30% of one number is subtracted from another number, the second number reduces to its own four-fifth. What is the ratio between the first and the second numbers respectively ?
(1) 4 : 7
(2) 3 : 2
(3) 2 : 5
(4) None of these

14. The largest and the second largest angles of a triangle are in the ratio of 3 : 2 respectively. The smallest angle is 20% of the sum of the largest and the second largest angles. What is the sum of the smallest and the second largest angles ?
(1) 80°
(2) 60°
(3) 100%
(4) 90°

15. The ratio between the angles of a quadrilateral is 7 : 2 : 5 : 6 respectively. What is the sum of double the smallest angle and half the largest angle of the quadrilateral ?
(1) 162°
(2) 198°
(3) 99°
(4) 135°

16. The angles of a quadrilateral are in the ratio of 2 : 4 : 7 : 5. The smallest angle of the quadrilateral is equal to the smallest angle of a triangle. One of the angles of the triangle is twice the smallest angle of the triangle. What is the second largest angle of the triangle ?
(1) 80°
(2) 60°
(3) 120°
(4) Cannot be determined

17. The ratio between the angles of a quadrilateral is 3 : 4 : 6 : 7. Half the second largest angle of the quadrilateral is equal to the smaller angle of a parallelogram. What is the value of adjacent angle of the parallelogram ?
(1) 136°
(2) 126°
(3) 94°
(4) 96°

18. The ratio between the three angles of a quadrilateral is 1 : 4 : 5 respectively. The value of the fourth angle of the quadrilateral is 60°. What is the difference between the value of the largest and the smallest angles of the quadrilateral ?
(1) 120°
(2) 90°
(3) 110°
(4) 100°

19. Mr. Pandit owned 950 gold coins all of which he distributed amongst his three daughters Lalita, Amita and Neeta. Lalita gave 25 gold coins to her husband, Amita donated 15 gold coins and Neeta made jewellery out of 30 gold coins. The new respective ratio of the coins left with them was 20 : 73 : 83. How many gold coins did Amita receive from Mr. Pandit ?
(1) 380
(2) 415
(3) 400
(4) 350

20. The largest and the second largest angles of a triangle are in the ratio of 13 : 12 respectively. The smallest angle is 20% of the sum of the largest and the second largest
angles. What is the sum of the smallest and the second largest angles ?
(1) 120°
(2) 108°
(3) 100°
(4) 102°

21. Twenty five percent of Pranab‟s annual salary is equal to eighty percent of Surya‟s annual salary. Surya‟s monthly salary is forty percent of Dheeru‟s monthly salary. IfDhreeu‟s annual salary is Rs 6 lacs, what is Pranab‟s monthly salary ? (At some places annual income and in some place monthly income are given)
(1) Rs 7.68 lacs
(2) Rs 56,000
(3) Rs 8.4 lacs
(4) Rs 64,000

22. The ratio between the three angles of a quadrilateral is 1 : 6 : 2 respectively. The value of the fourth angle of the quadrilateral is 45°. What is the difference between the value of the largest and the smallest angles of the quadrilateral ?
(1) 165°
(2) 140°
(3) 175°
(4) 150°

23. The ratio between the angles of a quadrilateral is 3 : 4 : 6 : 5. Two-third of the largest angle of the quadrilateral is equal to the smaller angle of a parallelogram. What is the value of adjacent angle of the parallelogram ?
(1) 120°
(2) 110°
(3) 100°
(4) 130°

24. Rohit has some 50 paisa coins, some 2 rupee coins, some 1 rupee coins and some 5 rupee coins. The value of all the coins is Rs 50. Number of 2 rupee coins is 5 more than that of the 5 rupee coins. 50 paisa coins are double in number than 1 rupee coins Value of 50 paisa coins and 1 rupee coins is Rs 26. How many 2 rupee coins does he have ?
(1) 4
(2) 2
(3) 7
(4) Cannot be determined

25. The ratio between the adjacent angles of a parallelogram is 2 : 3 respectively. Half the smaller angle of the parallelogram is equal to the smallest angle of a quadrilateral. Largest angle of quadrilateral is four times its smallest angle. What is the sum of largest angle of quadrilateral and the smaller angle of parallelogram.
(1) 252°
(2) 226°
(3) 144°
(4) None of these

26. One of the angles of a triangle is two-third of sum of adjacent angles of parallelogram. Remaining angles of the triangle are in ratio 5 : 7 respectively. What is the value of second largest angle of the triangle ?
(1) 25°
(2) 40°
(3) 35°
(4) Cannot be determined

27. The largest and the smallest angles of a triangle are in the ratio of 3 : 1 respectively. The second largest angle of the triangle is equal to 44°. What is the value of 150 per cent of the largest angle of the triangle ?
(1) 149
(2) 129
(3) 153
(4) 173

28. One of the angles of a quadrilateral is thrice the smaller angle of a parallelogram. The respective ratio between the adjacent angles of the parallelogram is 4 : 5. Remaining three angles of the quadrilateral are in ratio 4 : 11 : 9 respectively. What is the sum of the largest and the smallest angles of the quadrilateral ?
(1) 255°
(2) 260°
(3) 265°
(4) 270°

29. Smallest angle of a triangle is equal to two-third of the smallest angle of a quadrilateral. The ratio between the angles of the quadrilateral is 3 : 4 : 5 : 6. Largest angle of the triangle is twice its smallest angle. What is the sum of second largest angle of the triangle and largest angle of the quadrilateral ?
(1) 160°
(2) 180°
(3) 190°
(4) 170°

30. The largest and the second largest angles of a triangle are in the ratio of 4 : 3 respectively. The smallest angle is half the largest angle. What is the difference between the smallest and the largest angles of the triangle?
(1) 30°
(2) 60°
(3) 40°
(4) 20°

31. The ratio between the three angles of a quadrilateral is 13 : 9 : 5 respectively. The value of the fourth angle of the quadrilateral is 36°. What is the difference between the **largest** and the **second smallest** angles of the quadrilateral ?
(1) 104°
(2) 108°
(3) 72°
(4) 96°

32. The ratio between the adjacent angles of a parallelogram is 7 : 8 respectively. Also the ratio between the angles of quadrilateral is 5 : 6 : 7 : 12. What is the sum of the smaller angle of parallelogram and second largest angle of the quadrilateral ?
(1) 168°
(2) 228°
(3) 156°
(4) 224°

33. The ages of Sulekha and Arunima are in the ratio of 9 : 8 respectively. After 5 years the ratio of their ages will be 10 : 9. What is the difference in years between their ages.
(1) 4 years
(2) 5 years
(3) 6 years
(4) 7 years

34. The ages of Sonal and Nitya are in the ratio of 9 : 5 respectively. After 8 years the ratio of their ages will be 13 : 9. What is the difference in years between their ages ?
(1) 4 years
(2) 12 years
(3) 6 years
(4) None of these

35. The ratio of the 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 ?
(1) 64
(2) 51
(3) 48
(4) Cannot be detremined

36. Ratio of Rani‟s and Komal‟s age is 3 : 5 respectively. Ratio of Komal‟s and Pooja‟s age is 2 : 3 respectively. If Rani is two-fifth of Pooja‟s age, what is Rani‟s age ?
(1) 10 years
(2) 15 years
(3) 24 years
(4) Cannot be determined

37. Present ages of Amit and his father are in the ratio of 2 : 5 respectively. Four years hence the ratio of their ages becomes 5 : 11 respectively. What was

father‟s age five years ago ?
(1) 40 years
(2) 45 years
(3) 30 years
(4) 35 years

38. Four years ago Shyam‟s age was times that of Ram. Four years hence, Shyam‟s age will be times that of Ram. What is the present age of Shyam ?
(1) 15 years
(2) 20 years
(3) 16 years
(4) 24 years

39. The ratio of the ages of Tina and Rakesh is 9 : 10 respectively. Ten years ago the ratio of their ages was 4 : 5 respectively. What is the present age of Rakesh ?
(1) 25 years
(2) 20 years
(3) 30 years
(4) 24 years

40. The present ages of Vishal and Shekhar are in the ratio of 14 : 17 respectively. Six years from now, thier ages will be in the ratio of 17 : 20 respectively. What is Shekhar‟s present age ?
(1) 17 years
(2) 51 years
(3) 34 years
(4) 28 years

ASSIGNMENT PROBLEMS

1. The ratio between the ages of a father and a son at present is 5 : 2 respectively. Four years hence the ratio between the ages of the son and his mother will be 1 : 2 respectively. What is the ratio between the present ages of the father and the mother respectively?
(1) 3 : 4
(2) 5 : 4
(3) 4 : 3
(4) Cannot be determined

2. Radha‟s present age is three years less than twice her age 12 years ago. Also the respective ratio between Raj‟s present age and Radha‟s present age is 4 : 9. What will be Raj's age after 5 years ?
(1) 12 years
(2) 7 years
(3) 21 years
(4) None of these

3. The ratio of the present ages of Meena and Fiona is 16 : 13 respectively. Four years ago the respective ratio of their ages was 14 : 11. What will be Fiona‟s age four years from now?
(1) 28 years
(2) 32 years
(3) 26 years
(4) None of these

4. The respective ratio of the present ages of Swati and Trupti is 4 : 5. Six years hence the respective ratio of their ages will be 6 : 7. What is the difference between their ages ?
(1) 2 years
(2) 3 years
(3) 4 years
(4) Cannot be determined

5. The respective ratio between the present ages of Ram and Rakesh is 6 : 11. Four years ago the ratio of their ages was 1 : 2 respectively. What will be Rakesh‟s age after five years ?
(1) 45 years
(2) 29 years
(3) 49 years
(4) Cannot be determined

6. The respective ratio between the present ages of son, mother, father and grandfather is 2 : 7 : 8 : 12. The average age of son and mother is 27 years. What will be mother‟s age after 7 years ?
(1) 40 years
(2) 41 years
(3) 48 years
(4) 49 years

7. The respective ratio between the present ages of Ram, Rohan and Raj is 3 : 4 : 5. If the average of their present ages is 28 years then what would be the sum of the ages of Ram and Rohan together after 5 years ?
(1) 45 years
(2) 55 years
(3) 52 years
(4) 59 years

8. The respective ratio between present age of Manoj and Wasim is 3 : 11. Wasim is 12 years younger than Rehana. Rehana‟s age after 7 years will be 85

years. What is the present age of Manoj‟s father who is 25 years older than Manoj ?
(1) 43 years
(2) 67 years
(3) 45 years
(4) 69 years

9. The respective ratio between the present age of Aarti and Savita is 5 : x. Aarti is 9 years younger than Jahnavi. Jahnavi‟s age after 9 years will be 33 years. The difference between Savita‟s and Aarti‟s age is same as the presen age of Jahnavi. What will come in place of x?
(1) 21
(2) 37
(3) 17
(4) None of these

10. An amount of money is to be divided among P, Q and R in in the ratio of 3 : 5 : 7 respectively. If the amount received by R is Rs 4,000 more than the amount received by Q, what will be the be total amount received by P and Q together ?
(1) Rs. 8,000
(2) Rs. 12,000
(3) As. 16,000
(4) Cannot be determined

11. The ratio of 8 books to 20 books is
(a) 2 : 5
(b) 5 : 2
(c) 4 : 5
(d) 5 : 4

12. The ratio of the number of sides of a square to the number of edges of a cube is
(a) 1 : 2
(b) 3 : 2
(c) 4 : 1
(d) 1 : 3

13. A picture is 60cm wide and 1.8m long. The ratio of its width to its perimeter in lowest form is
(a) 1 : 2
(b) 1 : 3
(c) 1 : 4
(d) 1 : 8

14. Neelam's annual income is Rs. 288000. Her annual savings amount to Rs. 36000. Theratio of her savings to her expenditure is
(a) 1 : 8
(b) 1 : 7
(c) 1 : 6
(d) 1 : 5

15. Mathematics textbook for Class VI has 320 pages. The chapter 'symmetry' runs from page 261 to page 272. The ratio of the number of pages of this chapter to the total number of pages of the book is
(a) 11 : 320
(b) 3 : 40
(c) 3 : 80
(d) 272 : 320

16. In a box, the ratio of red marbles to blue marbles is 7:4. Which of the following could be the total number of marbles in the box?
(a) 18
(b) 19
(c) 21
(d) 22

17. On a shelf, books with green cover and that with brown cover are in the ratio 2:3. If there are 18 books with green cover, then the number of books with brown cover is
(a) 12
(b) 24
(c) 27
(d) 36

18. The greatest ratio among the ratios 2 : 3, 5 : 8, 75 : 121 and 40 : 25 is
(a) 2 : 3
(b) 5 : 8
(c) 75 : 121
(d) 40 : 25

19. There are 'b' boys and 'g' girls in a class. The ratio of the number of boys to the total number of students in the class is:
(a)b/b+g
(b)g/g+b
(c)b/g
(d)b+g/b

20. If a bus travels 160 km in 4 hours and a train travels 320km in 5 hours at uniform speeds, then the ratio of the distances travelled by them in one hour is
(a) 1 : 2
(b) 4 : 5
(c) 5 : 8
(d) 8 : 5

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	D	11	A
2	D	12	A
3	D	13	D
4	B	14	B
5	C	15	C
6	D	16	D
7	D	17	C
8	A	18	D
9	D	19	A
10	C	20	C

MIXTURES AND ALLIGATION

Mixtures are generally two types.

i) Simple mixture:- When two different ingredients are mixed together

ii) Compound mixture:- when two or more simple mixture are mixed together to form another mixture, it is known as a compound mixture.

Allegation: Allegation means linking; it is the rule that enables us to find the ratio in which two or more ingredients at the given price must be mixed to produce a mixture of desired price.

Mean Price: The cost of a unit quantity of the mixture is called the mean price.

Rule of Allegation:

If two ingredients are mixed then,

Quantity of cheaper/Quantity of costlier

= Cost of costlier – Mean price/ Mean price – Cost of cheaper

Suppose a container contains x of liquid from which y units are taken out and replaced by water.

- After n operations, **the quantity of pure liquid = $x(1-y/x)^n$**

CLASSWORK PROBLEMS

1.In what ratio must rice at Rs 9.30 per Kg be mixed with rice at Rs 10.80 per Kg so that the mixture be worth Rs 10 per Kg?
(a) 6:5
(b) 8:7
(c) 3:7
(d) 6:1

2.How much water must be added to 60 litres of milk at 1.5 litres for Rs. 20 So as to have a mixture worth Rs.10231023 a litre?(litres)
(a) 10
(b) 12
(c) 15
(d) 18

3.In what ratio must wheat at Rs.3.20 per kg be mixed with wheat at Rs.2.90 per kg so that the mixture be worth Rs.3.08 per kg?
(a) 3:4
(b) 4:3
(c) 3:2
(d) 2:3

4.In what proportion must rice at Rs. 3.10 per kg be mixed with rice at Rs. 3.60 per kg so that the mixture be worth Rs. 3.25 per kg?
(a) 5:3
(b) 3:7
(c) 3:5
(d) 7:3

5.In what ratio must tea at Rs. 62 per Kg be mixed with tea at Rs. 72 per Kg so that the mixture must be worth Rs. 64.50 per Kg?
(a) 2:3
(b) 3:2
(c) 3:1
(d) 1:3

6.The ratio, in which tea costing Rs. 192 per kg is to be mixed with tea costing Rs. 150 per kg so that the mixed tea when sold for Rs. 194.40 per kg, gives a profit of 20%.
(a) 3:5
(b) 2:5

(c) 3:7
(d) 1:2

7.In a zoo, there are Rabbits and Pigeons. If heads are counted, there are 200 and if legs are counted, there are 580. How many pigeons are there?
(a) 90
(b) 100
(c) 110
(d) 120

8.Weights of two friends Ram and Shyam are in the ratio 4:5. If Ram's weight is increased by 10% and total weight of Ram and Shyam become 82.8 kg, with an increases of 15%, by what percent did the weight of Shyam has to be increased?
(a) 19%
(b) 23%
(c) 29%
(d) 17%

9.In a 729 litres mixture of milk and water, the ratio of milk to water is 7:2. To get a new mixture containing milk and water in the ratio 7:3, the amount of water to be added is:
(a) 51 ltr
(b) 61 ltr
(c) 71 ltr
(d) 81 ltr

10.Three types of wheat of Rs. 1.27, Rs. 1.29 and Rs. 1.32 per kg are mixed together to be sold at Rs. 1.30 per kg. In what ratio should this wheat be mixed?
(a) 1:1:2
(b) 1:2:3
(c) 2:1:3
(d) 2:2:3

11.The milk and water in two vessels A and B are in the ratio 4:3 and 2:3 respectively. In what ratio the liquids in both the vessels be mixed to obtain a new mixture in vessel c consisting half milk and half water?
(a) 2:3
(b) 8:3
(c) 4:3
(d) 7:5

12.Two vessels A and B contain spirit and water mixed in the ratio 5:2 and 7:6 respectively. Find the ratio in which these mixture be mixed to obtain a new mixture in vessel c containing spirit and water in the ratio 8:5?
(a) 2:9
(b) 1:7
(c) 3:8
(d) 7:9

13.How many kilograms of sugar costing Rs. 9 per kg must be mixed with 27kg of sugar costing Rs.7 per kg so that there may be gain of 10% by selling the mixture at Rs.9.24 per kg?(Kg)
(a) 63
(b) 60
(c) 50
(d) 77

14.One quantity of wheat at Rs 9.30 per Kg is mixed with another quality at a certain rate in the ratio 8:7. If the mixture so formed be worth Rs 10 per Kg, what is the rate per Kg of the second quality of wheat?(Rs)
(a) 12.47
(b) 10.80
(c) 15.17
(d) 47.66

15.A can contains a mixture of two liquids A and B in 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?(litres)
(a) 28
(b) 21
(c) 36
(d) 45

16.8 litres are drawn from a cask filled with wine and is then filled with water. This operation is performed three more times.The ratio of the quantity of wine now left in cask to that of the total solution is 16:81.How much wine did the cask hold originally?
(a) 24
(b) 44
(c) 45
(d) 49

17.A man travelled a distance of 90Km in 9 hours partly on foot at 8 kmph and partly on bicycle at 17 kmph. Find the distance travelled on foot.(Km)
(a) 46
(b) 56
(c) 62
(d) 52

18.A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup.What part of the mixture must be drawn off and replaced with water so that the mixture may be half water and half syrup?
(a) 6/7
(b) 2/7
(c) 7/11
(d) 1/5

19.Teas worth Rs. 126 per kg and Rs. 135 per kg are mixed with a third variety in the ratio 1 : 1 : 2.If the mixture is worth Rs 153 per Kg , the price of the third variety per Kg will be?(Rs)
(a) 175.50
(b) 147.50
(c) 258.50
(d) 785.50

20.A 20 litre mixture of milk and water contains milk and water in the ratio 3 : 2. 10 litres of the mixture is removed and replaced with pure milk and the operation is repeated once more.At the end of the two removals and replacement, what is the ratio of milk and water in the resultant mixture?
(a) 3:17
(b) 5:3
(c) 17:3
(d) 9:1

21.How many kgs of Basmati rice costing Rs.42/kg should a shopkeeper mix with 25 kgs of ordinary rice costing Rs.24 per kg so that he makes a profit of 25% on selling the mixture at Rs.40/kg?(Kg)
(a) 16
(b) 12.5
(c) 20
(d) 200

22.In what ratio must a person mix three kinds of wheat costing him Rs 1.20,Rs 1.44 and Rs 1.74 per Kg so that the mixture may be worth Rs 1.41 per Kg?
(a) 11:77:7
(b) 25:45:8
(c) 27:23:6
(d) 11:45:7

23.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?(ltr)
(a) 5
(b) 10
(c) 7
(d) None

24.A sample of x litres from a container having a 60 litre mixture of milk and water containing milk and water in the ratio of 2 : 3 is replaced with pure milk so that the container will have milk and water in equal proportions. What is the value of x?(ltr)
(a) 6
(b) 10
(c) 30
(d) None

25.From a cask of milk containing 30 litres, 6 litres are drawn out and the cask is filled up with water.If the same process is repeated a second, then a third time, what will be the number of litres of milk left in the cask?(litres)
(a) 12
(b) 14.38
(c) 15.36
(d) 5.12

26.How many litres of a 12 litre mixture containing milk and water in the ratio of 2 : 3 be replaced with pure milk so that the resultant mixture contains milk and water in equal proportion?(litres)
(a) 1.5
(b) 2
(c) 4
(d) 1

27.A merchant mixes three varieties of rice costing Rs.20/kg, Rs.24/kg and Rs.30/kg and sells the mixture at a profit of 20% at Rs.30 / kg.How many kgs of the second variety will be in the mixture if 2 kgs of the third variety is there in the mixture?(Kg)
(a) 6
(b) 1
(c) 5
(d) 3

28.In what ratio must a person mix three kinds of tea costing Rs.60/kg, Rs.75/kg and Rs.100 /kg so that the resultant mixture when sold at Rs.96/kg yields a profit of 20%?
(a) 1:2:4
(b) 1:4:2
(c) 3:7:6
(d) None

29.A zookeeper counted the heads of the animals in a zoo and found it to be 80. When he counted the legs of the animals he found it to be 260.If the zoo had either pigeons or horses, how many horses were there in the zoo?
(a) 60
(b) 40
(c) 50
(d) 30

30.A milk vendor has 2 cans of milk .The first contains 25% water and the rest milk. The second contains 50% water.How much milk should he mix from each of the container so as to get 12 litres of milk such that the ratio of water to milk is 3:5?(litres)
(a) 6
(b) 8
(c) 7
(d) 1

31. A container contains 80 Litre milk. From this container 8 Litre milk was taken out and replaced with water. This process was further repeated two times. How much milk is now contained in the container?
(a) 58.32 L
(b) 57.32 L
(c) 59.32 L
(d) 56.32 L

32. A trader sold two articles in Rs 800. On one he gained 33(1/3)% and on another he gained 20%. In this whole transaction he gained 25%. Find the cost price of the second article (the one sold at 20% gain)
(a) Rs 240
(b) Rs 400
(c) Rs 300
(d) Rs 500

33. A mixture of certain quantity of milk with 20 Litre of water is sold at 80 paise per litre. If pure milk be worth Rs 1.20 per litre. How much milk is present in the mixture?
(a) 20 L
(b) 25 L
(c) 30 L
(d) 40 L

34. In an alloy, zinc and copper are in the ratio 1:3. In the second alloy the same elements are in the ratio 2:3. If what proportion should the two alloys be mixed so as to form a new alloy in which zinc and copper are in the ratio 1:2.
(a) 5:4
(b) 4:5
(c) 5:6
(d) 6:5

35. 400 grams of sugar solution has 40% sugar in it. How much sugar should be added to make it 50% in the solution?
(a) 60 gm
(b) 70 gm
(c) 80 gm
(d) 90 gm

36. A dishonest milkman professes to sell his milk at cost price, but he mixes it with water and thereby gains 33(1/3)%. The percentage of water in the mixture is?
(a) 20%
(b) 33 (1/3) %
(c) 25%
(d) 30%

37. A person has a chemical of Rs 15 per litre. In what ratio should water be mixed in that chemical so that after selling the mixture at Rs 12/litre he may get a profit of 20%.
(a) 1:2
(b) 2:1
(c) 1:3
(d) 3:1

