MANIDHANAEYAM FREE IAS ACADEMY – TNPSC - PRELIMINARY EXAM

UNIT – X – APTITUDE & MENTAL ABILITY

ARITHMETIC PROGRESSION AND GEOMETRIC PROGRESSION

1. Arithmetic Progression (AP):

- Structure of AP: a, (a + d), (a+2d), (a+3d),…..
- Characterized by a common difference 'd'. [d=t2-t1]
- 'n'th term $T_n = a + (n -)1\ d$, where a is the first term of the series
- Sum to n terms $S_n = n/2\ (a + l)$, where 'l' denotes the last term of the series of n terms or
- $S_n = n/2\ [2a+(n-1)d]$ (to be used if value of l is not readily available)
- Sum of 'n' natural numbers = [n(n+1)]/2 (e.g. 1+2+3+…..n)
- Sum of 'n' odd numbers = $[(l+1)/2]^2$ or n^2 (e.g. 1+3+5+…..n)
- Sum of 'n' square natural number = [n(n+1)(2n+1)]/6 (e.g. $1^2+2^2+3^2+…..n^2$)
- Sum of 'n' cube natural number = $[n(n+1)/2]^2$ (e.g. $1^3+2^3+3^3+…..n^3$)

2. Geometric Progression (GP):

- Stricture of GP: a, ar, ar^2, ar^3,…..
- characterized by a common ratio 'r' [r = t2/t1]
- 'n'th term $t_n = ar^{n-1}$, where 'a' is the first term of the
- series Sum to 'n' terms $S_n = a(r^n-1)/r-1$ (if r>1)
- series Sum to 'n' terms $S_n = a(1-r^{n-})/1-r$ (if r<1)
- If $n \to \infty$, and it possesses a sum to infinity given by $S\infty = a/1-r$

ALPHA-NUMERIC SEQUENCE PUZZLE

There are a variety of types in which questions may be asked for the alphanumerical series. These include:

- **Missing Series:** Where a series of alphabets and numbers may be given a particular pattern and candidates may be asked to fill in the blank space with the required element
- **Alphabet-Number-