38. If 2 kg of metal, of which 1/3 is zinc and the rest is copper be mixed with 3 kg of metal of which ¼ is zinc and the rest is copper, What is the ratio of zinc to copper in the mixture?
(a) 2:3
(b) 3:2
(c) 43:17
(d) 17:43

39. A man has 90 pens. He sells some of these at a profit of 15% and the rest at 9% profit. On the whole transaction he gets a profit of 11%. How many pens did

he sell at 9% profit?
(a) 60
(b) 50
(c) 40
(d) 70

40. A butler stole wine from a butt of sherry which contained 35% spirit and he replaced what he had stolen by wine containing only 20% spirit. The butt was then 25% strong only. How much of the butt did he steal?
(a) 1/3
(b) 2/3
(c) 3/4
(d) ¼

ASSIGNMENT PROBLEMS

1.The ratio of A & B in a mixture is 8:1, 15ltr of mixture is taken out and same amount of B is added, now ratio become 4:3. Find the initial amount of A in the mixture (approx)?
(a) 24
(b) 37
(c) 34
(d) 40

2. A shopkeeper sells his milk at cost price but he add some water and earn 16(2/3)% profit. Find the ratio of milk and water?
(a) 6:1
(b) 1:6
(c) 5:1
(d) 1:5

3.There is 70ltr milk in a container. From this 7ltr of milk is taken out and added some quantity of water. This process is repeated two more times. Find the remaining milk in container?
(a) 45ltr
(b) 48.03ltr
(c) 50ltr
(d) 51.03ltr

4. A man has to distribute Rs65 in a class of 50 students. He gives 1.5 rupee to boys and 1 rupee to girls each. Find how many girls are there in the class?
(a) 30
(b) 20
(c) 15
(d) 25

5. In an alloy the ratio of copper and aluminum is 4:5 and in other alloy the ratio of copper and aluminum is 6:7. In what ratio these alloy should be taken to make ratio of copper and aluminum is 5:6?
(a) 5 : 11
(b) 11 : 5
(c) 13 : 9
(d) 9 : 13

6. In a bag there are three types of coins, 1rupee, 50 paisa and 25paisa in the ratio of 5:10:24. There total value is Rs208. The total number of coins is?
(a) 507
(b) 208
(c) 961
(d) 744

7. 400gm of sugar solution has 30% sugar in it. How much sugar should be added to make it 50% in the solution (in gm)?
(a) 120
(b) 60
(c) 100
(d) 160

8. A mixture of certain quantity of milk with 15ltr of water is sold at 80paisa/ltr. If pure milk be worth

Rs1.10 per ltr. How much milk is there in the mixture?
(a) 50 ltr
(b) 40 ltr
(c) 60 ltr
(d) 70 ltr

9. A merchant borrowed Rs3500 from two money lenders. For one loan he paid 14% p.a and for other 18% p.a. the interest paid for one year was Rs525. How much did he borrow at 18%p.a?
(a) Rs875
(b) Rs625
(c) Rs750
(d) Rs1000

10. How many kg of salt at42 paisa per kg must a man mix with 25kg of salt at 24 paisa per kg, so that he may on selling the mixture at 40 paisa per kg, gain 25% on the outlay?
(a) 15kg
(b) 20kg
(c) 25kg
(d) 30kg

11. After selling an article a man gains 25%. Also he uses a false weight of 10%. Find the total profit earn by him?
(a) 37.5%
(b) 35%
(c) 37(8/9)%
(d) 38(8/9)%

12. A man wants to gain 20% after selling milk at cost price. So in what ratio he has to add water to earn this profit?
(a) 5:1
(b) 1:4
(c) 1:5
(d) 4:1

13. A shopkeeper has two types of article. The CP of 1st article is 20Rs/kg and other article is X Rs/kg. He has quantity of 1st article is 10kg and other article is 20 kg. He sold the mixture of these article at Rs 39/kg with a profit of 30%. Find the value of X?
(a) 70Rs/kg
(b) 35Rs/kg
(c) 60Rs/kg
(d) 30Rs/kg

14. A sugar solution of 60kg has 20% sugar in it. How much sugar must be added in this to make it half of the solution?
(a) 18kg
(b) 96kg
(c) 24kg
(d) 36kg

15. A man has 80 pens. He sells some of these at 15% profit and the rest at 10%loss. Overall he gets a profit of 10%. Find how many pens were sold at 15% profit ?
(a) 16
(b) 64
(c) 40
(d) 72

16. How much tea at Rs4 a kg should be added to 15kg of tea at Rs10 a kg so that the mixture be worth Rs6.50 a kg?
(a) 15
(b) 35
(c) 25
(d) 21

17. There are two types of jar. In the 1st jar the ratio of copper and aluminium is 1:2 and in the 2nd Jar is 1: 4. In what ratio these two jar should be mix to make 3rd jar In which the ratio of

copper & aluminium become 1:3?
(a) 3:5
(b) 5:3
(c) 2:5
(d) 5:2

18. A butler stole wine from a butt of sherry which contained 50% spirit and he replaced it with wine which contains 20% spirit. Now the strength of butt remain only 30%. How much of the butt did he steal?
(a) 1/3
(b) 1/2
(c) 2/3
(d) ¼

19. There are 65 students in a class. 39 rupees were distributed among them so that each boy gets 80 paisa and each girl gets 30 paisa. Find the number of girls in the class?
(a) 39
(b) 26
(c) 40
(d) 30

20. A container has 40 l of milk. From this, 4 l of milk is taken out and replaced with water. Now 4 l of mixture is taken out and replaced with water again. Find how much quantity of milk is remaining in the container?
(a) 32.4 l
(b) 32 l
(c) 31.4 l
(d) 31 l

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	B	11	D
2	A	12	C
3	D	13	C
4	B	14	D
5	D	15	B
6	A	16	D
7	D	17	A
8	B	18	C
9	A	19	B
10	B	20	A

LOGARITHMS

The ***logarithm*** of a positive number is the ***power*** of the ***base*** that produces the number.A logarithm whose ***base*** is 10 is called a ***common logarithm***. It has the default form log *N*.A logarithm whose ***base*** is *e* is called a ***natural logarithm***. It has the default form ln *N* .

$\log_b y = x$ if and only if $b^x = y$

$\ln y = x$ if and only if $e^x = y$

Properties of logarithm

$\log_b 1 = 0$

$\log_b b = 1$

$\log_b b^n = n$

Laws of logarithm

$\log_b xy = \log_b x + \log_b y$

$\log_b (x/y) = \log_b x - \log_b y$

$\log_b x^n = n\log_b x$

$\log_b x = \log_b y$ if and only if x=y

Change of base formula

$\log_x y = \log_b y / \log_b x$

$\log_b a = \log a / \log b = \ln a / \ln b$

Chain rule

$\log_a b * \log_b c * \log_c d * \log_d e = \log_a e$

$\log_a b * \log_b a = 1$

$\log_x y = 1/\log_y x$

CLASSWORK PROBLEMS

1.If $a^x = b^y$, then
(a) log a/b= x/y
(b) log a/ log b = x/y
(c) log a/ log b = y/x
(d) log b/a = x/y

2.2 $\log_{10} 5 + \log_{10} 8 - ½ \log_{10} 4 = ?$
(a) 2
(b) 4
(c) $2 + 2 \log_{10} 2$
(d) $4 - 4 \log_{10} 2$

3.$\log_a (ab) = x$, then $\log_b (ab)$ is :
(a) 1/x
(b) x/ (x+1)
(c) x/(1-x)
(d) x/(x-1)

4.If $\log_8 x + \log_8 1/6 = 1/3$, then the value of x is:
(a) 12
(b) 16
(c) 18
(d) 24

5.The value of $(\log_9 27 + \log_8 32)$ is:
(a) 7/2
(b) 19/6
(c) 5/3
(d) 7

6.If $\log_{12} 27 = a$, then $\log_6 16$ is:
(a) (3-a)/4(3+a)
(b) (3+a)/4(3-a)
(c) 4(3+a)/(3-a)
(d) 4(3-a)/(3+a)

7.The value of $(1/\log_3 60 + 1/\log_4 60 + 1/\log_5 60)$ is:
(a) 0
(b) 1
(c) 5
(d) 60

8.If log x + log y = log (x+y), then,
(a) x=y
(b) xy=1
(c) y= (x-1)/x
(d) y=x/(x-1)

9.If log 27= 1.431, then the value of log 9 is:
(a) 0.934
(b) 0.945
(c) 0.954
(d) 0.958

10.If log 2= 0.030103, the number of digits in 2^{64} is :
(a) 18
(b) 19
(c) 20
(d) 21

11.If $\log 2 = 0.3010$ and $\log 3 = 0.4771$, the values of $\log_5 512$ is
(a) 2.875
(b) 3.875
(c) 4.875
(d) 5.875

12.If log 27 = 1.431, then the value of log 9 is
(a) 0.754
(b) 0.854
(c) 0.954
(d) 0.654

13. If log 2 = 0.30103, Find the number of digits in 2^{56} is
(a) 17
(b) 19
(c) 23
(d) 25

14. If log 64 = 1.8061, then the value of log 16 will be (approx)?
(a) 1.9048
(b) 1.2040
(c) 0.9840
(d) 1.4521

15. What is the characteristic of the logarithm of 0.0000134?
(a) 5
(b) -5
(c) 6
(d) -6

16.The value of (1/log360+1/log460+1/log560)is
(a) 0
(b) 1
(c) 5
(d) 60

17. Find the logarithm of 144 to the base $23-\sqrt{23}$:
(a) 2
(b) 4
(c) 8
(d) None of these

18. If $\log_7\log_5(\sqrt{x} + \sqrt{x+5}) = 0$, find the value of x.
(a) 1
(b) 2
(c) 0
(d) None of these

19.
If $\log x(9/16) = -1/2$, then the value of x?
(a) -3/4
(b) 3/4
(c) 81/256
(d) 256/81

20. If $\log_a(ab) = x$, then $\log_b(ab) = ?$
(a) 1/x
(b) x/(x+1)
(c) x/(1-x)
(d) x/(x-1)

21. Find the value of x in the equation $(1/2)^{2x+1} = 1$.
(a) ½
(b) ¼
(c) -1/2
(d) -2/3

22. Given: $\log_8(5) = b$. Express $\log_4(10)$ in terms of b.
(a) (1+2b)/2
(b) (1+3b)/3
(c) (1+3b)/2
(d) (1+2b)/3

23. Simplify $\log_6(216) + [\log(42) - \log(6)] / \log(49)$:
(a) 0
(b) 3/2
(c) 3 ½
(d) 1

24. Find **a** so that the graph of $y = \log_a x$ passes through the point (e , 2).
(a) 1
(b) 0
(c) e
(d) √e

25. Find x in the equation $\log [\log (2 + \log_2(x + 1))] = 0$.
(a) 1
(b) 0
(c) 255
(d) 128

26. Find x in the equation $2 \times b^{4 \log_b x} = 486$.
(a) 1
(b) 2
(c) 3
(d) None of the above

27. Find x in the equation $\log (x - 1) + \log (2x - 1) = 2 \log (x + 1)$.
(a) 1
(b) 0
(c) 2
(d) 5

28. Find the x intercept of the graph of $y = 2 \log(\sqrt{(x - 1)} - 2)$.
(a) 1
(b) 3
(c) 9
(d) 10

29. Find x in the equation $y^2 - y - 6 = 0$, where $\log_3 y = x$.
(a) 3
(b) -1
(c) 1
(d) -2

30. If $\log_x(1 / 8) = -3 / 4$, than what is x?
(a) 4
(b) 16
(c) 9
(d) 8

31. If $\log_2(\log_7(x^2 – x + 37)) = 0$,then what could be the value of x?
(a) 3
(b) 4
(c) 5
(d) None of these

32. If $\log_3 2$, $\log_3(2^x – 5)$ and $\log_3(2^x – 3.5)$ are in AP, then the value of x is equal to
(a) 5
(b) 4
(c) 3
(d) 2

33.What is the sum of n terms in the series $\log m + \log(m^2/n) + \log(m^3/n^2) + \log(m^4/n^3) + ...$
(a) $\log(m^{(n+1)}/n^{(n-1)})^{n/2}$
(b) $\log(m^{(1-m)}/n^{(1-m)})^{n/2}$
(c) $\log(n^m/m^n)^{n/2}$
(d) $\log(n^{(n-1)}/m^{(n+1)})^{n/2}$

34. If $1/3 \log_3 M + 3 \log_3 N = 1 + \log_{0.008} 5$, then
(a) $M^9 = 9/N$
(b) $N^9 = 9/M$
(c) $M^3 = 3/N$
(d) $N^9 = 3/M$

35. Solve for x: $x\log_{10} x – \log_{10}\sqrt{x} = 2\log_x 10$
(a) 100
(b) 185
(c) 190
(d) 200

36. If $f(x) = \log\{(1+x)/(1-x)\}$, then $f(x)+f(y)$ is:
(a) f(x+y)
(b) f(x+y/1+xy)
(c) (x+y) f(1/1+xy)
(d) f(x)+f(y)/(1+xy)

37. If $\log_y x = a$, $\log_z y = b$ and $\log_x z = ab$, then which of the following pair of values for (a,b) is not possible?
(a) 1,1
(b) 2, ½
(c) 2,2
(d) ¼, 1/5

38. If x>=y, y>1, then the value of the expression $\log_x(x/y) + \log_y(y/x)$ can never be
(a) -1
(b) -1/2
(c) 0
(d) 1

39. Find the value of $1/\log_3 84 + 1/\log_4 84 + 1/\log_7 84$
(a) 1
(b) 4
(c) 3
(d) 7

40. If p,q and r are in H.P, then $\log_e(p+r) + \log_e(p-2q+r)$ is equal to
(a) $\log_e(p-r)$
(b) $2 \log_e|p-r|$
(c) $3 \log_e|p-r|$
(d) None

ASSIGNMENT PROBLEMS

1. Solve for x such that $5^x = 17$.
(a) 1.87
(b) 1.76
(c) 2.25
(d) 2.56

2. Find upto 3 significant figures, the value of x for which $8^x = 0.8$
(a) -0.107
(b) -1
(c) -0.152
(d) -0.126

3. If $2\log_3 x - \log_3(7x) = 1$, then find the value of x.
(a) 10
(b) 21
(c) 27
(d) 11

4. Find a and b (both are positive integers) such that $a = 3b$ and $\log_3 a + \log_3 b = 2$.
(a) $3\sqrt{3}, \sqrt{3}$
(b) $3\sqrt{2}, \sqrt{2}$
(c) $3\sqrt{5}, \sqrt{5}$
(d) None of these

5. Find upto 3 significant figures, the value of x for which $12^x = 4$
(a) 0.543
(b) 0.557
(c) 0.612
(d) 0.489

6. Solve for x, where $5^{2x} - 12(5^x) + 35 = 0$.
(a) 0.9
(b) 1.2
(c) 1.6
(d) 1.3

7. Given that $0<x<4$, such that $\log_5(4-x) - 2\log_5 x = 1$, then find the value of x.
(a) 0.7
(b) 0.8
(c) 0.9
(d) 1.2

8. Solve for x such that $\log_2 32 + \log_2 16 = (\log_2 x)^2$
(a) 2
(b) 4
(c) 6
(d) 8

9. Find the value of y such that $\log_2 y = -3$.
(a) 0.12
(b) 1.33
(c) 0.25
(d) 0.56

10. Find the value of x such that $\log_x 64 = 2$.
(a) 8
(b) -8
(c) -8 or 8
(d) None of these

11. Find the value of x such that $7^{2x} - 4(7^x) + 3 = 0$
(a) 0.56
(b) 1.23
(c) 0.24
(d) 0.63

12. Find the value of x when $\log_3(x-2) = -1$.
(a) 7/3
(b) 1/2
(c) 2/3
(d) 3

13. Find upto 3 significant figures, the value of x for which $5^x = 10$.
(a) 0.34
(b) 1.43
(c) 2.23
(d) 1.66

14. Find integer value of x such that $\log_3(28x-9) - 2\log_3 x = 1$.
(a) 0
(b) 3
(c) 9
(d) 6

15. If $y = 3x^2$ then find the value of $2\log_3 x - \log_3 y$.
(a) 0
(b) 1
(c) 2
(d) -1

16.Find the value of x such that $2\log_3 x - \log_3(x-2) = 2$.
(a) 0
(b) 3
(c) 6
(d) 3 and 6

17. Given that $x^2 - 34x + 225 = 0$, then find the value of $2\log_2(x+15) - \log_2 x$.
(a) 0
(b) 1
(c) 2
(d) 6

18. Find the number of digits in the decimal expresion of 2^{200}.
(a) 31
(b) 32
(c) 60
(d) 61

19. Simplify $1/\log_x xyz + 1/\log_y yxz + 1/\log_z zyx$.

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

20. Find the number of digits in the decimal expression of 15^{150}.
(a) 176
(b) 177
(c) 175
(d) 178

Answer key – Assignment problems

S.No	Option	S.No	Option
1	b	11	a
2	a	12	a
3	b	13	b
4	a	14	c
5	b	15	d
6	b	16	d
7	b	17	d
8	d	18	d
9	a	19	a
10	c	20	b

CLOCKS AND CALENDAR

Clocks

Minute Spaces

The face or dial of clock is a circle whose circumference is divided into 60 equal parts, named minute spaces.

Hour hand and minute hand

- A clock has two hands. The smaller hand is called the hour hand or short hand and the larger one is called minute hand or long hand.
- In 60 minutes, minute hand gains 55 minute spaces over the hour hand.
- (In 60 minutes, hour hand will move 5 minute spaces while the minute hand will move 60 minute spaces. In effect the space gain of minute hand with respect to hour hand will be 60 - 5 = 55 minutes.)
- Both the hands of a clock coincide once in every hour.
- The hands of a clock are in the same straight line when they are coincident or opposite to each other.
- When the two hands of a clock are at right angles, they are 15 minute spaces apart.
- When the hands of a clock are in opposite directions, they are 30 minute spaces apart.
- Angle traced by hour hand in 12 hrs = 360°
- Angle traced by minute hand in 60 min. = 360°.
- If a watch or a clock indicates 9.15, when the correct time is 9, it is said to be 15 minutes too fast.
- If a watch or a clock indicates 8.45, when the correct time is 9, it is said to be 15 minutes too slow.
- The hands of a clock will be in straight line but opposite in direction, 22 times in a day.
- The hands of a clock coincide 22 times in a day.
- The hands of a clock are at right angles 44 times in a day.
- The two hands of a clock will be together between H and (H+1) o' clock at (60H/11) minutes past H o' clock.
- Angle between hands of a clock

  When the minute hand is behind the hour hand, the angle between the two hands at M minutes past H 'o clock $=30(H-M/5)+M/2$ degree

  When the minute hand is ahead of the hour hand, the angle between the two hands at M minutes past H 'o clock $=30(M/5-H)-M/2$ degree
- The two hands of the clock will be at right angles between H and (H+1) o' clock at $(5H\pm15)12/11$ minutes past H 'o clock
- If the minute hand of a clock overtakes the hour hand at intervals of M minutes of correct time, the clock gains or loses in a

day by
$(720/11-M)(60\times24/M)$ mins

Calendar

A calendar is a specific measure of time. The smallest unit of calendar is a day. A day is an average time in which the earth completes one round on its axis. The time in which the earth travels around the sun is known a solar year.

(i) A solar year has 365 days 5 hours 48 minutes and 48 seconds. An ordinary year has 365 days. In order to remove this difference, every fourth year has 366 days and every fourth century is a leap year but no other century is a leap year.

(ii) The number of days more than the complete number of weeks in a given period is the number of odd days for that period.

(iii) In an ordinary year there are 52 weeks and one odd day.

- In a leap year there are 52 weeks and two odd days.
- 100 years contain 5 odd days.
- 200 years contain 3 odd days.
- 300 years contain 1 odd day.
- 400 years contain 0 odd days.

According to this.: Sunday for 0 odd days: Monday for 1 odd day; Tuesday for 2 odd days, and so on

CLASSWORK PROBLEMS

1.January 1st 2007 was Monday. What day of the week lies on January 1st 2008?
a) Monday
b) Tuesday
c) Wednesday
d) Sunday

2. January 1st 2008 is Tuesday. What day of the week lies on January 1st 2009?
a) Monday
b) Wednesday
c) Thursday
d) Sunday

3. On 8th December 2007 Saturday falls. What day of the week was it on 8th December 2006?
a) Sunday
b) Thursday
c) Tuesday
d) Friday

4. On 6th march 2005, Monday falls. What was the day of the week on 6th march, 2004?
a) Sunday
b) Saturday
c) Tuesday
d) Wednesday

5. The calendar for the year 2007 will be the same for the year?
a) 2014
b) 2016
c) 2017
d) 2018

6. On what dates of April, 2001 did Wednesday fall?
a) 1st, 8th, 15th, 22nd , 29th
b) 2nd, 9th, 16th, 23rd, 30th
c) 3rd, 10th, 17th , 24th
d) 4th , 11th ,18th , 25th

7. What was the day of the week on 17th june, 1998?
a) Monday
b)Tuesday
c) Wednesday
d) Thursday

8. What was the day of the week 28th may, 2006?
a) Thursday
b) Friday
c) Saturday
d) Sunday

9. What will be the day of the week on 15th August 2010?
a) Sunday
b) Monday

c) Tuesday
d) Friday

10. Today is Monday. After 61 days, it will be?
a) Wednesday
b) Saturday
c) Tuesday
d) Thursday

11. The last day of the century cannot be?
a) Monday
b) Wednesday
c) Tuesday
d) Friday

12. Which of the following is not leap year?
a) 700
b) 800
c) 1200
d) 2000

13. How many days are there in x weeks x days?
a) 7x2
b) 8x
c) 14x
d) 7

14. It is Sunday on January 1st 2006. Find the day of the week on January 1st 2010?
a) Sunday
b) Saturday
c) Friday
d) Wednesday

15. On 8th February 2005 it is Tuesday. What was the day of the week on 8th February 2004?
a) Tuesday
b) Monday
c) Sunday
d) Wednesday

16. If 11th August 1985was a Sunday, which day of the week was 13th august 1986?
a) Tuesday
b) Wednesday
c) Thursday
d) Friday

17. If 1st January 2012 is a Sunday, then which day of the week will the new year be celebrated in 2016?
a) Friday
b) Sunday
c) Wednesday
d) Saturday

18. On which dates of October 1994 did Monday fall?
a) 4, 11, 18, 25
b) 2, 9, 16, 23
c) 1, 8, 15, 22
d) 3, 10, 17, 24, 31

19. Which year will have same calendar as 2002?
a) 2008
b) 2011
c) 2009
d) 2013

20. Which year will have same calendar as 1984?
a) 2020
b) 2008
c) 2012
d) 2004

21. A clock is set right at 5 a.m. The clock loses 16 minutes in 24 hours. What will be the true time when the clock indicates 10 p.m. on 4th day?(in pm)
(a) 8
(b) 9
(c) 10
(d) 11

22. A watch which gains uniformly is 2 minutes low at noon on Monday and is 4 min. 48 sec fast at 2 p.m. on the following Monday. When was it correct?
(a) 2 p.m. on Monday
(b) 2 p.m. on Tuesday
(c) 2 p.m. on Wednesday
(d) 3 p.m. on Thursday

23. At what time between 5.30 and 6 will the hands of a clock be at right angles?
(a) 40 min. past 5
(b) 42 min. past 5
(c) 43 4/11 min past 5
(d) 43 7/11 min. past 5

24. At what time between 4 and 5 o'clock will the hands of a watch point in opposite directions?
(a) 54 6/11 min. past 4

(b) 50 min. past 4
(c) 45 min past 4
(d) 40 min past 4

25. At what time between 9 and 10 o'clock will the hands of a watch be together?
(a) 49 1/11 min. past 9
(b) 40 min. past 9
(c) 45 min. past 9
(d) 50 min. past 9

26. How many times in a day, are the hands of a clock in straight line but opposite in direction?
(a) 22
(b) 23
(c) 24
(d) 21

27. How many times are the hands of a clock at right angle in a day?
(a) 22
(b) 44
(c) 48
(d) 24

28. What will be the angle between the hands of the clock when clock shows 7:20?
(a) 120
(c) 90
(c) 110
(d) 100

29. What will be the time when angle between the hands of the clock is 105 during 2 to 3?
(a) 2:40 pm
(b) 2:20 pm
(c) 2:30 pm
(d) Cannot be determined

30.What will be the angle between the hands of the clock when the clock shows 6:30?
(a) 0
(b) 15
(c) 05
(d) 12

31. How many times will the hands of the clock be at right angle between 9 and 12?
(a) 3
(b) 6
(c) 5
(d) 4

32. An accurate clock shows 8 o'clock in the morning. Through how many degrees will the hour hand rotate when the clock shows 2 o'clock in the afternoon?
(a) 60
(b) 90
(c) 180
(d) 120

33. At what time between 3 and 4 o'clock will the minute hand and the hour hand are on the same straight line but facing opposite directions?
(a) 3:49:05
(b) 3:39:05
(c) 3:44:05
(d) 3:34:05

34. By how many degrees does the minute hand move in the same time, in which the hour hand move by 280 ?
(a) 165
(b) 336
(c) 110
(d) 120

35. How many degrees will the minute hand move, in the same time in which the second hand move 4800 ?
(a) 60
(b) 90
(c) 40
(d) 80

36.How many times do the hands of the clock coincide in a day?
(a) 24
(b) 22
(c) 20
(d) 18

37.If the hands of the clock coincide in 65 minutes, how much time does the clock gain or lose in a day?
(a) 10 mins gain
(b) 10 mins loss
(c) 10 10/143 mins gain
(d) 10 10/123 mins loss

38. What will be the angle betweent the hands of the clock, when the time is 3:30?
(a) 65
(b) 76
(c) 35
(d) 60

39.A clock which is set right at 12 noon gains 3 secs for every 2 mins, what will be the correct time when the clock shows 10:15 pm?
(a) 10:18 pm
(b) 10:06 pm
(c) 10:00 pm
(d) 10:05 pm

40.Three clocks in a room are set right at 12 midnight, first clock gains 2 mins for every hour and third clock loses 3 mins for every hour, where as the second runs correctly. After how many hours all the three shows the correct time?
(a) 480 hours
(b) 720 hours
(c) 1440 hours
(d) 360 hours

ASSIGNMENT PROBLEMS

1. What will be next leap year after 2096?
a) 2100
b) 2101
c) 2104
d) 2108

2. 1st Republic day was celebrated on 26th January 1950. It was a ___
a) Thursday
b) Friday
c) Monday
d) Tuesday

3. If 14th November 2006 is a Sunday, then 14th November 2706 is a __
(a) Sunday
(b) Monday
(c) Tuesday
(d) Friday

4. In a year, if 23rd November is a Friday then 14th march in the year is on which day of the week
a) Monday
b) Wednesday
c) Sunday
d) Cannot be determined

5. Which day of the week is 21st April 2006?
a) Tuesday
b) Wednesday
c) Thursday
d) Friday

6.It was Sunday on Jan 1, 2002. What was the day of the week Jan 1, 2011?
(a) Friday
(b) Saturday
(c) Thursday
(d) Wednesday

7.What was the day of the week on 17th june 1898?
(a) Friday
(b) Tuesday
(c) Wednesday
(d) Thursday

8.If today is Sunday, after 67 days it will be,
(a) Monday
(b) Tuesday
(c) Wednesday
(d) Thursday

9.On what dates of June, 2008 did Wednesday fall?
(a) 1st,8th,15th,22nd,29th
(b) 2nd,9th,16th,23rd,30th
(c) 3rd,10th,17th,24th
(d) 4th,11th,18th,25th

10.Which of the following year will have the same calendar year as 1995?
(a) 2001
(b) 1989
(c) 1992
(d) 2002

11.What will be the angle between the hands of the clock when the time is 5:40?
(a) 70
(b) 60
(c) 55
(d) 80

12.What will be the time between 6 and 7, when the angle is 70 degree?
(a) 6:20
(b) 6:45
(c) 6:20
(d) 7:00

13.How many times do the hands of the clock make an angle 120 degree between 5 and 7?
(a) 4
(b) 6
(c) 2
(d) None of these

14.How many times do the hands of the clock make an angle 110 degree in a day?
(a) 22
(b) 24
(c) 44
(d) 48

15.Find the angle between the hands of the clock when the clock shows 4:30?
(a) 45
(b) 35
(c) 60
(d) 55

16.A clock is set right at 9 am which gains uniformly 30 secs for every 30 mins, what will be the time in the clock when the actual time is 11:20 am?
(a) 11:24:30
(b) 11:22:40
(c) 11:22:20
(d) 11:22:30

17.Hands of a clock coincide for every 66 mins, find the actual loss of the clock in a day?
(a) 11 101/143 mins
(b) 11 109/121 mins
(c) 11 101/121 mins
(d) 11 109/143 mins

18.Two clocks are set right at 12 noon, first gains 2 mins for half an hour, second loses 3 mins for every 1 hour. When will the two clocks show the same time?
(a) 10:30
(b) 12:00
(c) 09:40
(d) 02:30

19. How many slag times are there for the angle 45 degree?
(a) 1
(b) 2
(c) 3
(d) 4

20. What is the slag time for the angle 60 degree?
(a) 2:00
(b) 6:00
(c) 10:00
(d) Both (a) and (c)

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	C	11	A
2	A	12	A
3	C	13	A
4	A	14	C
5	D	15	A
6	C	16	B
7	A	17	B
8	D	18	B
9	D	19	D
10	B	20	D

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)**

$$ {}^{n}P_{r} = \frac{n!}{(n-r)!} $$

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** kind, and where **repetition** is **not allowed**, is

$$= n!/p!\,q!\,r!\ldots$$
$$(\text{where, } p+q+r\ldots <= n)$$

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 just **n!** **(0 < r < n)**

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

Miscellaneous

Number of ways **4 different** letters can be posted in **7 different** letter boxes = 4^7

Number of ways **n identical** things can be **arranged** among **r different** places = r^n

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}

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)**

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

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 +... (r variables) = n) = ${}^{n+r-1}C_{r-1}$

Number of combinations or distributions of **n identical** objects among **r different** places such that each place gets atleast 1 is ${}^{n-1}C_{r-1}$

Also the **natural number solutions** of equation, (x + y + z +... (r variables) = n) = ${}^{n-1}C_{r-1}$

Number of selections out of **n distinct** objects

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

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

Number of ways in which a selection can be made by taking **some** or **all** out of **p + q + r +...** things where p are alike of one kind, q alike of second, r

alike of third and so on is $(p+1)(q+1)(r+1)\ldots - 1$

Number of **zero or more selections** out of **n same** objects

$$= 1 + 1 + 1 + \ldots + 1 = \mathbf{n + 1}$$

Number of **one or more selections** out of **n same** objects

$$= 1 + 1 + 1 + \ldots + 1 = \mathbf{n}$$

Number of **lines** in a **plane** formed by **n points** (where no three points are collinear) $= {}^{n}C_2$

Number of **diagonals** in a **regular polygon** $= {}^{n}C_2 - n$

Number of **triangles** formed in a **plane** using **n points** (where no three points are collinear) $= {}^{n}C_3$

Formulae related to Combination

a) $nC0 = 1 = nCn$

b) $nC1 = n = nCn\text{-}1$

c) $nCn\text{-}r = nCr$

d) $nCa = nCb \Rightarrow a + b = n$

e) $nCr + nCr\text{-}1 = n+1Cr$

f) $nC0 + nC1 + nC2 + \ldots + nCn\text{-}1 + nCn = 2^n$

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**

$$= \mathbf{n!/[(n/r)!]^r}$$

Number of ways in which **n** things can be divided into groups of **p, q, r**... things

$$= \mathbf{n!/\ p!\ q!\ r!\ldots\ (n = p + q + r\ldots)}$$

Number of ways in which **n** distinct objects can be distributed **equally** among **r groups**

$= \mathbf{n!/\ [(n/r)!]^r}$ (if groups are **distinct**)

$= \mathbf{n!/\ r!\ [(n/r)!]^r}$ (if groups are **not distinct**)

GRID

Number of **Squares** in a **square grid** of **n** $\times$ **n side** $= \mathbf{1^2 + 2^2 + 3^2 + 4^2 + \ldots + n^2}$

Number of **Rectangles (including Squares)** in a **square grid of n** $\times$ **n side**

$$= \mathbf{1^3 + 2^3 + 3^3 + 4^3 + \ldots + n^3}$$

Number of **Squares** in a grid having **m rows** and **n columns**

$$= \mathbf{m \times n + (m\text{-}1) \times (n\text{-}1) + (m\text{-}2) \times (n\text{-}2) + \ldots}$$

(until one of them gets zero)

Number of **Rectangles (including Squares)** in a grid having **m rows** and **n columns**

$$= \mathbf{(1 + 2 + \ldots + m) \times (1 + 2 + \ldots + n)}$$

CLASSWORK 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

Q(8 –9) There are 6 players in a cricket which is to be sent to Australian tour. The total number of
members is 12.
If 2 particular member is always included
a) 210
b) 270
c) 310
d) 420

If 3 particular player is always excluded
a) 76
b) 82
c) 84
d) 88

10.In a group of 6 boys and 5 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) 360

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) 720
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 number of green marbles in the box?
A. 10
B. 15
C. 14
D. 18

22.In how many ways can 3 prizes be given away to 12 students when each student is eligible for all the prizes ?
A.1234
B.1728
C.5314
D.1331

23.Total no of ways in which 30 sweets can be distributed among 6 persons ?

A.35 C 5
B.36 C 5
C.36 C 6
D.35!/5!

24.A bag contains 4 red balls and 5 black balls. In how many ways can i make a selection so as to take atleast 1 red ball and 1 black ball ?
A.564
B.345
C.465
D.240

25.In how many ways can 7 beads be strung into necklace ?
A.2520
B.5040
C.720
D.360

26.Find the no of 3 digit numbers such that atleast one of the digit is 6 (with repetitions) ?
A.252
B.345
C.648
D.560

27.In how many ways can 7 girls and 4 boys stand in a row so that no 2 boys are together ?
A.8467200
B.9062700
C.7407000
D.8407200

28.In how many ways the letters of the word PERMUTATION be arranged ?
A.10!/2!
B.10!
C.11!
D.11!/2!

29.How many numbers can be formed with the digits 1, 7, 2, 5 without repetition ?
A.89
B.56
C.64
D.72

30.There are 3 boxes and 6 balls. In how many ways these balls can be distributed if all the balls and all the boxes are different?
A.243
B.512
C.729
D.416

31.In how many ways can 4 books be selected out of 10 books on different subjects ?
A.210
B.320
C.716
D.5040

32.In how many ways can 5 boys and 4 girls can be seated in a row so that they are in alternate position.
a) 2780
b) 2880
c) 2800
d) 2980

33.In how many ways 5 African and five Indian can be seated along a circular table, so that they occupy alternate position.
a) 5! 5!
b) 4! 5!
c) 5! 4!
d) 4! 4!

34.There is meeting of 20 delegates is to be held in a hotel. In how many ways these delegates can be seated along a round table, if three particular delegates always seat together.
a) 17! 3!
b) 18! 3!
c) 17! 4!
d) can't be determined

35.In how many 8 prizes can be given to 3 boys, if all boys are equally eligible of

getting the prize.
a) 512
b) 343
c) 256
d) 526

36.There are 15 points in a plane out of which 6 are collinear. Find the number of lines that can be formed from 15 points.
a) 105
b) 90
c) 91
d) 95

37.In party there is a total of 120 handshakes. If all the persons shakes hand with every other person. Then find the number of person present in the party.
a) 15
b) 16
c) 17
d) 18

38.There are 8 boys and 12 girls in a class. 5 students have to be chosen for an educational trip. Find the number of ways in which this can be done if 2 particular girls are always included
a) 812
b) 816
c) 818
d) 820

39.In how many different ways the letters of the world INSIDE be arranged in such a way that all vowels always come together
a) 64
b) 72
c) 84
d) 96

40.How many 3 digit number can be formed by 0, 2, 5, 3, 7 which is divisible by 5 and none of the digit is repeated.
a) 24
b) 36
c) 48
d) 60

ASSIGNMENT PROBLEMS

1.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

2. How many 6 digit telephone numbers can be formed if each number starts with 35 and no digit appears more than once?
(a) 720
(a)360
(c) 1420
(d)1680

3. An event manager has ten patterns of chairs and eight patterns of tables. In how many ways can he make a pair of table and chair?
(a)100
(b) 80
(c) 110
(d) 64

4. In how many different ways can the letters of the word 'CORPORATION' be arranged so that the vowels always come together?
(a) 47200
(b)48000
(c) 42000
(d)50400

5. When the letters of the word BANANA are arranged in dictionary order, what will be the rank of the word BANANA?
(a) 35
(b) 36
(c) 34
(d) 42

6. 4. How many numbers are there between 100 and 1000 such that at least one of their digits is 6?
(a) 648
(b) 258
(c) 654
(d) 252

7. How many numbers not exceeding 10000 can be made using the digits 2,4,5,6,8 if repetition of digits is allowed?
(a) 9999
(b) 820
(c) 780
(d) 740

8. 25 buses are running between two places P and Q. In how many ways can a person go from P to Q and return by a different bus?
(a) 50
(b)600
(c) 576
(d) 625

9. In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?
(a) 159
(b) 209
(c) 201
(d) 212

10. 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)3600
(c)2400
(d) None of these

11. What is the sum of all 4 digit numbers formed using the digits 2, 3,4 and 5 without repetition?
(a) 93324
(b)92314
(c)93024
(d)91242

12. In a birthday party, every person shakes hand with every other person. If there was a total of 28 handshakes in the party, how many persons were present in the party?
(a)9
(b) 8
(c) 7
(d) 6

13. In how many different ways can 5 girls and 5 boys form a circle such that the boys and the girls alternate?
(a) 2880
(b)1400
(c)1200
(d) 3212

14. Find out the number of ways in which 6 rings of different types can be worn in 3 fingers?
(a) 120
(b) 216
(c)125
(d)729

15. If there are 9 horizontal lines and 9 vertical lines in a chess board, how many rectangles can be formed in the chess board?
(a) 920
(b) 1024
(c) 64
(d) 1296

16. How many five digit positive integers that are divisible by 3 can be formed using the digits 0, 1, 2, 3, 4 and 5, without any of the digits getting repeating
(a) 15
(b) 96
(c) 216
(d) 120

17. If the letters of the word CHASM are rearranged to form 5 letter words such that none of the word repeat and the results arranged in ascending order as in a dictionary what is the rank of the word CHASM?
(a) 24
(b) 31
(c) 32
(d) 30

18. How many four letter distinct initials can be formed using the alphabets of English language such that the last of the four words is always a consonant?
(a) (26^3)*(21)
(b) 26*25*24*21
(c)25*24*23*21
(d) None of these.

19. There are 12 yes or no questions. How many ways can these be answered?
(a) 1024
(b) 2048
(c) 4096
(d) 144

20. A person writes letters to six friends and addresses the corresponding envelopes. In how many ways can the letters be placed in the envelopes so that at least two of them are in wrong envelopes?
(a) 119
(b) 120
(c) 720
(d) 719

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	B	11	A
2	D	12	B
3	B	13	A
4	D	14	D
5	A	15	D
6	D	16	C
7	C	17	C
8	B	18	A
9	B	19	C
10	D	20	D

PROBABILITY

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

Probability is quantitative measure of the chance of occurrence of a particular event.

If all the possible outcomes of an experiment are known but the exact output cannot be predicted in advance, that experiment is called a random experiment.

Examples

Tossing of a fair coin

When we toss a coin, the outcome will be either Head (H) or Tail (T)

Throwing an unbiased die

Die is a small cube used in games. It has six faces and each of the six faces shows a different number of dots from 1 to 6. Plural of die is dice.

When a die is thrown or rolled, the outcome is the number that appears on its upper face and it is a random integer from one to six, each value being equally likely.

Drawing a card from a pack of shuffled cards

A pack or deck of playing cards has 52 cards which are divided into four categories as given below

Spades (♠)

Clubs (♣)

Hearts (♥)

Diamonds (♦)

Each of the above mentioned categories has 13 cards, 9 cards numbered from 2 to 10, an Ace, a King, a Queen and a jack

Hearts and Diamonds are red faced cards whereas Spades and Clubs are black faced cards.

Kings, Queens and Jacks are called face cards

Taking a ball randomly from a bag containing balls of different colours

Sample Space

Sample Space is the set of all possible outcomes of an experiment. It is denoted by S.

Examples

When a coin is tossed, S = {H, T} where H = Head and T = Tail

When a dice is thrown, S = {1, 2 , 3, 4, 5, 6}

When two coins are tossed, S = {HH, HT, TH, TT} where H = Head and T = Tail

Events are said to be equally likely if there is no preference for a particular event over the other.

Examples

When a coin is tossed, Head (H) or Tail is equally likely to occur.

When a dice is thrown, all the six faces (1, 2, 3, 4, 5, 6) are equally likely to occur.

Two or more than two events are said to be mutually exclusive if the occurrence of one of the events excludes the occurrence of the other

This can be better illustrated with the following examples

When a coin is tossed, we get either Head or Tail. Head and Tail cannot come simultaneously. Hence occurrence of Head and Tail are mutually exclusive events.

When a die is rolled, we get 1 or 2 or 3 or 4 or 5 or 6. All these faces cannot come simultaneously. Hence occurrences of particular faces when rolling a die are mutually exclusive events.

Note : If A and B are mutually exclusive events, $A \cap\cap B = \phi\phi$ 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

$A \cup B$ is the event that either A or B or Both occur. (i.e., at least one of A or B occurs)

$A \cap B$ is the event that both A and B occur

Let E be an event and S be the sample space. Then probability of the event E can be defined as

$P(E) = n(E)/n(S)$

where P(E) = Probability of the event E, n(E) = number of ways in which the event can occur and n(S) = Total number of outcomes possible

$P(S) = 1$

$0 \leq P(E) \leq 1$

$P(\phi) = 0$

Addition theorem

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

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

If A and B are mutually exclusive events, then $P(A \cup B) = P(A) + P(B)$ because for mutually exclusive events, $P(A \cap B) = 0$

If A and B are two independents events, then $P(A \cap B) = P(A).P(B)$

Let A be any event and $\bar{A}$ be its complementary event (i.e., $\bar{A}$ is the event that A does not occur). Then $P(\bar{A}) = 1 - P(A)$

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

$P(E) = x/x+y$

$P(\bar{E}) = y/x+y$

CLASSWORK 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 colours alternatively.
a) 56/429
b) 57/429
c) 61/429
d) 68/429

Direction(Q6 – Q8):
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 thatBoth the balls are green
a) 13/49
b) 15/49
c) 16/49
d) 17/49

7.First one is green and second one is red
a) 16/49
b) 14/49
c) 11/49
d) 12/49

8.Both the balls are red
a) 14/49
b) 9/49
c) 11/49
d) 12/49

9.Find the probability that in a leap year, the numbers of Mondays are 53?
a) 1/7

b) 2/7
c) 3/7
d) 4/7

10.A urn contains 4 red balls, 5 green balls and 6 white balls, if one ball is drawn at random, find the probability that it is neither red nor white.
a) 1/3
b) 1/4
c) 1/5
d) 2/3

11.A six-digit is to be formed from the given numbers 1, 2, 3, 4, 5 and 6. Find the probability that the number is divisible by 4.
a) 3/17
b) 4/15
c) 4/19
d) 4/17

12.A bag contains 6 red balls and 7 white balls. Another bag contains 5 red balls and 3 white balls.One ball is selected from each. Find the probability that one ball is red and one is white?
a) 53/104
b) 47/104
c) 63/104
d) 51/104

13.A lottery is organised 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 choosen.
a) 1/7
b) 2/7
c) 3/7
d) 4/7

14.A card is drawn from a pack of 52 cards. The card is drawn at random; find the probability that it is neither club nor queen?
a) 4/13
b) 5/13
c) 7/13
d) 9/13

15.A box contains 50 balls, numbered from 1 to 50. If three balls are drawn at random with replacement. What is the probability that sum of the numbers are odd?
a) 1/2
b) 1/3
c) 2/7
d) 1/5

16.From a pack of cards, if three cards are drawn at random one after the other with replacement, 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 that either 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 that at 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 up random, 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 is the probability that two are red and one is 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 is the 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 is the 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 of different colours?
a) 7/99
b) 11/99
c) 14/99
d) 19/99

31.P and Q are sitting in a ring with 11 other persons. If the arrangement of 11 persons is at
random, then the probability that there are exactly 4 persons between them?
a) 1/3
b) 1/4
c) 1/5
d) 1/6

32.10 persons are seated around a round table. What is the probability that 4 particular persons are always seated together?
a) 1/21

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

33.A box contains 4 red, 5 black and 6 green balls. 3 balls are drawn at random. What is the
probability that all the balls are of same colour?
a) 33/455
b) 34/455
c) 44/455
d) 47/455

34.An apartment has 8 floors. An elevator starts with 4 passengers and stops at 8 floors of the apartment. What is the probability that all passengers travels to different floors?
a) 109/256
b) 135/256
c) 105/256
d) 95/256

35.A speak truth in 60% cases and B in 80% cases. In what percent of cases they likely to
contradict each other narrating the same incident?
a) 9/25
b) 7/25
c) 11/25
d) 13/25

36.A box contains 30 electric bulbs, out of which 8 are defective. Four bulbs are chosen at random from this box. Find the probability that at least one of them is defective?
a) 432/783
b) 574/783
c) 209/784
d) 334/784

37.Two person A and B appear in an interview. The probability of A's selection is 1/5 and the probability of B'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

38.A 4- digit number is formed by the digits 0, 1, 2, 5 and 8 without repetition. Find the probability that the number is divisible by 5.
a) 1/5
b) 2/5
c) 3/5
d) 4/5

39.A bag contains 6 red balls and 8 green balls. 2 balls are drawn at random one by one with replacement. Find the probability that both the balls are green
a) 16/49
b) 25/49
c) 12/49
d) 21/49

40.A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn and are found to be both hearts. Find the Probability of the lost card being a heart?
A. 12/50
B. 8/50
C. 11/50
D. 9/50

ASSIGNMENT PROBLEMS

1.There are three boxes each containing 3 Pink and 5 Yellow balls and also there are 2 boxes each containing 4 Pink and 2 Yellow balls. A Yellow ball is selected at random. Find the probability that
Yellow ball is from a box of the first group?
A. 42/61
B. 45/61
C. 51/61
D. 52/61

2.A fruit basket contains 10 Guavas and 20 Bananas out of which 3 Guavas and 5 Bananas are defective. If two fruits selected at random, what is the probability that either both are Bananas or both are non-defective?
A. 315/435
B. 313/435
C. 317/435
D. 316/435

3.A committee of five persons is to be chosen from a group of 10 people. The probability that a certain married couple will either serve together or not at all is?
A. 54/199
B. 52/195

C. 53/186
D. 51/126

4.Out of 14 applicants for a job, there are 6 women and 8 men. It is desired to select 2 persons for the job. The probabilty that atleast one of selected persons will be a Woman is?
A. 77/91
B. 54/91
C. 45/91
D. 40/91

5.Three Bananas and three oranges are kept in a box. If two fruits are chosen at random, Find the probability that one is Banana and another one is orange?
A. 1/5
B. 3/5
C. 4/5
D. 2/5

6.A basket contains 6 White 4 Black 2 Pink and 3 Green balls. If three balls picked up random, What is the probability that all three are White?
A. 4/91
B. 5/93
C. 7/97
D. 8/92

7.A basket contains 6 White 4 Black 2 Pink and 3 Green balls. If three balls are picked at random, what is the probability that two are Black and one is Green?
A. 22/355
B. 15/381
C. 10/393
D. 18/455

8.A basket contains 6 White 4 Black 2 Pink and 3 Green balls. If four balls are picked at random, what is the probability that atleast one is Black?
A. 69/91
B. 80/91
C. 21/91
D. 55/91

9.A basket contains 6 White 4 Black 2 Pink and 3 Green balls.If two balls are picked at random, what is the probability that either both are Pink or both are Green?
A. 2/105
B. 4/105
C. 8/137
D. 5/137

10. The probability that A can solve the problem is 2/3 and B can solve the problem is ¾.if both of them attempt the problem, then what is the probability that the problem gets solved.
(a) 1/2
(b) 17/12
(c) 1/4
(d) 11/12

11. Two dice are tossed. The probability that the total score is a prime number is:
(a) 1 / 6
(b) 5 / 12
(c) 1 / 2
(d) 7 / 9

12. A drawer contains 50 bolts and 150 nuts. Half of the bolts and half of the nuts are rusted. If one of the items is chosen at random, the probability that it is rusted or a bolt is
(a) 5/8
(b) ½
(c) 3/8
(d) 1/8

13. A card is chosen from a well shuffled pack of 52 cards. What is the probability that the card chosen is a spade number?
(a) ¼
(b) 2/13
(c)5/26
(d) 1/26

14. Two cards are drawn from a pack of cards in succession (with replacement). Find the probability that both are king.
(a)1/144
(b)1/169
(c)1/171
(d)1/2

15. The probability of a student possessing a Hi-Tech point pen is 3/5 and that of possessing a ball point pen is 2/3. Find the probability that a student can have at least one type of pen.
(a) 3/5
(b) 2/5
(c) 13/15
(d) 1/15

16. When 3 coins are tossed together what is the probability of getting exactly 2 tails?

(a) 3/8
(b) 8/9
(c) 2/3
(d) None of these

17. If A speaks the truth 80 % of the times and B speaks the truth 60 % of the times. What is the probability that both speak the truth at the same time?
(a) 0.8
(b) 0.48
(c) 0.6
(d) 0.14

18. The probability that a computer company will get a computer hardware contract is 2/3, and the probability that it will not get a software contract is 5/9. If the probability of getting at least one contract is 4/5, what is the probability that it will get both the contracts?
(a) 21 / 45
(b) 8 / 27
(c) 14 / 45
(d) 32 / 135

19. Tickets numbered from 1 to 20 are mixed up together and then a ticket is drawn at random. The probability that the ticket has a number which is a multiple of 3 or 7 is
(a) 1/5
(b) 2/5
(c) 3/5
(d) 4/5

20. A man and his wife appear in an interview for two vacancies in the same post. The probability of husband's selection is (1 / 7) and the probability of wife's selection is (1 / 5). What is the probability that only one of them is selected?
(a) 4 / 5
(b) 2 / 7
(c) 8 /15
(d) 4 / 7

Answer Key – Assingment Problems

Q.No	Option	Q.No	Option
1	B	11	B
2	D	12	A
3	D	13	B
4	A	14	B
5	B	15	C
6	A	16	A
7	D	17	B
8	A	18	C
9	B	19	B
10	D	20	B

TIME AND WORK

Same Efficiency Problems.

If M1 persons can do W1 work in D1 days and M2 persons can do W2 works in D2 days then we can say

$$M1 \times D1 \times W2 = M2 \times D2 \times W1$$

If the persons work T1 and T2 hours per day respectively then the equation gets modified to
$M1 \times D1 \times T1 \times W2 = M2 \times D2 \times T2 \times W1$

If the persons has efficiency of E1 and E2 respectively then,
$M1 \times D1 \times T1 \times E1 \times W2 = M2 \times D2 \times T2 \times E2 \times W1$

Different Efficiency Problems:

If A can do a piece of work in n days, then the work done by A in one day = 1/n

If A can do a work in D1 days and B can do the same work in D2 days

then A and B together can do the same work in $(D1 \times D2)/(D1+D2)$ days.

If A is twice as good a workman as B, then A will take half of the time taken by B to complete a piece of work.

If A is thrice as good a workman as B, then A will take one third of the time taken by B to complete a piece of work.

If A and B together can do a piece of work in x days, B and C together can do in y days and C and A together can do in z days, then the same work can be done

By A alone in $2xyz/(xy+yz-zx)$ days.

By B alone in $2xyz/(yz+zx-xy)$ days.

By C alone in $2xyz/(zx+xy-yz)$ days.

By A, B and C together in $2xyz/(yz+zx+xy)$ days.

If A can do a piece of work in D1 days, B can do in D2 days and C can do in D3 days then they together can do the same work in $D1 \times D2 \times D3/(D1 \times D2+D2 \times D3+D1 \times D3)$ days.

If A and B together can do a piece of work in D1 days and A alone can do it in D2days, then B alone can do the work in $D1 \times D2/ D2-D1$ days.

If the number of men are changed in the ratio of m:n, then the time taken to complete the work will change in the ratio n:m

Pipes & Cisterns:

These problems are almost the same as those of Time and work problems. Thus, if a pipe fills a tank in 6 hrs, then the pipe fills 1/6th of the tank in hour. There is one difference that pipes & cisterns problems is that there are outlets as well as inlets. Thus, there are agents (the outlets) which perform negative work too. The rest of the process is almost similar.

Inlet

A pipe connected with a tank (or a cistern or a reservoir) is called an inlet, if it fills it.

Outlet

A pipe connected with a tank is called an outlet, if it empties it.

Formulae

I. If a pipe can fill a tank in x hours, then the part filled in 1 hour = 1/x

II. If a pipe can empty a tank in y hours, then the part of the full tank 1 empited in 1 hour = 1/y

III. If a pipe can fill a tank in x hours and another pipe can empty the full tank in y hours, then the net part filled in 1 hour, when both the pipes are opened = (1/x – 1/y)

time taken to fill the rank, when both the pipes are opened **= xy / x-y**

IV. If a pipe can fill a tank in x hours and another can fill the same tank in y hrs, then the net part filled in 1 hr, when both the pipes are opened =(1/x + 1/y)

time taken to fill the tank **= xy / x+y**

CLASSWORK PROBLEMS

1. A is 30% more efficient than B. How much time will they, working together, take to complete a job which A alone could have done in 23 days?
(a) 11 days
(b) 13days
(c)20 3/7 days
(d)None of these

2.A does half as much work as B in three-fourth of the time. If together they take 18 days to complete the work, how much time shall B take to do it?
(a)30 days
(b)40 days
(c)15 days
(d) None of these

3.A is 50% as efficient as B.C does half of the work done by A and B together. If C alone does the work in 40 days, then A ,B and C together can do the work in?
(a)20 days
(b)15 days
(c)30 days
(d)20 1/3 days

4. Two workers A and B working together completed a job in 5 days. If A worked twice as efficiently as he actually did and B worked 1_3 as efficiently as he actually did, the work would have been completed in 3 days. A alone could complete the work in?
(a)7 ½ days
(b)6 ¼ days
(c)5 ¼ days
(d)None of these

5.A can do a work in 15 days and B in 20 days. If they work on it together for 4 days, then the fraction of the work that is left is?
(a)8/15
(b)7/20
(c)4/15
(d)6/15

6.A can finish a work in 18 days and B can do the same work in 15 days. B worked for 10 days and left the job. In how many days, A alone can finish the remaining work?
(a)8
(b)5
(c)6
(d)7

7.A and B can complete a work in 15 days and 10 days respectively. They started doing the work together but after 2 days B had to leave and A alone completed the remaining work. The whole work was completed in?
(a)10 days
(b)15 days
(c)12 days
(d)8 days

8. A can finish a work in 24 days, B in 9 days and C in 12 days. B and C start the work but are forced to leave after 3 days. The remaining work was done by A in?
(a)6 days
(b)5 days
(c)10 days
(d)10 ½ days

9.A machine P can print one lakh books in 8 hours, machine Q can print the same number of books in 10 hours while machine R can print them in 12 hours. All the machines are started at 9

a.m. While machine P is closed at 11 am and the remaining two machines complete the work. Approximately at what time will the work be finished?
(a)11:30 am
(b)12:30 pm
(c)12 noon
(d)1 pm

10. A and B can do a piece of work in 30 days, while B and C can do the same work in 24 days and C and A in 20 days. They all work together for 10 days when B and C leave. How many days more will A take to finish the work?
(a)18 days
(b)36 days
(c)24 days
(d)30 days

11.X and Y can do a piece of work in 20 days and 12 days respectively. X started the work alone and then after 4 days .Y joined him till the completion of the work. How long did the work last?
(a)6 days
(b)10 days
(c)15 days
(d)20 days

12.A and B can together finish work in 30 days .They worked together for 20 days and then B left. After another 20 days, A finished the remaining work .In how many days A alone can finish the job?
(a)40
(b)50
(c)54
(d)60

13.X can do a piece of work in 40 days. He works at it for 8 days and then Y finished it in 16 days. How long will they together take to complete the work?
(a)13 1/3 days
(b)16 days
(c)25days
(d)50 days

14.A, B,C together can complete a piece of work in 10 days. All the three started working at it together and after 4 days A left. Then B and C together completed the work in 10 more days .A alone could complete the work in?
(a)15 days
(b)16 days
(c)25 days
(d)50 days

15.A does 4/5 of a work in 20 days. He then calls in B and they together finish the remaining work in 3 days How long B alone would take to do the whole work?
(a)23 days
(b)37 days
(c)37 ½ days
(d)40 days

16.A and B together can do a piece of work in 30 days. A having worked for16 days. B finished the remaining work alone in 44 days. In how many days shall B finish the whole work alone?
(a)30 days
(b)40 days
(c)60 days
(d)70 days

17.A and B together can do a piece of work in 12 days, which B and C together can do in 16 days. After A has been working at it for 5 days and B for 7 days, C finishes it in 13 days. In how many days C alone will do the work?
(a)46
(b)24
(c)16
(d)36

18.A and B can do a piece of work in 45 days and 40 days respectively. They began to the work together but A leaves after some days and then B completed the remaining work in 23 days. The number of days which A left the work was?
(a)8
(b)6
(c)9
(d)12

19.A can do a piece of work in 14 days which B can do in 21 days. They begin together but 3 days before the completion of the work, A leave off The total number of days to complete the work is?
(a)6 3/5
(b)8 1/2

(c)10 1/5
(d)13 1/2

20.A can do a piece of work in 14 days which B can do in 21 days. They begin together but 3 days before the completion of the work, A leave off The total number of days to complete the work is?
(a)9.2 days
(b)10.2 days
(c)11 days
(d)8 days

21.A, B and C together earn Rs.300 per day, while A and C together earn Rs.188 and B and C together earn Rs.152.The daily earning of C is?
(a)Rs.40
(b)Rs.112
(c)Rs.68
(d)Rs.150

22.A,B and C are employed to do a piece of work for Rs.529.A and B together are supposed to do 19/23 of the work and B and C together 8/23 of the work. What amount should A be paid?
(a)Rs.315
(b)Rs.345
(c)Rs.375
(d)Rs.355

23. Kim can do a work in 3 days while David can do the same work in 2 days. Both of them finish the work together and get Rs.150.What is the share of Kim?
(a)Rs.70
(b)Rs.60
(c)Rs.75
(d)Rs.30

24.If A can do ¼ of a work in 3 days and 3 days and B can do 1/6 of the same work in 4 days, how much will A get if both work together and are paid Rs.180 in all?
(a)Rs.120
(b)Rs.140
(c)Rs.100
(d)Rs.135

25.A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for Rs.3200.With the help of C, they completed the work in 3 days. How much is to be paid to C?
(a)Rs.600
(b)Rs.400
(c)Rs.375
(d)Rs.800

26.A sum of money is sufficient to pay A's wages for 21 days and B's wages for 28 days. The same money is sufficient to pay the wages of both for?
(a)12 days
(b)14 days
(c)12 ¼ days
(d)24 ½ days

27.A can do a piece of work in 10 days in 15 days. They work for 5 days. The rest of the work had finished by C in 2 days. If they get Rs.1500 for the whole work, the daily wages of B and C are?
(a)Rs.150
(b)Rs.225
(c)Rs.250
(d)Rs.300

28.A and B together can complete a work in 12 days. A alone can complete it in 20 days. If B does the work only for half a day daily, then in how many days A and B together will complete the work?
(a)10 days
(b)20 days
(c)15 days
(d)11 days

29.A alone can complete a work in 16 days and B alone in 12 days. Starting with A, they work on alternate days. The total work will be completed in?
(a)12 days
(b)13 days
(c) 13 5/7 days
(d) 13 ¾ days

30.A, B and C can do a piece of work in 11 days,20 days and 55 days respectively, working alone. How soon can the work be done if A is assisted by B and C on every third day?
(a)7 days
(b)8 days
(c)9 days
(d)10 days

31.A, B and C can separately do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on alternative days?
(a)12 days
(b)15 days
(c)18 days
(d)16 days

32. Two pipes A and B can fill a tank in 15 minutes and 20 minutes respectively. Both the pipes are opened together but after 4 minutes, pipe A is turned off. What is the total time required to fill the tank?
(a) 10 min 20 sec
(b) 11 min 45 sec
(c) 12 min 30 sec
(d) 13 min 40 sec

33. Three pipes A, B and C can fill a tank in 6 hours. After working at it together for 2 hours, C is closed and A and B can fill the remaining part in 7 hours. The number of hours taken by C alone to fill the tank is:
(a) 10
(b) 14
(c) 12
(d) 16

34. A pump can fill a tank with water in 2 hours. Because of a leak, it took 2 1/3 hours to fill the tank. The leak can drain all the water of the tank in:
(a) 8
(b) 14
(c) 7
(d) 12

35. Two pipes can fill a tank in 20 and 24 minutes respectively and a waste pipe can empty 3 gallons per minute. All the three pipes working together can fill the tank in 15 minutes. The capacity of the tank is:
(a) 80 gallons
(b) 120 gallons
(c) 60 gallons
(d) 100 gallons

36. A tap can fill a tank in 6 hours. After half the tank is filled, three more similar taps are opened. What is the total time taken to fill the tank completely?
(a) 3 hr 15 min
(b) 4 hr 15 min
(c) 4 hr 10 min
(d) 3 hr 45 min

37. Three taps A,B and C can fill a tank in 12,15 and 20 hours respectively. If A is open all the time and B ,C are open for one hour each alternatively, the tank will be full in:
(a) 6 hours
(b) 12 hours
(c) 7 hours
(d) 7.5 hours

38. A water tank is two-fifth full.Pipe A can fill a tank in 10 minutes and pipe B can empty it in 6 minutes.If both the pipes are open,how long will it take to empty or fill the tank completely?
(a) 6 min to empty
(b) 9 min to empty
(c) 6 min to fill
(d) 9 min to fill

39. A cistern is normally filled in 8 hours but takes two hours longer to fill because of a leak in its bottom. If the cistern is full, the leak will empty it in ?
(a) 20 hours
(b) 28 hours
(c) 36 hours
(d) 40 hours

40. 12 buckets of water fill a tank when the capacity of each tank is 13.5 liters. How many buckets will be needed to fill the same tank,if the capacity of each bucket is 9 liters?
(a) 16
(b) 18
(c) 15
(d) 8

ASSIGNMENT PROBLEMS

1. One pipe can fill a tank three times as fast as another pipe. If together the two pipes can fill the tank in 36 min, then the slower alone will be able to fill the tank in:
(a) 81 min
(b) 108 min
(c) 144 min
(d) 192 min

2. Taps X and Y can fill a tank in 30 and 40 minutes respectively. Tap Z can empty the filled tank in 60 minutes. If all the three taps are kept open for one

minute each,how much time will the taps take to fill the tank?
(a) 48 min
(b) 72 min
(c) 24 min
(d) None of these

3. Two pipes A and B can separately fill a cistern in 60 min and 75 min respectively. There is a third pipe in the bottom of the cistern to empty it. If all the three pipes are simultaneously opened, then the cistern is full in 50 min. In how much time, the third pipe alone can empty the cistern ?
(a) 85 min
(b) 95 min
(c) 105 min
(d) 100 min

4. Pipe A can fill a tank in 16 minutes and pipe B cam empty it in 24 minutes. If both the pipes are opened together after how many minutes should pipe B be closed, so that the tank is filled in 30 minutes ?
(a) 21 min
(b) 22 min
(c) 23 min
(d) 24 min

5. A cistern has a leak which would empty the cistern in 20 minutes. A tap is turned on which admits 4 liters a minute into the cistern, and it is emptied in 24 minutes. How many liters does the cistern hold ?
(a) 360 litres
(b) 480 litres
(c) 320 litres
(d) 420 litres

6.5 men and 2 boys working together can do four times as much work as a man and a boy. Working capacities of a man and a boy are in the ratio?
(a)1:2
(b)2:1
(c)1:3
(d)3:1

7.If 2 men and 6 women working together can do four times as much work as a man and a woman. Working capacities of a man and a boy are in the ratio?
(a)2:1
(b)3:1
(c)4:1
(d)1:1

8.4 men and 6 women can complete a work in 8 days, while 3 men and 7 women can complete it in 10 days. In how many days will 10 women complete it?
(a)35
(b)40
(c)50
(d)45

9.One man,3 women and 4 boys can do a piece of work in 96 hours,2 men and 8 boys can do it in 80 hours,2 men and 3 women can do it in 120 hours.5men and 12 boys can do in:?
(a) 39 1/11 hours
(b) 47 3/11 hours
(c) 43 7/11 hours
(d) 31 9/11 hours

10.If 6 men and 8 boys can do a piece of work in 10 days while 26 men and 48 boys can do the same in 2 days, the time taken by 15 men and 20 boys in doing the same type of work will be?
(a)4 days
(b)5 days
(c)6 days
(d)7 days

11.A certain number of men can finish a piece of work in 100 days. If however, there were 10 men less, it would take 10 days more for the work to be finished. How many men were there originally?
(a)100
(b)82
(c)75
(d)110

12.A works twice as fast as B. If B can complete a work in 12 days independently. The number of days in which A and B can together finish the work is _____.
(a)18 days
(b)6 days
(c)8 days
(d)4 days

13.Efficiency of Ravi and Mayank of doing the same work is 3 : 2. If they together can complete a

work in 18 days, then in how many days Ravi can complete the work alone?
(a)45
(b)30
(c)24
(d)40

14.A builder decided to build a building in 20 days. He employed 100 men in beginning and 50 more after 15 days and completed the construction in stipulated time. If he had not employed the additional men, how many days behind schedule would it have been finished?
(a)5 days
(b)7 days
(c)10 days
(d)None of these

15.8 men working for 9 hours a day complete a piece of work in 20 days. In how many days can 7 men working for 10 hours a day complete the same piece of work?
(a)21 days
(b)20.57 days
(c)22.35 days
(d)None of these

16.Wages of 10 women for 5 days is Rs.1250. The daily wage of a man is twice that of a woman. How many men must work for 8 days to earn Rs.1600?
(a)5 men
(b)8 men
(c)4 men
(d)6 men

17.Alok is twice as good a workman as Dinesh. Alok can finish a piece of work in 60 days less than Dinesh. In how many days will they together be able to do the work?
(a)30 days
(b)40 days
(c)50 days
(d)55 days

18.A and B finish a work together in 30 days, they worked for it for 20 days and then B left. The remaining work was done by A alone in 20 more days. B alone can finish the work in _____.
(a)50 days
(b)5 days
(c)60 days
(d)48 days

19.If 3 men or 4 women can plough a field in 43 days, how long will 7 men and 5 women take to plough it?
(a)5 days
(b)10 days
(c)11 days
(d)12 days

20.A does half as much work as B in one sixth of the time. If together they take 10 days to complete a work, how much time shall B take to do it alone?
(a)70 days
(b)30 days
(c)40 days
(d)50 days

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	C	11	D
2	C	12	D
3	D	13	B
4	A	14	D
5	B	15	B
6	B	16	C
7	D	17	B
8	B	18	D
9	C	19	D
10	A	20	C

TIME SPEED AND DISTANCE

Step 1: Speed * Time = Distance

Speed × Time = Distance

Speed = Distance ÷ Time

Time = Distance ÷ Speed

Step 2: Speed is inversely proportional to time.

Please understand that, If speed is high then time taken to cover x distance will be less and if speed is slow then time taken to cover the same distance x, will be more.

Speed ∝ 1 ÷ Time

-distance covered is constant

Step 3: To convert km/hr to m/sec and m/sec to km/hr.

We know, km/hr is bigger value and m/sec is smaller so what we do to convert bigger value into smaller?

We divide by a value which has greater **denominator** than numerator. so to convert km/hr into m/sec we multiply by 5÷18, where 18 (denominator) is greater than 5 (numerator).

x km/hr = x × 5÷18 m/sec

Similarly, To convert m/sec to km/hr, we do the reverse process.

x × 5÷18 m/sec = x km/hr

Step 4: Average Speed

Average speed = Total Distance travelled /Total Time taken

If a part of a journey is travelled at speed S1 km/hr in T1 hours and remaining part at speed S2 km/hr in T2 hours then, Total distance travelled = S1T1 + S2T2 km

Average speed = S1T1 + S2T2/T1 + T2 km/hr

In a journey travelled with different speeds, if the distance covered in each stage is constant, the average speed is the harmonic mean of the different speeds.

Suppose a man covers a certain distance at x km/hr and an equal distance at y km/hr

Then the average speed during the whole journey is 2xy/x+y km/hr

In a journey travelled with different speeds, if the time travelled in each stage is constant, the average speed is the arithmetic mean of the different speeds.

If a man travelled for certain time at the speed of x km/hr and travelled for equal amount of time at the speed of y km/hr then

The average speed during the whole journey is x+y/2 km/hr

Step 5: Ratio of speed

If the ratio of the speed of A and B is a:b,then the ratio of the time taken by them to cover the same distance is 1/a:1/b or b:a

Step 6: Relative Speed

If two objects are moving in the same direction at v1 m/s and v2 m/s respectively where v1>v2, then their relative speed (v1−v2) m/s.

Step 7: Circular tracks

If two people are running on a circular track with speeds in ratio a:b where a and b are co-prime, then they will meet at a+b distinct points if they are running in opposite direction.They will meet at |a-b| distinct points if they are running in same direction

If two people are running on a circular track having perimeter l, with speeds m and n,

The time for their first meeting = l / (m +n) (when they are running in opposite directions)

The time for their first meeting = l / (|m-n|) (when they are running in the same direction)

If a person P starts from A and heads towards B and another person Q starts from B and heads towards A and they meet after a time 't' then, **$t = \sqrt{(x*y)}$**

where x = time taken (after meeting) by P to reach B
and y = time taken (after meeting) by Q to reach A

A and B started at a time towards each other. After crossing each other, they took T1 hrs, T2 hrs respectively to reach their destinations. If they travel at constant speeds S1 and S2 respectively all over the journey,
Then $S1^2 / S2^2 = T2 / T1$

Step 8: Trains

Two trains of length L1 and L2 travelling at speeds of S1 and S2
cross each other in a time = L1+L2/S1+S2 (if they are going in opposite directions)
cross each other in a time = L1+L2/|S1−S2 | (if they are going in the same direction)

Step 9: Boats and Streams

If the speed of water is 'W' and speed of a boat in still water is 'B'

• Speed of the boat (downstream) is B+W

• Speed of the boat (upstream) is B-W

The direction along the stream is called **downstream.**

And, the direction against the stream is called **upstream.**

If the speed of the boat downstream is x km/hr and the speed of the boat upstream is y km/hr,

then **Speed of boat in still water** = x+y /2 km/hr

Rate of stream = x−y /2 km/hr

While converting the speed in m/s to km/hr, multiply it by 3.6 (18/5).

1 m/s = (18/5) km/h

While converting km/hr into m/sec, we multiply by 5/18

CLASSWORK PROBLEMS

1.At 10 AM taps A, B and C are turned on. A can fill the tub in 5 hrs, B can fill it in 10 hrs and C can empty it in 7½hrs. At what time, working together will the tank be filled
(a) 4 AM
(b) 6 AM
(c) 4 PM
(d) 6 PM

2.A leaves a station at 8 mph and after 5 hours B leaves the same station and travels in the same direction as A at 12 mph. After how much time B overtakes A?
(a) 6 hrs
(b) 8 hrs
(c) 10 hrs
(d) 12 hrs

3.Two cars P and Q start at the same time from A and B which are 120 km apart. If the two cars travel in opposite directions, they meet after one hour and if they travel in same direction (from A towards B), then P meets Q after 6 hrs. What is the speed of the car P?
(a) 60 km/h
(b) 70 km/h

(c) 80 km/h
(d) 40 km/h

4.A, B and C are the three persons run on the circular path at the speed of 20 m/sec, 30 m/sec and 50 m/sec respectively in the same direction. The circumference of the track is 600 meters. When will they be together again for the first time at the starting point?
(a) 45 Sec
(b) 60 sec
(c) 35 sec
(d) 55 sec

5.The ratio of the distance from x to y to the distance from y to z is 5 : 4.A man travels from x to y at 50 mph and y to z at 40 mph. Find his average speed for the entire journey?
(a) 25 mph
(b) 35 mph
(c) 45 mph
(d) 50 mph

6.The speed of a bus without stoppages is 50 mph and with stoppage is 35 mph. How many minutes per hour does the bus stop?
(a) 15 min
(b) 18 min
(c) 20 min
(d) 24 min

7.A man covers 1/3rd of the distance at 60 mph and remaining distance at the rate of 80 mph. Find his average speed for the entire journey?
(a) 36 mph
(b) 45 mph
(c) 60 mph
(d) 72 mph

8.A train leaves point A at 6.00 (a)m. and reaches point B at 10.00 (a)m. Another train leaves point B at 8.00 (a)m. and reaches point A at 12 noon. When do the two trains meet?
(a) 9.00 (a)m.
(b) 10.00 (a)m.
(c) 11.00 (a)m.
(d) 1.00 p.m.

9.Increasing his speed by 2 mph a person covers a certain distance 1 hr early. Had he decreased his speed by 2 mph, he would have taken 1 ½ hrs late. Find the distance traveled by that person?
(a) 30 miles
(b) 40 miles
(c) 48 miles
(d) 60 miles

10.Navin is travelling on his bike and has calculated to reach point A at 2 pm if he travels at 40 kmph, he will reach there at 12 noon if he travels at 60 kmph. At what speed must he travel to reach A at 1 pm?
(a) 50 km/h
(b) 45 km/h
(c) 58 km/h
(d) 48 km/h

11. A thief is noticed by a policeman from a distance of 300 m. The thief starts running and the policeman chases him. The thief and the police man run at the rate of 10 kmph and 11 kmph respectively. What is the distance between them after 6 minutes?
(a) 200 m
(b) 150 m
(c) 100 m
(d) 190 m

12.A train, 180m long crossed 120m long platforms in 20s and another train at same speed crossed a pole in 10s. In what time can they cross each other, when they travel in opposite directions?
(a) 11s
(b) 13s
(c) 12s
(d) 14s

13.Two trains pass each other on parallel lines. Each train is 100 meters long. When they are going in the same direction, the faster one takes 60 seconds to pass the other completely. If they are going in opposite directions they pass each other completely in 10 seconds. Find the speed of the slower train? (in km/h)
(a) 30
(b) 42
(c) 48
(d) 60

14.In a stream that is running at 2 km/h, a man goes 10 km upstream and comes back to the starting point in 55 minutes. Find the speed of the man in still water.

(a) 20 km/h
(b) 22 km/h
(c) 24 km/h
(d) 28 km/h

15.A boat travels 12km downstream in 48 min, if the speed of stream is 2kmph, then speed of boat in still water is
(a) 13kmph
(b) 15kmph
(c) 17kmph
(d) None

16.A boat covers 55 km downstream and 25 km up stream in 10 hrs while it covers 44 km downstream and 35 km up stream in 11 hrs. The velocity of the current is?
(a) 2 km/h
(b) 3 km/h
(c) 4 km/h
(d) 5 km/h

17.Walking at ¾ of his normal speed, Abhishek is 16 minutes late in reaching his office. The usual time taken by him to cover the distance between his home and his office is
(a) 48 minutes
(b) 60 minutes
(c) 42 minutes
(d) 62 minutes

18.A railway passenger counts the telegraph poles on the rail road as he passes them. The telegraph poles are at a distance of 50 meters. What will be his count in 4 hours, if the speed of the train is 45 km per hour?
(a) 600
(b) 2500
(c) 3600
(d) 5000

19.A car driver, driving in a fog, passes a pedestrian who was walking at the rate of 2 km/h in the same directions. The pedestrian could see the car for 6 minutes and it was visible to him up to a distance of 0.6 km. What was the speed of the car?
(a) 30 km/h
(b) 15 km/h
(c) 20 km/h
(d) 8 km/h

20.A person traveled a distanced of 200 kilometer between two cities by a car covering the first quarter of the journey at a constant speed of 40 km/h and the remaining three quarters at a constant speed of x km/h. If the average speed of the person for the entire journey was 53.33 km/h what is the value of x.
(a) 55 km/h
(b) 60 km/h
(c) 70 km/h
(d) 80 km/h

21.Two cars started simultaneously toward each other from town A and B that are 480 km apart. It took the first car traveling from A to B 8 hours to cover the distance and the second car traveling from B to A 12 hours. Determine at what distance from A the two cars meet.
(a) 288 km
(b)200 km
(c) 300 km
(d) 196 km

22.The Sinhagad Express left Pune at noon sharp. Two hours later, the Deccan Queen started from Pune in the same direction. The Deccan Queen overtook the Sinhagad Express at 8 p.m. Find the average speed of the two trains over this journey if the sum of their average speeds is 70 km/h.

(a) 34.28 km/h
(b) 35 km/h
(c) 50 km/h
(d) 12 km/h

23.A motorboat went downstream for 28 km and immediately returne(d) It took the boat twice as long to make the return trip. If the speed of the river flow were twice as high, the trip downstream and back would take 672 minutes. Find the speed of the boat in still water and the speed of the river flow in kmph.
(a) 9, 3
(b) 9, 6
(c) 8, 2
(d) 12, 3

24.A boat sails downstream from point A to point B, which is 10 km away from A, and then returns to (A) If the actual speed of the boat (in still water) is 3 km/h, the trip from A to B takes 8 hours less than that from B to (A) What must

the actual speed of the boat for the trip from A to B to take exactly 100 minutes?
(a) 1 km/h
(b) 2 km/h
(c) 3 km/h
(d) 4 km/h

25.A boat goes 40 km upstream in 8 hrs and a distance of 49 km downstream in 7 hrs. The speed of the boat in still water is
(a) 5 km/h
(b) 5.5 km/h
(c) 6 km/h
(d) 6.5 km/h

26.How many minutes Raman will take to cover a distance of 400 meters if he runs at a speed of 20 km/hr ?
(a) 2 mins
(b) 1.5 mins
(c) 1⅕ mins
(d) 2.5 mins

27.John travelled from his town to city. John went to city by bicycle at the speed of 25 km/h and came back at the speed of 4 km/h. If John took 5 hours and 48 min to complete his journey, what is the distance between town and city ?
(a) 15 km
(b) 22 km
(c) 20 km
(d) 25 km

28.Speed of a train is 20 meters per secon(d) It can cross a pole in 10 seconds. What is the length of train ?
(a)150 m
(b)250 m
(c)200 m
(d)300 m

29.Ram walks at a speed of 12 km/h. Today the day was very hot so walked at ⅚ of his average spee(d) He arrived his school 10 minutes late. Find the usual time he takes to cover the distance between his school and home?
(a)40 mins
(b)45 mins
(c)50 mins
(d)60 mins

30.A car running at 65 km/h takes one hour to cover a distance. If the speed is reduced by 15 km/hour then in how much time it will cover the distance ?
(a)72 mins
(b)78 mins
(c)76 mins
(d)None of these

31.In a 100 m race A runs at a speed of 1.66 m/s. If A gives a start of 4m to B and still beats him by 12 seconds. What is the speed of B ?
(a)1 m/s
(b)1.33 m/s
(c)1.25 m/s
(d)Rs 1.5 m/s

32.In a kilometer race, A beats B by 100 meters. B beats C by 100 meters. By how much meters does A beat C in the same race ?
(a)200 meters
(b)180 meters
(c)190 meters
(d)210 meters

33.Without any stoppage a person travels a certain distance at an average speed of 42 km/hr and with stoppages he covers the same distance at an average speed of 28 km/hr. How many minutes per hour does he stop?
(a) 25 minutes
(b) 30 minutes
(c) 20 minutes
(d) None of these

34.A train passes through a telegraph post in 9 seconds moving with a speed of 54 km per hour. The length of the train is
(a) 135 metres
(c) 125 metres
(b) 145 metres
(d) None of these

35.A train 50 m long passes a platform 100 m long in 10 seconds. The speed of the train in m/se(c) is
(a) 25
(c) 35
(b) 15
(d) None of these

36.A train 300 metres long is running at a speed of 90 km/hr. How many seconds will it take to cross a 200 metres long train running in the same direction at a speed of 60 km/hr?
(a) 70 sec
(c) 50 sec

(b) 60 sec
(d) None of these

37.Two trains are running in opposite directions with the same spee(d) If the length of each train is 135 metres and they cross each other in 18 seconds, the speed of each train is
(a) 29 km/hr
(b) 35 km/hr
(c) 27 km/hr
(d) None of these

38.A and B are two stations. A train goes from A to B A at 64 km/hr and returns to A at a slower spee(d) If its average speed for the whole journey is 56 km/hr, at what speed did it return?
(a) 48 km/hr
(b) 49.77 km/hr
(c) 30 km/hr
(d) 47.46 km/hr

39.Excluding stoppages, the speed of a bus is 54 km/hr and including stoppages, it is 45 km/hr. For how many minutes does the bus stop per hour?
(a) 9
(b) 10
(c) 12
(d) 20

40.Ramesh sees a train passing over 1 km long bridge. The length of the train is half that of bridge. If the train clears the bridge in 2 minutes, the speed of the train is
(a) 45 km/hr
(b) 43 km/hr
(c)50 km/hr
(d) None of these

ASSIGNMENT PROBLEMS

1.Amit started cycling along the boundaries of a square field from cover point (A) After half an hour he reached the corner point C, diagonally opposite to (A) if his speed was 8 km/hr, what is the area of the field in square km
(a) 64
(b) 8
(c) 4
(d) cannot be determined

2.A train 110 metres in length passes a man walking at the speed of 6 km/hr. against it in 6 seconds. The speed of the train in km per hour is
(a) 60 km/hr
(b) 45 km/hr
(c) 50 km/hr
(d) 55 km/hr

DIRECTION (Q.3-4) : A passenger train running from Sitapur to Gitapur meets with an accident 50 kms from Sitapur, after which it travels at 3/5 times its original speed and arrives 3 hours late at Gitapur. If the accident had occurred 50 kms farther, it would have been only 2 hours late.

3. What is the distance between Sitapur and Gitapur?
(a) 400 km
(b) 200 km
(c) 100 km
(d) 150 km

4. The original speed of the train (in kmph) is-
(a) 33.33
(b) 13.33
(c) 50
(d) 66.66

5. Ram and Shyarn run a race between points A and B, 5 km apart. Ram starts at 9 am from A at a speed of 5 km/ hr, reaches B, and returns to A at the same speed. Shyam starts at 9.45 am from A at a speed of 10 km/ hr, reaches B and comes back to A at the same speed. At what time do Ram and Shyam first meet each other?
(a) 10.00am
(b) 10.10 am
(c) 10.20 am
(d) 10.30 am

6.Pranav can row a distance of 20km downstream in 8 hours. If the stream flows at a rate of 1.5 km/hr, what is Pranav's speed in still water ?
(a) 2 km/hr
(b) 0.5 km/hr
(c) 1 km/hr
(d) 3 km/hr

7. A man can row 15 km/hr in still water and he finds that it takes him twice as much time to row up than as to row down the same distance in the river. The speed of the current (in km/hr is) :
(a) 6 km/ hr

(b) 6.5 km/hr
(c) 4.5 km/hr
(d) 5 km/hr

8. The difference between downstream speed and upstream speed is 3 km/hr and the total time taken during upstream and downstream is 3 hours. What is the downstream speed, if the downstream and upstream distance are 3 km each?
(a) 2.5 km/h
(b) 4.33 km/h
(c) 4 km/h
(d) 3.3 km/h

9. Avantika can row 20 km downstream in 5 hours. If the stream flows at 2 km/hr, what is Avantika's speed in still water?
(a) 2.5 km/hr
(b) 2 km/hr
(c) 3 km/hr
(d) 4 km/hr

10. A and B are places that are 200 kms apart. A train starts from A at the speed of 20 km/hr and another train starts from B at the same time at the speed of 30 km/hr, towards each other. At what distance from A will these two trains meet and how much time will the trains take to reach the meeting point ?
(a) 120 km, 4 hrs
(b) 80 km, 4 hrs
(c) 120 km, 8 hrs
(d) 80 km, 6 hrs

11.A man covers X km in t hours at S km/hr; another man covers X/2 km in 2t hours at R km/hr. Then the ratio S:R equals
(a)4:1
(b)2:1
(c)1:4
(d)1:2

12. If a cyclist starts at 7 km/hr and he increases his speed in every 3 hours by 1 km/hr then the time taken by the cyclist to cover 113 km is:
(a)27/2 hours
(b)20/3 hours
(c)12 hours
(d)13 hours

13. A bike rider starts at 60 km/hr and he increases his speed in every 2 hours by 3 km/hr. Then the maximum distance covered by him in 24 hours is:
(a)1000km
(b)918km
(c)899 km
(d)none of these

14. A car starts at 10 am with a speed of 50 km/hr. Due to the problem in engine it reduces its speed as 10 km/hr for every 2 hours. After 11 am, the time taken to covers 10 km is:
(a)12 minutes and 10 seconds
(b)15 minutes and 09 seconds
(c)13 minutes and 20 seconds
(d)none of these

15. A person crosses a 600 m long street in 5 minutes. What is his speed in km per hour?
(a)3.6
(b)7.2
(c)8.4
(d)10

16. If a person walks at 14 km/hr instead of 10 km/hr, he would have walked 20 km more. The actual distance travelled by him is:
(a)50km
(b)56km
(c)70km
(d)80km

17. A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at the same time. On the way, however, the train lost about 12.5 minutes while stopping at the stations. The speed of the car is:
(a)100kmph
(b)110kmph
(c)120kmph
(d)130kmph

18. Excluding stoppages, the speed of a bus is 64 kmph and including stoppages, it is 48 kmph. For how many minutes does the bus stop per hour?
(a)30
(b)10
(c)15
(d)20

19. An aeroplane covers a certain distance at a speed of 240 kmph in 5

hours. To cover the same distance in hours, it must travel at a speed of:
(a)300kmph
(b)360kmph
(c)600kmph
(d)720kmph

20. A person travels equal distances with speed of 3 km/hr, 4 km/hr and 5 km/hr and takes a total of 47 minutes. Find the total distance
(a)3 km
(b)4 km
(c)6 km
(d)9 km

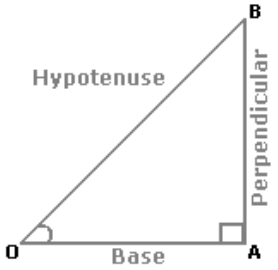
Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	C	11	A
2	A	12	D
3	B	13	B
4	A	14	C
5	B	15	B
6	C	16	A
7	D	17	C
8	B	18	C
9	B	19	D
10	B	20	A

HEIGHTS AND DISTANCE

Trigonometry:

In a right angled $\triangle$ OAB, where $\angle BOA = \theta$,



i. $\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{AB}{OB}$;

ii. $\cos\theta = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{OA}{OB}$;

iii. $\tan\theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{AB}{OA}$;

iv. $\text{cosec}\,\theta = \frac{1}{\sin\theta} = \frac{OB}{AB}$;

v. $\sec\theta = \frac{1}{\cos\theta} = \frac{OB}{OA}$;

vi. $\cot\theta = \frac{1}{\tan\theta} = \frac{OA}{AB}$;

Trigonometrical Identities:

$\sin^2\theta + \cos^2\theta = 1$.

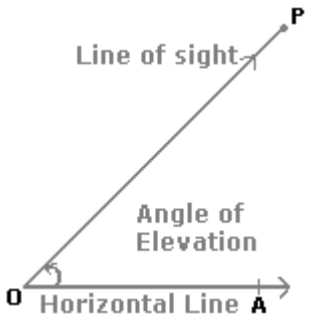
$1 + \tan^2\theta = \sec^2\theta$.

$1 + \cot^2\theta = \text{cosec}^2\theta$.

Values of T-ratios:

θ	$0°$	$(\pi/6)$ $30°$	$(\pi/4)$ $45°$	$(\pi/3)$ $60°$	$(\pi/2)$ $90°$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{2}$	1
$\cos\theta$	1	$\frac{3}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{3}$	1	3	not defined

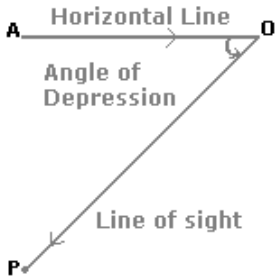
Angle of Elevation:



Suppose a man from a point O looks up at an object P, placed above the level of his eye. Then, the angle which the line of sight makes with the horizontal through O, is called the **angle of elevation** of P as seen from O.

$\therefore$ Angle of elevation of P from O = $\angle$ AOP.

Angle of Depression:



Suppose a man from a point O looks down at an object P, placed below the level of his eye, then the angle which the line of sight makes with the horizontal through O, is called the **angle of depression** of P as seen from O.

CLASSWORK PROBLEMS

1. Two ships are sailing in the sea on the two sides of a lighthouse. The angle of elevation of the top of the lighthouse is observed from the ships are 30º and 45º respectively. If the lighthouse is 100 m high, the distance between the two ships is:
(a) 300 m
(b) 173 m
(c) 273 m
(d) 200 m

2. A man standing at a point P is watching the top of a tower, which makes an angle of elevation of 30º with the man's eye. The man walks some distance towards the tower to watch its top and the angle of the elevation becomes 45º. What is the distance between the base of the tower and the point P?
(a) 9 units
(b) 12 units
(c) $3\sqrt{3}$ units
(d) none of these

3. From a point P on a level ground, the angle of elevation of the top tower is 30º. If the tower is 200 m high, the distance of point P from the foot of the tower is:
(a) 346 m
(b) 400 m
(c) 312 m
(d) 298 m

4. The angle of elevation of the sun, when the length of the shadow of a tree is equal to the height of the tree, is:
(a) 30◦
(b) 45◦
(c) 60◦
(d) None of these

5. An observer 2 m tall is $10\sqrt{3}$ m away from a tower. The angle of elevation from his eye to the top of the tower is 30º. The height of the tower is:
(a) 10 m
(b) 12 m
(c) 14 m
(d) None of these

6. The angle of elevation of a ladder leaning against a wall is 60º and the foot of the ladder is 12.4 m away from the wall. The length of the ladder is:
(a) 6.2 m
(b) 12.4 m
(c) 14.8 m
(d) 24.8 m

7. A man on the top of a vertical observation tower observers a car moving at a uniform speed coming directly towards it. If it takes 8 minutes for the angle of depression to change from 30° to 45°, how soon after this will the car reach the observation tower?
(a) 8 min 17 sec
(b) 10 min 57 sec
(c) 12 min 23 sec
(d) 14 min 34 sec

8. A man is watching from the top of a tower a boat speeding away from the tower. The boat makes an angle of depression of 45° with the man's eye when at a distance of 100 metres from the tower. After 10 seconds, the angle of depression becomes 30°. What is the approximate speed of the boat, assuming that it is running in still water?
(a) 26.28 kmph
(b) 32.42 kmph
(c) 24.22 kmph
(d) 31.25 kmph

9. The top of a 15 metre high tower makes an angle of elevation of 60° with the bottom of an electronic pole and angle of elevation of 30° with the top of the pole. What is the height of the electric pole?
(a) 5 m
(b) 8 m
(c) 10 m
(d) 12 m

10. The angle of elevation of the top of a tower from a certain point is 30°. If the observer moves 40 m towards the tower, the angle of elevation of the top of the tower increases by 15°. The height of the tower is:
(a) 54.6 m
(b) 62.2 m
(c) 64.2 m
(d) 52.2 m

11. On the same side of a tower, two objects are located. Observed from the

top of the tower, their angles of depression are 45° and 60°. If the height of the tower is 600 m, the distance between the objects is approximately equal to :
(a) 254 m
(b) 272 m
(c) 288 m
(d) 284 m

12. A ladder 10 m long just reaches the top of a wall and makes an angle of 60° with the wall.Find the distance of the foot of the ladder from the wall
(a) 4.32 m
(b) 5 m
(c) 17.3 m
(d) 8.65 m

13. From a tower of 80 m high, the angle of depression of a bus is 30°. How far is the bus from the tower?
(a) 40 m
(b) 46.24 m
(c) 160 m
(d) 138.4 m

14. The angle of elevation of the top of a lighthouse 60 m high, from two points on the ground on its opposite sides are 45° and 60°. What is the distance between these two points?
(a) 45 m
(b) 30 m
(c) 103.8 m
(d) 94.6 m

15. From the top of a hill 100 m high, the angles of depression of the top and bottom of a pole are 30° and 60° respectively. What is the height of the pole?
(a) 50 m
(b) 52 m
(c) 66.67 m
(d) 33.33 m

16. A vertical tower stands on ground and is surmounted by a vertical flagpole of height 18 m. At a point on the ground, the angle of elevation of the bottom and the top of the flagpole are 30° and 60° respectively. What is the height of the tower?
(a) 9 m
(b) 10.4 m
(c) 12 m
(d) 15.5 m

17. A balloon leaves the earth at a point A and rises vertically at uniform speed. At the end of 2 minutes, John finds the angular elevation of the balloon as 60°. If the point at which John is standing is 150 m away from point A, what is the speed of the balloon?
(a) 0.63 m/s
(b) 0.72 m/s
(c) 2.16 m/s
(d) 3.87 m/s

18. The angles of depression and elevation of the top of a wall 11 m high from top and bottom of a tree are 60° and 30° respectively. What is the height of the tree?
(a) 22 m
(b) 33 m
(c) 44 m
(d) None of these

19. Two vertical poles are 200 m apart and the height of one is double that of the other. From the middle point of the line joining their feet, an observer finds the angular elevations of their tops to be complementary. Find the heights of the poles.
(a) 141 m and 282 m
(b) 70.5 m and 141 m
(c) 65 m and 130 m
(d) 130 m and 260 m

20. To a man standing outside his house, the angles of elevation of the top and bottom of a window are 60° and 45° respectively. If the height of the man is 180 cm and he is 5 m away from the wall, what is the length of the window?
(a) 8.65 m
(b) 2 m
(c) 2.5 m
(d) 3.65 m

21. The elevation of the summit of a mountain from its foot is 45°. After ascending 2 km towards the mountain upon an incline of 30°,the elevation changes to 60°. What is the approximate height of the mountain?
(a) 1.2 km
(b) 0.6 km
(c) 2.7 km
(d) 1.4 km

22. Two persons are on either sides of a tower of height 50 m. The persons

observers the top of the tower at an angle of elevation of 30° and 60°. If a car crosses these two persons in 10 seconds, what is the speed of the car?
(a) $24\sqrt{3}$ kmph
(b) $8\sqrt{3}$ kmph
(c) $20/\sqrt{3}$ kmph
(d) 26 kmph

23. Find the angle of elevation of the sun when the shadow of a pole of 18 m height is $6\sqrt{3}$ m.
(a) 30◦
(b) 45◦
(c) 60◦
(d) None of these

24. The angle of elevation of the top of the tower from a point on the ground is $\sin{-1}(3/5)$. If the point of observation is 20 meters away from the foot of the tower, what is the height of the tower?
(a) 9 m
(b) 12 m
(c) 15 m
(d) 18 m

25. A person, standing exactly midway between two towers, observes the top of the two towers at angle of elevation of 22.5° and 67.5°. What is the ratio of the height of the taller tower to the height of the shorter tower? (Given that tan 22.5° = $\sqrt{2}$ -1)
(a) $1-2\sqrt{2} : 1$
(b) $1+2\sqrt{2} : 1$
(c) $3+2\sqrt{2} : 1$
(d) $3-2\sqrt{2} : 1$

26. From the foot and the top of a building of height 230 m, a person observes the top of a tower with angles of elevation of b and a respectively. What is the distance between the top of these buildings if tan a = 5/12 and tan b = 4/5
(a) 250 m
(b) 650 m
(c) 600 m
(d) 400 m

27. A vertical pole fixed to the ground is divided in the ratio 1:9 by a mark on it with lower part shorter than the upper part. If the two parts subtend equal angles at a place on the ground, 15 m away from the base of the pole, what is the height of the pole?
(a) $60\sqrt{5}$ m
(b) $15\sqrt{5}$ m
(c) $60\sqrt{3}$ m
(d) $15\sqrt{3}$ m

28. An aeroplane when 900 m high passes vertically above another aeroplane at an instant when their angles of elevation at same observing point are 60° and 45° respectively. Approximately, how many meters higher is the one than the other?
(a) 381 m
(b) 169 m
(c) 254 m
(d) 211 m

29. When the sun's altitude changes from 30° to 60°, the length of the shadow of a tower decreases by 70m. What is the height of the tower?
(a) 35 m
(b) 140 m
(c) 60.6 m
(d) 20.2 m

30. The angle of elevation of a ladder leaning against a wall is 60º and the foot of the ladder is 4.6 m away from the wall. The length of the ladder is:
(a) 2.3 m
(b) 9.2 m
(c) 4.6 m
(d) 7.8 m

31. From a point P on a level ground, the angle of elevation of the top tower is 30º. If the tower is 100 m high, the distance of point P from the foot of the tower is:
(a) 149 m
(b) 169 m
(c) 173 m
(d) 196 m

32. The angle of elevation of the sun, when the length of the shadow of a tree $\sqrt{3}$ times the height of the tree, is:
(a) 30◦
(b) 45◦
(c) 60◦
(d) 90◦

33. A flagstaff 17.5 m high casts a shadow of length 40.25 m. What will be the height of a building, which casts a

shadow of length 28.75 m under similar conditions ?
(a) 14 cm
(b) 13.5 cm
(c) 12.5 cm
(d) 11.4 cm

34. A vertical tov 18 cm long casts a shadow 8 cm long on the ground. At the same time a pole casts a shadow 48 m. long on the ground. Then find the height of the pole ?
(a) 108 m
(b) 84 m
(c) 118 m
(d) 94 m

35. The angle of elevation of the top of a tower from a point A on the ground is 30°. On moving a distance of 20 metres towards the foot of the tower to a point B, the angle of elevation increases to 60°. The height of the tower is
(a) √3 m
(b) 5√3 m
(c) 10√3 m
(d) 20√3 m

36. The shadow of the tower becomes 60 meters longer when the altitude of the sun changes from 45° to 30°. Then the height of the tower is
(a) 20(√3 + 1) m
(b) 24(√3 + 1) m
(c) 30(√3 + 1) m
(d) 30(√3 – 1) m

37. The angle of elevation of the top of a tower from the point P and Q at distance of 'a' and 'b' respectively from the base of the tower and in the same straight line with it are complementary. The height of the tower is
(a) √ab
(b) a/b
(c) ab
(d) a^2 b^2

38. A vertical post 15 ft. high is broken at a certain height and its upper part, not completely separated meets the ground at an angle of 30°. Find the height at which the post is broken
(a) 10 ft.
(b) 5 ft.
(c) 15√3 ft.
(d) 5√3 ft.

39. From a point 20 m away from the foot of a tower, the angle of elevation of the top of the tower is 30°. The height of the tower is
(a) 10√3 m
(b) 20√3 m
(c) 10/√3 m
(d) 20/√3 m

40. The length of the shadow of a vertical tower on level ground increases by 10 metres when the altitude of the sun changes from 45° to 30°. Then the height of the tower is
(a) 5√3 m
(b) 10(√3 + 1) m
(c) 5(√3 + 1) m
(d) 10√3 m

ASSIGNMENT PROBLEMS

1. The angle of elevation of an aeroplane from a point on the ground is 60°. After 15 second flight, the elevation changes to 30°. If the aeroplane is flying at a height of 1500√3 m, find the speed of the plane
(a) 300 m/sec
(b) 200 m/sec
(c) 100 m/sec
(d) 150 m/sec

2. The angle of elevation of the top of a tower from a point on the ground is 30° and moving 70 meters towards the tower it becomes 60°. The height of the tower is
(a) 10 m
(b) 10/√3 m
(c) 10√3 m
(d) 35√3 m

3. If the angle of elevation of a balloon from two consecutive kilometer-stones along a road are 30° and 60° respectively, then the height of the balloon above the ground will be
(a) √3/2 km
(b) 1/2 km
(c) 2/√3 km
(d) 3√3 km

4. The angle of elevation of ladder leaning against a house is 60° and the foot of the ladder is 6.5 metres from the house. The length of the ladder is
(a) 13 m

(b) 12 m
(c) 15 m
(d) 13.5 m

5. A man standing at a point P is watching the top of a tower, which makes an angle of elevation of 30°. The man walks some distance towards the tower and then his angle of elevation of the top of the tower is 60°. If the height of tower is 30 m, then the distance he moves is
(a) 22 m
(b) $22\sqrt{3}$ m
(c) 20 m
(d) $20\sqrt{3}$ m

6. At a point on a horizontal line 6. through the base of a monument the angle of elevation of the top of the monument is found to be such that its tangent is 1/5. On walking 138 metres towards themonument the secant of the angle of elevation is found to be $(\sqrt{193})/2$. The height of the monument (in metre) is
(a) 35
(b) 42
(c) 49
(d) 56

7. The angle of elevation of the top of a building from the top and bottom of a tree are x and y respectively. If the height of the tree is h metre, then (in metre) the height of the building is
(a) hcotx/(cotx + coty)
(b) hcoty/(cotx + coty)
(c) hcotx/(cotx - coty)
(d) hcoty/(cotx - coty)

8. Two poles of equal height are standing opposite to each other on either side of a road which is 100m wide. From a point between them on road, angle of elevation of their tops are 30° and 60°. The height of each pole is
(a) $20\sqrt{3}$ m
(b) $25\sqrt{3}$ m
(c) $28\sqrt{3}$ m
(d) $30\sqrt{3}$ m

9. The angle of elevation of the top of a chimney and roof of the building from a point on the ground are 45° and x° respectively. The height of building is h metre. Then the height of the chimney, is
(a) hcotx + h
(b) hcotx – h
(c) htanx + h
(d) htanx – h

10. There are two vertical posts, one on each side of a road, just opposite to each other. One post is 108 metre high. From the top of this post the angle of depression of the top and foot of the other post are 30° and 60° respectively. The height of the other post is
(a) 36 m
(b) 72 m
(c) 88 m
(d) 56 m

11.There are two temples, one on each bank of a river just opposite to each other. One temple is 54m high. From the top of this temple, the angles of depression of the top and the foot of the other temple are 30° and 60° respectively. The length of the temple is;
(a) 18 m
(b) 36 m
(c) $18\sqrt{3}$ m
(d) $36\sqrt{3}$ m

12. From a tower 125 metres high the angle of depression of two objects, which are in horizontal line through the base of the tower are 45° and 30° and they are on the same side of the tower. The distance (in metres) between the objects is
(a) $125\sqrt{3}$ m
(b) $125(\sqrt{3} - 1)$ m
(c) $125(\sqrt{3} + 1)$ m
(d) $125/(\sqrt{3} - 1)$ m

13. From a point P on the ground the angle of elevation of the top of a 10m tall building is 30°. A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from P is 45°. Find the length of the flagstaff.
(a) $10\sqrt{3}$ m
(b) $10(\sqrt{3} - 1)$ m
(c) $10(\sqrt{3} + 1)$ m
(d) $10/(\sqrt{3} - 1)$ m

14. The angle of elevation of the top of a vertical tower situated perpendicularly on a plane is observed as 60° from a point P on the same plane. From another point Q, 10m vertically above the point P, the angle of depression of the foot of

the tower is 30°. The height of the tower is
(a) 15 m
(b) 20 m
(c) 25 m
(d) 30 m

15. From a point 20 m away from the foot of a tower, the angle of elevation of the top of the tower is 30°. The height of the tower is
(a) $10\sqrt{3}$ m
(b) $20\sqrt{3}$ m
(c) $20/\sqrt{3}$ m
(d) $10/\sqrt{3}$ m

16. A rope is tightly stretched and attached from top of a vertical tower to the ground. The angle made by rope with ground is 30°. If height of the tower is m, find length of the rope.
(a) $m\sqrt{3}$
(b) 2m
(c) $m/\sqrt{3}$
(d) None of these

17. In a right angled triangle ABC, AB = 6 and AC =12 , find value of (sin A × tan A).
(a) $\sqrt{3}/2$
(b) 1
(c) 3/2
(d) $1/2\sqrt{3}$

18. A ladder reaches a window which is 12m above the ground on one side of the street. Keeping its foot at the same point, the ladder is turned to the other side of the street to reach a window 9m high. If the length of the ladder is 15m, find the width of the street
(a) 36 m
(b) 21 m
(c) 18 m
(d) 32 m

19. Two poles of heights 6m and 11m stand vertically upright on a plane ground.If the distance between their feet is 12m,then find the distance between their tops.
(a) 15 m
(b) 15.2 m
(c) 13 m
(d) 12.5 m

20.Two light houses are kept on the ground level away from each other at some distance, if their heights are 120 m and 90 m respectively and the light ray from each light house touches the foot of the other. Find the height from the ground level to the point at which the light rays intersect.
(a) 55.6 m
(b) 54.2 m
(c) 51.4 m
(d) 50.6 m

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	B	11	B
2	D	12	C
3	A	13	B
4	A	14	D
5	D	15	C
6	B	16	B
7	C	17	C
8	B	18	B
9	B	19	C
10	B	20	C

GEOMETRY

Classification of angles

Acute angle: An angle greater than 0° but less than 90° is called an acute angle

Right angle: An angle exactly equal to 90 ° is called a right angle

Obtuse angle: An angle greater than 90° but less than 180° is called an obtuse angle.

Straight angle: An angle exactly equal to 180° is called a straight angle.

Reflex angle: An angle greater than 180° but less than 360° is called a reflex angle.

Complete angle: An angle exactly equal to 360° is called a complete angle.

Complementary angles: If the sum of two angles equal to 90°, then the angles are complementary.

Supplementary angles: If the sum of two angles equal to 180°, then the angles are supplementary.

Adjacent angles: If two angles have a common hand and a common vertex then they are adjacent.

Basic properties of triangles

Sum of all interior angles of a triangle = 180°

Largest angle is opposite to the longest side in a triangle or the longest side is opposite to the largest angle

Smallest angle is opposite to the shortest side or the shortest side is opposite to the smallest angle.

Angles opposite to the equal sides are equal and the sides opposite to the equal angles are equal.

Sum of any two sides is greater than the third side.(Triangle inequality)

Difference of any two sides is lesser than the third side.

Exterior angles of a triangle: Any one of the three sides of a triangle is extended up to an outside point then the angle formed by the extension line and one side of the triangle is called the exterior angle of the triangle.

An exterior angle of a triangle is equal to the sum of its opposite interior angles.

Sum of all exterior angles = 360°

Geometrical centers of a triangle

Circum center(S)

The point of concurrency of the perpendicular bisectors of the three sides of a triangle is called the Circum center of the triangle.

If S is the circum center and SA = SB = SC = R, where R is the circum radius.

In an acute angled triangle circum center lies inside the triangle.

In a right angled triangle, circum centre is the midpoint of the hypotenuse, hence the circum radius = 1/2 (hypotenuse).

In an obtuse angled triangle circum centre lies outside the triangle.

In centre of a triangle (I)

In center is the point of concurrency of all the angle bisectors of a triangle.

If 'I' is the in centre and ID is a perpendicular drawn to the side BC.

ID is the in-radius of the triangle and that is denoted by 'r'.

Ortho center of a triangle (O)

Point of concurrency of the three altitudes of a triangle is called the ortho-center and it is denoted by 'O'.

In an acute angled triangle ortho-center lies inside the triangle.

In a right angled triangle ortho center is the vertex where right angle formed.

In an obtuse angled triangle ortho center lies outside the triangle.

Centroid of a triangle (G)

Centroid is the point of concurrency of all the medians.

The line segment joining one vertex and the midpoint of its opposite side is called median.

D, E and F are the mid points of the sides BC, AC and AB respectively.

AD, BE and CF are the medians.

G is the Centroid.

In a right angled triangle the length of the median drawn to the hypotenuse is equal to half the length of the hypotenuse.

Centroid divides medians in the ratio 2:1.

Area of Trianlge

- **General formula**

  Area = 1/2 * bh

  b → base of the triangle

  h→ height of the triangle

- **Heron's formula**

  Area = $\sqrt{(S\ (S-a)(S-b)(S-c))}$

  a, b and c → lengths of three sides

  S → semi perimeter

  S = a+b+c/2

- **Trigonometric application**

  Area = 1/2 ab Sin C= 1/2 bc Sin A= 1/2 ac Sin B

  a, b and c → lengths of three sides

  A, B and C → measure of three angles

- **Application of circum radius (R)**

  Area = abc/4r

  a, b and c → lengths of three sides

  R → circum radius

- **Application of in-radius (r)**

  Area = r.S

  r → in-radius

  S → semi perimeter

- **Equilateral Triangle**

  Area = $\sqrt{3}$ / 4 * a^2

  a → length of each side.

  Height of an equilateral triangle = $\sqrt{3}/4$ * a

- **Isosceles triangle**

  Area = b/4 * $\sqrt{(4a^2 - b^2)}$

a→ length of equal sides

b → length of third side

Internal angle bisector theorem

In ΔABC, AD is the angle bisector of ∠A, then AD/AC = BD/CD and BD * AC - AB * CD = AD^2

External angle bisector theorem

BE is the angle bisector of ∠CBD. then BC/AB = CE/AE

Apollonius theorem

In triangle ABC, AD is the median from vertex A to side BC.

$AB^2 + AC^2 = 2(AD^2 + BD^2)$

Pythagorean triplets

If any three magnitudes a, b and c satisfying the relation $a^2 = b^2 + c^2$, then the triplet (a, b, c) of these three values is called a Pythagorean triplet.

i.e. A triangle in the dimension of Pythagorean triplet should be right angled triangle.

Some important Pythagorean triplets are;

3 : 4 :5

5 : 12 : 13

7: 24 : 25

8 : 15 : 17

Special Pythagorean triplets

In an isosceles right angled triangle, sides are in the ratio 1 : 1: $\sqrt{2}$

Exact half of an equilateral triangle is a right triangle with angles 30°, 60° and 90°. In such a triangle sides are in the ratio 1 : $\sqrt{3}$: 2

Interesting fact..!!!

We can find out most of the Pythagorean Triplet by using the following general expressions;

2m, **m^2 - 1** and **m^2 + 1**, where m > 1.

Name of polygons as per number of sides

Number of sides (n)	Name
3	Triangle
4	Equilateral
5	Pentagon
6	Hexagon
7	Septagon/Heptagon
8	Octagon
9	Nonagon
10	Decagon

Basic results:

In any 'n' sided polygon;

Sum of interior angles = (n - 2) 180°

Sum of exterior angles = 360°

Number of diagonals from any particular vertex to rest all vertices's = n - 3

Total number of diagonals = n/(n-3)2

Number of triangles formed by joining vertices's = n (n-1)(n-2)/6

Regular polygons:

In a polygon if all sides are equal in length and all the angles are equal in measure, then it is a regular polygon.

Eg: square, equilateral triangle etc.

Trapezium

One pair of opposite sides are parallel. i.e. AB || CD.
Height of a trapezium is equal to the distance between the parallel sides.
Area = 1/2 * h(a+b), where a and b are the lengths of the parallel sides and h is distance between the parallel sides.
In a trapezium if the lengths of the non-parallel sides are equal, then it is an isosceles trapezium.

Parallelogram

Pair of opposite sides are parallel. i.e. AB || CD and BC || AD .
Height of a parallelogram is the distance between two parallel sides.
Diagonals bisect each other. i.e. M is the midpoint of AC and BD.
Δ AMB ≅ Δ CMD and ΔAMD ≅ ΔCMB.
Δ AMB, Δ CMD, ΔAMD and ΔCMB are all equal in area. i.e. Area of each triangle = 1/4 * Area of the parallelogram
Area = b * h, where 'b' is base and 'h' is height.

Rhombus

All sides are equal
Diagonals bisect each other at 90°.
ΔAMB ≅ ΔCMD ≅ ΔAMD ≅ ΔCMB. area of each triangle = 1/4 * Area of the rhombus
Area = 1/2 * (d1 * d2), where d_1 and d_2 are the diagonals.

Rectangle

Opposite sides are equal in length.
Opposite sides are parallel.
Diagonals are equal and bisect each other.
Four triangles formed by the intersection of two diagonals are all equal in area. i.e. area of each triangle = 1/4 * Area of the rectangle.
Out of the above mentioned triangles, opposite triangles are congruent.
Area = length * breadth
Perimeter = 2 (length + breadth)

Square

All sides are equal.
All angles are right angles.
Diagonals are equal and bisect each other at 90°.
All the four triangles formed by the intersection of diagonals are congruent.
Area = side^2 = a^2
Perimeter = 4a
Length of diagonal = $\sqrt{2}$ * a

Circles

Circle is the collection of all points which are equidistant from a particular point on a plane. This particular point is called the center of the circle and constant distance is the radius of the circle.

O – center r - radius
Diameter(d) = 2r Area = π r2
Circumference = 2 πr
Angle around the centre = 360°

Area and arc length of a sector:

If the central angle of a sector = θ°, then;
θ/360 = arc length of the sector/ 2 πr = area of the sector/ π r2
Area of sector = θ3/60 * π r2
Arc length of the sector = θ/360 * 2πr

Rules:

Perpendicular from the center of a circle to a chord will bisect the chord.
If two chords are intersecting in a circle, then;
PT * QT = RT * ST.
Angle inscribed in a semi circle is right angle.

Angle subtended at the center of a circle by an arc is double the angle subtended by it at any point on the remaining part of the circumference.

Angles in the same segment of a circle are equal/Angles lie in the same arc are equal.

Tangents and secants to a circle

If a line touches the circle at exactly one point, then the line is a tangent to the circle.
AB is a tangent and T is the point of tangency.
There are infinitely many tangents are possible to a circle.
Through one point on the circumference of a circle, there is exactly one tangent is possible to a circle.
From an outside point, there are two different tangents are possible to a circle.
In the diagram PQ and PR are the tangents from an outside point P.
PQ = PR
Radius to the point of tangency is perpendicular to the tangent.
In the below diagram AB is a tangent and ACD is a secant to the same circle.
AB^2 = AC * AD

If PBA and PDC are two secants to the same circle.
PB * PA = PC * PD

Cyclic quadrilateral

A quadrilateral inscribed in a circle is called Cyclic Quadrilateral.
In diagram ABCD is a cyclic quadrilateral.
Area of a cyclic quadrilateral = √((S-a)(S-b)(S-c)(S-d))
Where a, b, c and d are the four sides of the quadrilateral and S = a+b+c+d / 2
Opposite angles of a cyclic quadrilateral are supplementary. i.e. ∠A+∠C= ∠B+∠D=180°

Ptolemy's Theorem:

If ABCD is a cyclic quadrilateral, then the product of the two diagonals is equal to the sum of the product of the opposite sides. AC * BD = (AB * CD) + (AD * BC)

Results on Quadrilaterals:

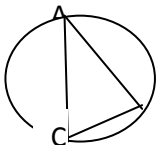
i. The diagonals of a parallelogram bisect each other.
ii. Each diagonal of a parallelogram divides it into triangles of the same area.
iii. The diagonals of a rectangle are equal and bisect each other.
iv. The diagonals of a square are equal and bisect each other at right angles.
v. The diagonals of a rhombus are unequal and bisect each other at right angles.
vi. A parallelogram and a rectangle on the same base and between the same parallels are equal in area.
vii. Of all the parallelogram of given sides, the parallelogram which is a rectangle has the greatest area.

CLASSWORK PROBLEMS

1. The ratio of areas of a circle to that of a square, if the circle circumscribes the square is,
(a) π:3
(b) π:2
(c) 2π:3
(d) 2π:1

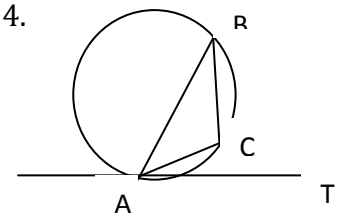
2. O is the centre of a circle with AC & BC being tangents originating from point c, which lies external to the circle. If angle ACB is 50 degrees, then angle AOB in degrees is,
(a) 80
(b) 90
(c) 120
(d) 130

3. In the figure above AC is the diameter of the circle. If angle ACB is 35 degrees then angle CAB in degrees



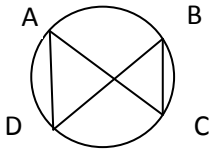
(a) 35
(b) 55
(c) 65
(d)70

4.



In the figure given above, AT is a tangent to the circle, with point of tangency at A. AB is a chord and angle BAT is 59 degrees. Angle ACB in degrees will be,
(a) 99
(b) 111
(c) 121
(d) 131

5. In the above figure AD & BC are chords of the circle which intersect at point E (not marked in the figure). If angle AED is 112 degrees & AD is parallel to BC, then angle ADE in degrees is,



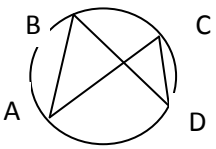
(a) 24
(b) 34
(c) 42
(d) 43

6. The maximum number of tangents that can be drawn to two circles touching each other is,
(a) 1
(b) 2
(c) 3
(d) 4

7. In a circle of radius 13 cm, a chord AB is positioned at a distance of 5 cm, from its centre. Find the length of the chord?
(a) 12cm
(b) 18cm
(c) 20cm
(d) 24cm

8. Two circles with radius 5cm & 3cm are drawn on a plane paper such that the distance between their centers is 8 cm. Which of the following is true?
(a) The circles intersect at two points.
(b) The circles touch each other externally.
(c) The circles touch each other internally.
(d) None of the above

9. In the figure AC & BD are not diameters of the circle. If Angle ABD is 55 degree then angle ACD is



(a) 55 degree
(b) 52 degree
(c) 90 degrees
(d) Cannot be determined

10. ABCD is a cyclic quadrilateral. Side AD is extended to a point E. If angle ABC is 105 degree then angle CDE is,
(a) 126 degree
(b) 100 degree
(c) 105 degrees

(d) 97.5 degree

11. A circle has a diameter of 14cm.The length of the tangent drawn to it from a point outside the circle which is at a distance of 25cm from the centre of the circle is,
(a) 24cm
(b) 26cm
(c) 27cm
(d) 26.5cm

12. Find the centroid of the triangle whose vertices are: (3, -5), (-7, 4), (10, -2)
(a) (2, -1)
(b) (-3, 1)
(c) (5, 2)
(d) (3, 4)

13. Find the third vertex of the triangle, if two of its vertices are at (-3, 1), (0, -2) and the centroid is at the origin
(a) (2, 1)
(b) (3, 1)
(c) (3, 4)
(d) (5, 2)

14. Find the circumcentre of the triangle whose vertices are (-2, -3), (-1, 0), (7, -6)
(a) (4, 8)
(b) (1, 3)
(c) (2, -2)
(d) (3, -3)

15. The three vertices of a parallelogram are (1, 1), (4, 4), (4, 8). Find the fourth vertex
(a) (-3, 1)
(b) (1, 5)
(c) (1, -3)
(d) (5, 1)

16. Find the centre of the circle passing through (5, -8), (2, -9), (2, 1)
(a) (2, -4)
(b) (-3, 1)
(c) (5, 2)
(d) (3, 4)

17. If the points (1, 4) (r, -2), (-3, 16) are collinear. Find r
(a) 7
(b) 5
(c) 6
(d) 3

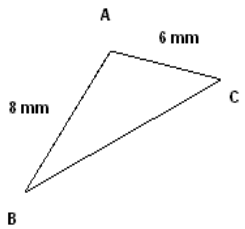
18. Find the area of the largest triangle that can be inscribed in a semicircle of diameter 6 cm?
(a) 10 cm^2
(b) 9 cm^2
(c) 7.5 cm^2
(d) 8.25 cm^2

19. Find the area of a cyclic quadrilateral whose sides are 8cm, 10cm, 12cm & 16 cm,
(a) $\sqrt{15015}$ cm^2
(b) $\sqrt{30030}$ cm^2
(c) $\sqrt{10010}$ cm^2
(d) None of these

20. The perimeter of a semicircle of radius 14 cm is,
(a) 44cm
(b) 72cm
(c) 88cm
(d) 48cm

21. Find the area of an equilateral triangle that has sides equal to 10 cm.
(a) 43.3 sq.cm
(b) 52.7 sq.cm
(c) 60 sq.cm
(d) 63.8 sq.cm

22. Triangle ABC, shown below, has an area of 15 mm^2. Side AC has a length of 6 mm and side AB has a length of 8 mm and angle BAC is obtuse. Find length of BC.



(a)12 mm
(b) 13.23 mm
(c) 15 mm
(d) 15.6 mm

23. If the largest angle in a triangle is 70 degrees, what is least possible value of the smallest angle of the triangle?
(a) 69 deg
(b) 1 deg
(c) 40 deg
(d) 39 deg

24. Find the number of non overlapping triangles which can be formed from the vertices of an octagon.
(a) 56
(b) 36
(c) 16
(d) 6

25. An order was placed for the supply of a carpet whose breadth was 6 m and length was 1.44 times the breadth. What will be the cost of a carpet whose length and breadth are 40% more and 25% more respectively than the first carpet. Given that the cost of carpet is Rs. 45 per sq m?
(a) Rs. 3642.40
(b) Rs. 3868.80
(c) Rs. 4216.20
(d) Rs. 4082.40

26. The perimeter of a square is double the perimeter of a rectangle. The area of the rectangle is 480 sq cm. Find the area of the square.
(a) 200 sq cm
(b) 72 sq cm
(c) 162 sq cm
(d) Cannot be determined

27. A cube of side one meter length is cut into small cubes of side 10 cm each. How many such small cubes can be obtained?
(a) 10
(b) 100
(c) 1000
(d) 10000

28. The volumes of two cones are in the ratio 1 : 10 and the radii of the cones are in the ratio 1 : 2. What is the ratio of their heights?
(a) 2 : 5
(b) 1 : 5
(c) 3 : 5
(d) 4 : 5

29. A metallic sphere of radius 12 cm is melted and drawn into a wire, whose radius of cross section is 16 cm. What is the length of the wire?
(a) 6 cm
(b) 8 cm
(c) 9 cm
(d) None of these

30. The difference between the length and breadth of a rectangle is 23m. If its perimeter is 206m. Then its area is:
(a) 2520 sq.m
(b) 2420 sq.m
(c) 2480 sq.m
(d) 2529 sq.m

31. Find the length of the tangent from a point which is at a distance of 5cm from the center of the circle of radius 3cm.
(a) 4cm
(b) 3cm
(c) 2cm
(d) 1cm

32. A chord of length 6cm is drawn in a circle of radius 5cm. Calculate its distance from the center of the circle.
(a) 1cm
(b) 4cm
(c) 8cm
(d) 10cm

33. How many bricks, each measuring 25cm x 11.25cm x 6cm, will be needed to build a wall of 8m x 6m x 22.5cm?
(a) 5600
(b) 6000
(c) 6400
(d) 7200

34. A boat having a length 3m and breadth 2m is floating on a lake. The boat sinks by 1cm when a man gets on it. The mass of the man is:
(a) 12 kg
(b) 60 kg
(c) 72 kg
(d) 96 kg

35.Find the area of the isoceles triangle whose perimeter is 20 cm and the ratio of equal side to unequal side is 3:4.
(a) $8\sqrt{5}$ cm^2
(b) $16\sqrt{5}$ cm^2
(c) $12\sqrt{5}$ cm^2
(d) $10\sqrt{5}$ cm^2

36.Find the circum radius of a triangle whose sides are 6cm,6cm and 8cm.
(a) $7/\sqrt{5}$ cm
(b) $8/\sqrt{5}$ cm
(c) $9/\sqrt{5}$ cm
(d) $11/\sqrt{5}$ cm

37.In triangle ABC, BC is produced upto D. If angle ACD is 128 degrees, then find the angle of BAC, if length of the sides AC and BC are equal
(a) 69 degrees
(b) 59 degrees
(c) 64 degrees
(d) Cannot be determined

38.In a right angled triangle ABC, right angled at B, and ∠ACB=30. If AB= 5 units, find the measure of AC.
(a) More than 10
(b) 10
(c) 8.6
(d) 5.3

39.Trianlge ABC is similar to EDF, AB = 5, ED = 22, and AC = 15 then find the measure of EF.
(a) 40
(b) 44
(c) 63
(d) 66

40. Let ABC be an equilateral triangle and AX, BY, CZ be the altitudes. Then the right statement out of the four given responses is?
(a) AX = BY = CZ
(b) AX ≠ BY ≠ CZ
(c) AX = BY ≠ CZ
(d) None of these

ASSIGNMENT PROBLEMS

1. The radius of a circle is 13 cm and the distance of its chord XY from centre is 12 cm. Then length of that chord is ?
(a) 15 cm
(b) 12 cm
(c) 10 cm
(d) 20 cm

2.Suppose in ΔABD , angle ADB = 20° and C is a point on BD such as AB = AC and CD = CA. Then what will be the measure of angle ABC ?
(a) 30
(b) 40
(c) 45
(d) 60

3. If G is the centroid and AD is a median of a triangle ABC, if AD is 12 cm then AG is?
(a) 4 cm
(b) 6 cm
(c) 8 cm
(d) 10 cm

4. Two tangents are drawn from point P to a circle at points A and B. O is the centre of circle. Then if angle AOP = 60°, then angle APB = ?
(a) 30
(b) 60
(c) 90
(d) 120

5. AB is the diameter of a circle with centre O. CD is a chord which is equal to radius in length. AC and BD are produced to meet at P. Then angle APB will be of?
(a) 30
(b) 60
(c) 90
(d) 120

6. G be the centroid of ΔABC and if AG = BC then what will be the measure of angle BGC?
(a) 45
(b) 60
(c) 90
(d) 75

7. Tangents drawn at two points P and Q lying on circumference of a circle cut each other at A if angle PAQ = 68°, then angle APQ is ?
(a) 28
(b) 34
(c) 56
(d) 68

8. In ΔABC internal angle bisector of angle C cuts AB at point D. In this AB ≠ AC and E is a point on CD such that AE = AD. If angle ABC = 50° then angle CAE is equal to
(a) 25
(b) 30
(c) 50
(d) 40

9. ABC is a triangle and P is any point on AB such that angle ACP = angle ABC, if AC = 9 cm, CP = 12 cm and BC = 15 cm, then AP is equal to?
(a) 4.5 cm
(b) 7.2 cm
(c) 9.7 cm
(d) 10.1 cm

10. Find the perimeter of a triangle whose area is 54 cm and in radius is 12 cm?
(a) 4 cm
(b) 7 cm
(c) 9 cm
(d) 10 cm

11. The lengths of perpendiculars drawn from any point in the interior of an equilateral triangle to the respective sides are 6cm, 8cm, and 10cm. The length of each side of the triangle is?
(a) 20 cm
(b) 21 cm
(c) $16\sqrt{3}$ cm
(d) $21\sqrt{3}$ cm

12. In a Δ ABC, D is the midpoint of line BC and E is the mid point of AD. Then find the ratio of area of Δ BEA and Δ ABC?
(a) 5:1
(b) 7:1
(c) 6:1
(d) 1:4

13. In a Δ ABC, BD and CE are two medians which intersects each other at 'O'. AO intersect the line ED at M. Find the ratio of AM : MO?
(a) 3:1
(b) 3:8
(c) 5:8
(d) 1:5

14. I is the incentre of a triangle ABC. If angle ACB = 55°, angle ABC = 65° then the value of angle BIC is?
(a) 110
(b) 120
(c) 130
(d) 150

15. In Δ ABC, angle B = 60° and angle C = 40°. If AD and AE be respectively the internal bisector of angle A and perpendicular on BC, then the measure of angle DAE is?
(a) 10
(b) 40
(c) 30
(d) 25

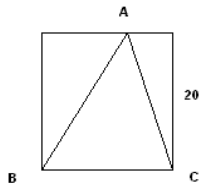
16. The angle between the external bisectors of two angles of a triangle is 60°. Then the third angle of the triangle is?
(a) 60
(b) 70
(c) 80
(d) 90

17. AD is the median of a triangle ABC and O is the centroid such that AO = 10 cm. The length of OD (in cm) is?
(a) 2 cm
(b) 5 cm
(c) 6 cm
(d) 9 cm

18. In a Δ ABC, BD & CE are the two medians which intersect each other at right angle. AB = 22, AC = 19, find BC = ?
(a) 12 cm
(b) 11 cm
(c) 13 cm
(d) 14 cm

19. In Δ ABC, AD, BE and CF are the altitudes in the ratio 1 : 2 : 3 respectively, then the ratio of AB : BC : CA is?
(a) 1:2:3
(b) 3:2:1
(c) 1:4:9
(d) 2:6:3

20. Triangle ABC shown below is inscribed inside a square of side 20 cm. Find the area of the Triangle.



(a) 90 sq.cm
(b) 120 sq.cm
(c) 150 sq.cm
(d) 200 sq.cm

Answer Key – Assignment Problems

Q.No	Option	Q.No	Option
1	C	11	C
2	B	12	D
3	C	13	A
4	B	14	B
5	B	15	A
6	C	16	A
7	C	17	B
8	C	18	C
9	B	19	D
10	C	20	D

MENSURATION

Some important formulae to remember.

Cuboid

Lateral surface area = $2(l+b)h$

Total surface area = LSA + $2lb$

Volume = lbh

Cube

Lateral surface area = $4a^2$

Total surface area = $6a^2$

Volume = a^3

Cylinder

Curved surface area = $2\pi rh$

Total Surface area = $2\pi rh + 2\pi r^2$

Volume = $\pi r^2 h$

Cone

Curved surface area = πrl

L – slanding height

$L^2 = r^2 + h^2$

Total surface area = $CSA+\pi r^2$

Volume = $1/3(\pi r^2 h)$

Hollow cylinder

Curved surface area = $2\pi h(R+r)$

Total surface area = $2\pi(R+r)(h+(R-r))$

Volume = $\pi h(R^2-r^2)$

Sphere

Total surface area = $4\pi r^2$

Volume = $4/3(\pi r^3)$

Hemisphere

Curved Surface area = $2\pi r^2$

Total surface area = $3\pi r^2$

Volume = $2/3(\pi r^3)$

CLASSWORK PROBLEMS

1.What will be the area of trapezium whose parallel sides are 22 cm and 16 cm long, and the distance between them is 11 cm?
A) 209 cm2
B) 282 cm2
C) 265 cm2
D) 179 cm2

2. The perimeter of a rectangle is 42 m. If the area of the square formed on the diagonal of the rectangle as its side is 1 1/12 times more than the area of the rectangle, find the longer side of the rectangle.
A) 19 m
B) 16 m
C) 9 m
D) 12 m

3. At the rate of Rs. 2 per sq m, cost of painting a rectangular floor is Rs.5760. If the length of the floor is 80% more than its breadth, then what is the length of the floor?
A) 45 m
B) 72 m
C) 40 m
D) 56 m

4. A 7 m wide path is to be made around a circular garden having a diameter of 7 m. What will be the area of the path in square metre?
A) 298
B) 256
C) 308
D) 365

5. The perimeter of a rectangle of length 62 cm and breadth 50 cm is four times perimeter of a square. What will be the circumference of a semicircle whose diameter is equal to the side of the given square?
A) 36 cm
B) 25 cm
C) 29 cm
D) 17 cm

6. What is the volume of a cylinder whose curved surface area is 1408 cm2 and height is 16 cm?
A) 7715 cm3
B) 9856 cm3
C) 8722 cm3
D) 7346 cm3

7. A cone with diameter of its base as 30 cm is formed by melting a spherical ball of diameter 10 cm. What is the approximate height of the cone?
A) 6 cm
B) 3 cm
C) 2 cm
D) 5 cm

8. A cylinder whose base circumference is 6 m can roll at a rate of 3 rounds per second. How much distance will the cylinder cover in 9 seconds?
A) 125 m
B) 162 m
C) 149 m
D) 173 m

9. A container is formed by surmounting a hemisphere on a right circular cylinder of same radius as that of hemisphere. If the volume of the container is 576π m3 and radius of cylinder is 6 m, then find the height of the container.
A) 14 m
B) 12 m
C) 20 m
D) 18 m

10. The radii of two cylinders are in the ratio 3 : 2 and their curved surface areas are in the ratio 3 : 5. What is the ratio of their volumes?
A) 8 : 11
B) 5 : 9
C) 7 : 4
D) 9 : 10

11. A right circular cone is exactly fitted inside a cube in such a way that the edges of the base of the cone are touching the edge of one of the faces of the cube and the vertex is on the opposite face of the cube. If the volumes of cube is 216 cm3 , what is the volume of the cone (approximately)?
A) 56 cm3
B) 60 cm3
C) 46 cm3
D) 50 cm3

12. Find the volume of a frustrum whose height is 12 cm, radius of the bottom is 4 cm and that of top is 10 cm.
A) 1982 cm3
B) 1882 cm3
C) 1961 cm3
D) 1992 cm3

13. If a square, circle and triangle has same perimeter then which one of them has the minimum area?
A) Square
B) Circle
C) Triangle
D) All have equal area

14. A cylinder has some water at height 20 cm. If a sphere of radius 6 cm is poured into it then find the rise in height of water if the radius of cylinder is 4 cm.
A) 3 cm
B) 9 cm
C) 18 cm
D) 15 cm

15. If the base of a pyramid is square and its side is $4\sqrt{2}$ cm and slant height of pyramid is 5 cm, find the volume of pyramid.
A) 48 cm3
B) 96 cm3
C) 24 cm3
D) 32 cm3

16. A sphere of 5 cm radius is melted and small sphere of radius 1 cm is made from it. Find the number of small sphere that can be made from it.
A) 25
B) 125
C) 50
D) 100

17. A person wants to make a cylindrical box which is open from the top. If the height of that box is 10 cm and radius is 7 cm find the area of sheet which is required to make it.
A) 880 cm2
B) 1188 cm2
C) 594 cm2
D) 440 cm2

18. A square park has a 2 m wide cross road in middle of it. If the side of park is 100 m then find the remaining area of the park.
A) 9650 m2
B) 9596 m2
C) 9600 m2
D) 9604 m2

19. In a right circular cone the radius of its base is 6 cm and its height is 14 cm. A cross section is made through the mid-point of the height parallel to the base. The volume of the lower portion is?
A) 528 cm3
B) 366 cm3
C) 498 cm3
D) 462 cm3

20. If radius of cone decrease by 50% and height increase by 20%. Then find the percentage change in the volume.
A) 70% decrease
B) 70% increase
C) 40% decrease
D) 40% increase

21.The perimeter of a square is equal to the perimeter of a rectangle of length 14 cm and breadth 20 cm. Find the circumference of a semicircle (approx.) whose diameter is equal to the side of the square.
A) 44 cm
B) 22 cm
C) 32 cm
D) 27 cm

22.There are two circles of different radius such that radius of the smaller circle is three – seventh that of the larger circle. A square whose area equals 3969 sq cm has its side as thrice the radius of the larger circle. What is the circumference of the smaller circle?
A) 59 cm
B) 56.5 cm
C) 49.5 cm
D) 65.5 cm

23.A Birthday cap is in the form of a right circular cone which has base of radius as 9 cm and height equal to 12 cm. Find the approximate area of the sheet required to make 8 such caps.
A) 3225 cm2
B) 3244 cm2
C) 3332 cm2
D) 3394 cm2

24.The barrel of a fountain pen is cylindrical in shape which radius of base as 0.7 cm and is 5 cm long. One such barrel in the pen can be used to write 300 words. A barrel full of ink which has a capacity of 14 cu cm can be used to write how many words approximately?

A) 598
B) 656
C) 508
D) 545

25.A vessel is in the form of a hemi-spherical bowl on which is mounted a hollow cylinder. The diameter of the sphere is 14 cm and the total height of vessel is 15 cm, find the capacity of the vessel.
A) 1977.23 cm3
B) 1999.45 cm3
C) 1840.67 cm3
D) 1950.67 cm3

26.A car has wheels of diameter 70 m. How many revolutions can the wheel complete in 20 minutes if the car is travelling at a speed of 110 m/s?
A) 550
B) 580
C) 600
D) 640

27.A clock has its hour hand of length 7 cm. What area will it swept in covering 10 minutes?
A) 32.17 cm2
B) 25.67 cm2
C) 45.45 cm2
D) 41.23 cm2

28.The diameters of the internal and external surfaces of a hollow spherical shell are 10cm and 6 cm respectively. If it is melted and recasted into a solid cylinder of length 8/3 cm, find the diameter of the cylinder.
A) $28\sqrt{2}$ cm
B) $14\sqrt{2}$ cm
C) $26\sqrt{2}$ cm
D) $18\sqrt{2}$ cm

29.The radii of two cylinders are in the ratio 4 : 5 and their curved surface areas are in the ratio 3 : 5. What is the ratio of their volumes?
A) 12 : 25
B) 13 : 21
C) 7 : 19
D) 11 : 15

30.. The height of the cone is 24 cm and the curved surface area of cone is 550 cm2. Find its volume.
A) 1200 cm2
B) 1232 cm2
C) 1240 cm2
D) 1260 cm2

31. The side of a square base of a pyramid increases by 20% and its slant height increases by 10%. Find the per cent change in Curved Surface Area.
A) 28%
B) 58.4%
C) 32%
D) 45.20%

32. If a copper wire is bend to make a square whose area is 324 cm2. If the same wire is bent to form a semicircle, then find the radius of semicircle.
A) 7 cm
B) 14 cm
C) 11 cm
D) 21 cm

33. A man wants to make small sphere of size 1 cm of radius from a large sphere of size of 6 cm of radius. Find out how many such sphere can be made?
A) 216
B) 125
C) 36
D) 200

34. A sphere of radius 9 cm is dip into a cylinder who is filled with water upto 20 cm. If the radius of cylinder is 6 cm find the percentage change in height.
A) 30%
B) 40%
C) 35%
D) 45%

35. The length of the perpendicular drawn from any point in the interior of an equilateral triangle to the respective sides are P1, P2 and P3. Find the length of each side of the triangle.
A) $2/\sqrt{3}$ *(P1 + P2 + P3)
B) 1/3 * (P1 + P2 + P3)
C) $1/\sqrt{3}$ *(P1 + P2 + P3)
D) $4/\sqrt{3}$ *(P1 + P2 + P3)

36.. A conical cup is filled with ice cream. The ice cream forms a hemispherical shape on its top. The height of the hemispherical part is 7 cm. The radius of the hemispherical part equals the height of cone then the volume of ice cream is?
A) 1078 cm3
B) 1708 cm3
C) 7108 cm3
D) 7180 cm3

37. Assume that a drop of water is spherical and its diameter is one tenth of a cm. A conical glass has equal height to its diameter of rim. If 2048000 drops of water fill the glass completely then find the height of the glass.
A) 12 cm
B) 16 cm
C) 32 cm
D) 18 cm

38. If the radius of a sphere increase by 4 cm then the surface area increase by 704 cm2 . The radius of the sphere initially was?
A) 5
B) 4
C) 6
D) 8

39. By melting two solid metallic spheres of radii 1 cm and 6 cm, a hollow sphere of thickness 1 cm is made. The external radius of the hollow sphere will be.
A) 8 cm
B) 9 cm
C) 6 cm
D) 7 cm

40. Find the curved surface of cone which can inscribed in a cylinder of base radius 5 cm and height 12 cm.
A) (60pi) cm^2
B) (65pi) cm^2
C) (72pi) cm^2
D) None of these

ASSIGNMENT PROBLEMS

1. A room 10mtr long 4mtr broad and 4mtr high has two windows of 2*1 mtr and 3*2 mtr. Find the cost of papering the walls with paper 50cm wide at 25 paisa per meter?
A) Rs.48
B) Rs.50
C) Rs.52
D) Rs.54

2. A cubical block of 8m*12m*16m is cut into exact number of equal cubes. The least possible number of cubes will be?
A) 9
B) 24
C) 18
D) 30

3. Find the volume, curved surface area and the total surface area of a hemisphere of radius 21cm?
A) 19404cm^3, 2772cm^2, 4158cm^2
B) 4158cm^3, 5000cm^2, 4000cm^2
C) 20000cm^3, 40000cm^2,1000cm^2
D) 30000cm^3, 2000cm^2,5000cm^2

4. A right circular cone is exactly fitted inside a cube in such a way that the edges of the base of the cone are touching the edges of one of the faces of the cube and the vertex is on the opposite face of the cube. If the volume of cube is 2744 cubic cm, what is the approximate volume of the cone?
A) 715
B) 719

C) 729
D) 725

5. A hollow cylindrical tube is open at both ends is made of iron 4cm thick. If the external diameter be 52cm and the length of the tube be 120cm, find the number of cubic cm of iron in it?approx
A) 72419
B) 72425
C) 72405
D) 72411

6. A solid toy is in the form of a hemisphere surmounted by a right circular cone. Height of the cone is 2cm and the diameter of the base is 4cm. If a right circular cylinder circumscribe the solid, find how much more space will it cover?
A) 4π cm^3
B) 2π cm^3
C) 16π cm^3
D) 8π cm^3

7. The ratio between volumes of a hemisphere and a cone is 1:1. If the cone's height is equal to its diameter, then find the ratio of diameter of hemisphere and cone ?
A) 2:1
B) 1:1
C) 3:2
D) 2:3

8. If the height of a pyramid is 12cm and its base is a square which perimeter is 40cm, then find the volume of pyramid?
A) 300 cm^3
B) 200 cm^3
C) 400 cm^3
D) 500 cm^3

9. If the perimeter of square, circle, rectangle, are equal. Then whose area is largest?
A) Circle
B) Square
C) Rectangle
D) All are equal

10. A rectangular plot of grass is 50m long and 40m broad. From the center of each side a path of 3m wide goes across the center of the opposite side. Find the area of path?
A) 270
B) 280
C) 251
D) 261

11. Poles are to be fixed along the boundary of a rectangular field in such a way that distance between any two adjacent poles is 2 m.The perimeter of the field is 70m and length and the breadth of the field are in the ratio 4:3 resp. How many poles will be required?
A) 42
B) 40
C) 35
D) 38

12.The circumference of a circular garden is 1320m.Find the area. Outside the garden , a road of 2m width runs around it .What is the area of this road and calculate the cost of gravelling it at the rate of 50 paise per sq. m .
A) 2500.15 m2, Rs.1500.15
B) 2652.57 m2, Rs.1326.285
C) 2541.14 m2, Rs.1600.47
D) 3245.78 m2,Rs.2000

13.A square shape of park of area 23,104 sq. M is to be enclosed with wire placed at heights 1,2,3,4 m above the ground . Find required length of the wire ,,if its length required for each circuit is 10% greater than the perimeter of the field ?
A) 2675.2m
B) 2145.12m
C) 2750m
D) 2478.11m

14.Area of a hexagon is $54\sqrt{3}$ cm^2. What is its side ?

A) 7cm
B) 5cm
C) 4cm
D) 6cm

15.Smallest side of a right angled triangle is 8 cm less than the side of a square of perimeter 64cm . Second largest side of the right angled triangle is 4 cm less than the length of rectangle of area 112 sq. cm and breadth 8 cm .What is the largest side of the right angled triangle?
A) 9.2cm
B) 7.75cm
C) 12.80 cm
D) 14cm

16.If the radius of the circular field is equal to the side of a square field .If the difference between the area of the circular field and area of the square field is 5145 sq. m ,then calculate the perimeter of the circular field?
A) 421m
B) 315m
C) 310m
D) 308m

17.A rectangular plot has a concrete path running in the middle of the plot parallel to the parallel to the breadth of the plot. The rest of the plot is used as a lawn ,which has an area of 240sq. m. If the width of the path is 3m and the length of the plot is greater than its breadth by 2m ,what is the area of the rectangular plot(in m)?
A) 410m
B) 288m
C) 250m
D) 300m

18.A solid spherical ball of radius r is converted into a solid circular cylinder of radius R. If the height of the cylinder is twice the radius of the sphere ,then find the relation between these two with respect to radius.
A) $R = r\sqrt{(3/4)}$
B) $R = r\sqrt{(3/2)}$
C) $R = r\sqrt{(1/2)}$
D) $R = r\sqrt{(2/3)}$

19.A rectangular tank of length 37 (1/3) m internally , 12 m in breadth and 8 m in depth is full of water .Find the weight of water in metric tons, given that one cubic metre of water weighs 1000kg.
A) 3584 metric tons
B) 4500 metric tons
C) 4101 metric tons
D) 3870 metric tons

20.An equilateral triangle and a regular hexagon have equal perimeters. The ratio of the area of the triangle and that of the hexagon is :
A) 3:4
B) 4:9
C) 1:2
D) 2:3

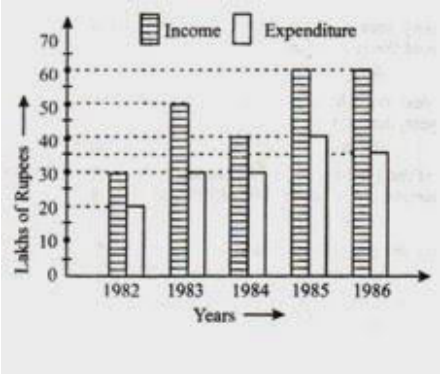
Answer key – Assignment Problems

Q.No	Option	Q.No	Option
1	C	11	C
2	B	12	B
3	A	13	A
4	B	14	D
5	D	15	C
6	D	16	D
7	B	17	B
8	C	18	D
9	A	19	A
10	D	20	D

DATA INTERPRETATION

CLASSWORK PROBLEMS

Directions:Read the graph and answer questions.Income and Expenditure of a company over the year (in lakhs of rupees).



1.The ratio of the average income of all the years to the average profit is :
(a) 24 : 13
(b) 48 : 17
(c) 12 : 7
(d) 6 : 5

2.Percentage increase in profit in 1986 over 1982 is:
(a) 150 %
(b) 120 %
(c) 100%
(d) 80%

3.The total income exceeds the total expenditure over the year 1982 to 1986 by:
(a) 85 lakhs
(b) 105 lakhs
(c) 115 lakhs
(d) 120 lakhs

4.What is the difference in profit between 1983 and 1984 (in lakhs of rupees) :
(a) No profit
(b) 5
(c) 10
(d) 15

5.The number of years in which the income is more than the average income of the given year is:
(a) One
(b) Two
(c) Three
(d) Four

Directions: The pie chart given here shows expenditure incurred by a family on the various items and their savings , which amount to Rs 8000 in a month .study the chart and answer the question number 6 to 10 based on the pie chart

6.How much more amount is spent on food than housing?
(a) 1000
(b) 3000
(c) 2000
(d) 2500

7.How much expenditure incurred on the education?
(a) 3000
(b) 5000
(c) 4000
(d) 7000

8.The ratio of the expenditure on food to the saving is?
(a) 3 :2
(b) 2 :1
(c) 4:3
(d) 3 :4

9.What is the expenditure of the family in education & housing for the month?
(a) 10000
(b) 18000
(c) 15000
(d) 16000

10.What are the ratio of expenditure on education and housing?
(a) 2:7
(b) 7:2
(c) 2:5
(d) 3:8

Direction: Study the following table carefully and answer the questions given below it.
Number of Executives recruited by six different organizations over the years.

Organization	P	Q	R	S	T	U
2004	458	512	418	502	476	492
2005	522	536	472	500	482	523
2006	480	495	464	508	488	518
2007	506	505	428	444	490	534
2008	427	485	422	512	510	498
2009	492	488	444	499	512	510

11. What is the total number of executives recruited by all the organizations together in the year 2006?
(a) 2927
(b) 3042
(c) 2864
(d) 3143
(e) None of these

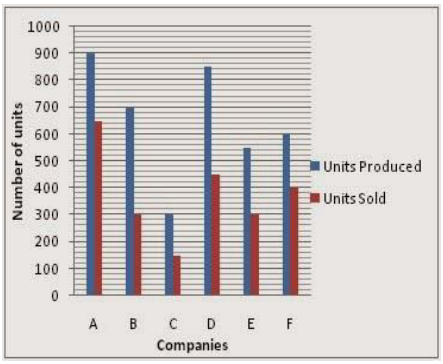
12.What is the ratio of total number of executives recruited by organization U in the years 2007 and 2009 together to the total number of executives recruited by organization P in the same years?
(a) 436:517
(b) 499:522
(c) 517:436
(d) 522:499
(e) None of these

13.What is the average number of executives recruited by organization S over all the years together? (rounded off to the nearest integer)
(a) 494
(b) 482
(c) 514
(d) 506
(e) 478

14. What is the per cent increase in the number of executives recruited by organization R in 2005 from the previous year?(rounded off to two digits after decimal)
(a)18.67
(b) 12.92
(c) 16.48
(d)13.21
(e) None of these

15.The number of executives recruited by organization T in the year 2008 forms approximately what per cent of the total number of executives recruited by all the organizations together in that year?
(a) 11
(b) 31
(c) 18
(d) 26
(e) 23

Direction: Study the following graph carefully and answer the questions given below it.Production and sale of printers of various companies in a month



16.What is the average number of units sold by all the companies together?
(a) 360
(b) 390
(c) 375
(d) 410
(e) None of these

17. Which company had the highest percentage of sale with respect to its production?
(a) D
(b) B
(c) E
(d) A
(e) None of these

18. What is the average number of units produced by all the companies

together?
(a) 675
(b) 650
(c) 625
(d) 600
(e) None of these

19. The total units sold by the companies A, B and C together is approximately what per cent of the total units produced by these companies?
(a) 62
(b) 50
(c) 76
(d) 84
(e) 57

20.What is the ratio of the total production of companies D and E to the total sale of the same companies?
(a) 28:15
(b) 9:5
(c) 15:11
(d) 2:3
(e) None of these

DATA SUFFICIENCY

21. Which day of the last week did Satish meet Kapil, at Kapil's residence?
I. Kapil was out of town from Monday to Wednesday. He returned on Thursday morning.
II. On Friday night Satish telephoned his friend to inform that only yesterday he had got approval of Kapil after personally explaining to him all the details.
(a) if the data in statement I alone are sufficient to answer the question;
(b)if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

22. What is Gagan's age?
I. Gagan, Vimal and Kunal are all of the same age.
II. Total age of Vimal, Kunal and Anil is 32 and Anil is as old as Vimal and Kunal together.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

23. How is Rakesh related to Keshav?
I. Tapan's wife Nisha is paternal aunt of Keshav.
II. Rakesh is the brother of a friend of Nisha.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

24. Manoj, Prabhakar, Akash and Kamal are four friends. Who among them is the heaviest?
I. Prabhakar is heavier than manoj and Kamal but lighter than Akash.
II. Manoj lighter than Prabhakar and Akash but heavier than Kamal.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c)if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e)If the data in both the statements together are needed.

25. Hemanth ranks tenth in a class. How many students are there in the class?
I. His friend got 58th rank which is the last.
II. Hemanth's rank from the last is 49th.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;

(c) if the data either in I or II alone are sufficient to answer the question;
(d)if the data even in both the statements together are not sufficient to answer the question;
(e)If the data in both the statements together are needed.

26. Vipin's and Javed's salaries are in the proportion of 4:3 respectively. What is Vipin's salary?
I. Javed's salary is 75% that of Vipin's salary.
II. Javed's salary is Rs.4500.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

27. At what time did Sonali leave her home for office?
I. Sonali received a phone call at 9.15 a.m. at her home.
II. Sonali's car reached office at 10.15 a.m., 45 minutes after she left her residence.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

28. How many sons does D have?
I. A's father has three children.
II. B is A's brother and son of D.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

29. A, B, C, D and E are sitting in a row. B is between A and E. Who among them is in the middle?
I. A is left of B and right of D.
II. C is at the right end.
(a)if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

30. How many gift boxes were sold on Monday?
I. It was 10% more than the boxes sold on the earlier day i.e., Sunday.
II. Every third visitor to the shop purchased the box and 1500 visitors were there on Sunday.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e)If the data in both the statements together are needed.

31. What is the monthly salary of Praveen?
I. Praveen gets 15% more than Sumit while Sumit gets 10% less than Lokesh.
II. Lokesh's monthly salary is Rs.2500.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c). if the data either in I or II alone are sufficient to answer the question;
(d_ if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

32. How many pages of the book X did Robert read on Sunday?

I. The book has 300 pages out of which two-third were read by him before Sunday.
II. Robert read the last 40 pages of the book on the morning of Monday.
A. if the data in statement I alone are sufficient to answer the question;
B. if the data in statement II alone are sufficient answer the question;
C. if the data either in I or II alone are sufficient to answer the question;
D. if the data even in both the statements together are not sufficient to answer the question;
E. If the data in both the statements together are needed.

33. In the last month the company decided to increase the cost of its mixer by 10%. What is the present price of the mixer?
I. The cost of mixer and juicer together was Rs. 2850 a month ago.
II. The amount of 10% increase on the mixer comes to Rs.220.
A. if the data in statement I alone are sufficient to answer the question;
B. if the data in statement II alone are sufficient answer the question;
C. if the data either in I or II alone are sufficient to answer the question;
D. if the data even in both the statements together are not sufficient to answer the question;
E. If the data in both the statements together are needed.

34. In a certain language, 'pit nac mit' means 'red pant shirt'. Which word means 'pant' in that language?
I. 'mit tim nac sir' means 'he wore red pant'.
II. 'nee jic pit' means 'shirt is dirty'.
A. if the data in statement I alone are sufficient to answer the question;
B. if the data in statement II alone are sufficient answer the question;
C. if the data either in I or II alone are sufficient to answer the question;
D. if the data even in both the statements together are not sufficient to answer the question;
E. If the data in both the statements together are needed.

35. In a code, 'lee pee tin' means 'Always keep smiling'. What is the code for 'smiling'?
I. 'tin lut lee' means 'Always keep left'.
II. 'dee pee' means 'Rose smiling'.
A. if the data in statement I alone are sufficient to answer the question;
B. if the data in statement II alone are sufficient answer the question;
C. if the data either in I or II alone are sufficient to answer the question;
D. if the data even in both the statements together are not sufficient to answer the question;
E. If the data in both the statements together are needed.

36. How many visitors saw the exhibition yesterday?
I. Each entry pass holder can take up to three persons with him/her.
II. In all, 243 passes were sold yesterday.
A. if the data in statement I alone are sufficient to answer the question;
B. if the data in statement II alone are sufficient answer the question;
C. if the data either in I or II alone are sufficient to answer the question;
D. if the data even in both the statements together are not sufficient to answer the question;
E. If the data in both the statements together are needed.

37. How much was the total sale of the company?
I. The company sold 8000 units of product A each costing Rs.25.
II. This company has no other product line.
A. if the data in statement I alone are sufficient to answer the question;
B. if the data in statement II alone are sufficient answer the question;
C. if the data either in I or II alone are sufficient to answer the question;
D. if the data even in both the statements together are not sufficient to answer the question;
E. If the data in both the statements together are needed.

38. In what proportion would Raj, Karan and Altaf distribute profit among them?
I. Raj gets two - fifth of the profit.
II. Karan and Altaf have made 75% of the total investment.
A. if the data in statement I alone are sufficient to answer the question;

B. if the data in statement II alone are sufficient answer the question;
C. if the data either in I or II alone are sufficient to answer the question;
D. if the data even in both the statements together are not sufficient to answer the question;
E. If the data in both the statements together are needed.

39. What will be the total weight of 10 poles each of the same weight?
I. One-fourth of the weight of a pole is 5 kilometers.
II. The total weight of three poles is 20 kilometers more than the total weight of two poles.
A. if the data in statement I alone are sufficient to answer the question;
B. if the data in statement II alone are sufficient answer the question;
C. if the data either in I or II alone are sufficient to answer the question;
D. if the data even in both the statements together are not sufficient to answer the question;
E. If the data in both the statements together are needed.

40. Rajiv's monthly salary is Rs.4000. What is Atul's monthly salary?
I. Atul gets Rs.500 more than the average salary of his and Rajeev's.
II. Average of Rajeev's and Atul's salary is Rs.4500.
A. if the data in statement I alone are sufficient to answer the question;
B. if the data in statement II alone are sufficient answer the question;
C. if the data either in I or II alone are sufficient to answer the question;
D. if the data even in both the statements together are not sufficient to answer the question;
E. If the data in both the statements together are needed.

ASSIGNMENT PROBLEMS

Direction (1 - 5) : Study the following table and answer the questions based on it. Expenditures of a Company (in Lakh Rupees) per Annum Over the given Years

Year	Item of Expenditure				
	Salary	Fuel and Transport	Bonus	Interest on Loans	Taxes
1998	288	98	3.00	23.4	83
1999	342	112	2.52	32.5	108
2000	324	101	3.84	41.6	74
2001	336	133	3.68	36.4	88
2002	420	142	3.96	49.4	98

1.What is the average amount of interest per year which the company had to pay during this period?
(a) Rs. 32.43 lakhs
(b) Rs. 33. 72 Lakhs
(c) Rs. 34 . 18 lakhs
(d) Rs. 36.66 lakhs
(e) None of these

2.The total amount of bonus paid by the company during the given period is approximately what percent of the total amount of salary paid during this period?
(a) 0.1 %
(b) 0.5%
(c) 1%
(d) 1.25%
(e) None of these

3. Total expenditure on all these items in 1998 was approximately what percent of the total expenditure in 2002?
(a) 62%
(b) 66%
(c) 69 %
(d) 71 %
(e) 85%

4.The total expenditure of the company over these items during the year 2000 is?
(a) Rs. 544.44 lakhs
(b) Rs. 501.11 lakhs
(c) Rs. 446.46 lakhs
(d) Rs. 478.87 lakhs
(e) None of these

5.The ratio between the total expenditure on Taxes for all the years and the total expenditure on Fuel and Transport for all the years respectively is approximately?
(a) 4 : 7
(b) 10 : 13
(c) 15 : 18
(d) 5 : 8
(e) None of these

Directions(6–10) Study the given table carefully to answer the questions. The following table gives number of people staying in five different localities and the percentage Breakup of Men, Women and Children in them.

Area	Total	Percentage		
		Men	Women	Child
A	2820	45	30	25
B	1560	35	45	20
C	3600	44	38	18
D	4250	64	26	10
E	4400	38	43	19

6.What is the total number of men and children staying in locality D together ?
(a) 4135
(b) 4315
(c) 1530
(d) 3145
(e) None of these

7.What is the total number of children staying in localities C and D together?
(a) 1285
(b) 1073
(c) 1125
(d) 1605
(e) None of these

8.What is the respective ratio of number of men staying in locality A to the number of men staying in locality C ?
(a) 171 : 146
(b) 176 : 141
(c) 141 : 176
(d) 146 : 171
(e) None of these

9.Total number of people staying in locality E forms approximately what per cent of the total number of people staying in locality A ?
(a) 181
(b) 132
(c) 156
(d) 144
(e) 117

10.The number of women staying in which locality is the highest ?
(a) C
(b) E
(c) A
(d) B
(e) None of these

DATA SUFFICIENCY

11. Among five friends who is the tallest?
I. D is taller than A and C.
II. B is shorter than E but taller than D.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

12. What is the price range of ordinary wall clocks?
I. The price range of ordinary wrist watches of company X is Rs.400 to Rs.600.
II. The price range of ordinary wall clocks of company X is 50% that of their ordinary watches.

(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e)If the data in both the statements together are needed.

13. What is the amount of rice exported from India?
I. India's export to America is 80,000 tonnes and this is 10% of the total rice exports.
II. India's total export tonnage of rice is 12.5% of the total of 1.9 million tonnes.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

14. How much amount Ronnie required to pay for the new car in the buy-back schema?
I. The cost of the new car was three times the cost price of his old car.
II. His old car was valued at Rs.25000 under buy-back schema.
(a)if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d)if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

15. How many votes did candidate X receive in the city Cooperative bank's director's election?
I. Candidate X got 17 percent of the votes that were cast.
II. Four-fifth of the 1000 eligible voters cast their votes.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c)if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

16. What is Manohar's birthday?
I. Manohar's father was born on 27th May, 1948.
II. Manohar is 25 years younger than his mother.
(a)if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c)if the data either in I or II alone are sufficient to answer the question;
(d)if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

17. On which day in April is Gautham's birthday?
I. Gautam was born exactly 28 years after his mother was born.
II. His mother will be 55 years 4 months and 5 days on August 18 this year.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c)if the data either in I or II alone are sufficient to answer the question;
(d)if the data even in both the statements together are not sufficient to answer the question;
(e)If the data in both the statements together are needed.

18. Total money with Naresh and Ajay is 28 percent of that with Usman. How much money is Ajay having?
I. Usman has got Rs.75000.
II. The ratio of money of Naresh to money held by Ajay is 1 : 3.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;

(c) if the data either in I or II alone are sufficient to answer the question;
(d)if the data even in both the statements together are not sufficient to answer the question;
(e). If the data in both the statements together are needed.

19. What time did the train leave today?
I. The train normally leaves on time.
II. The scheduled departure is at 14.30.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c) if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

20. On which day in January, Subhas left for Germany?
I. Subhas has so far spent 10 years in Germany.
II. Subhas's friend Anil left for Germany on 15th February and joined Subhas 20 days after Subhas arrival.
(a) if the data in statement I alone are sufficient to answer the question;
(b) if the data in statement II alone are sufficient answer the question;
(c). if the data either in I or II alone are sufficient to answer the question;
(d) if the data even in both the statements together are not sufficient to answer the question;
(e) If the data in both the statements together are needed.

Answer key – Assignment Problems

Q.No	Option	Q.No	Option
1	D	11	E
2	C	12	E
3	C	13	B
4	A	14	E
5	B	15	E
6	C	16	D
7	B	17	E
8	C	18	E
9	C	19	D
10	B	20	D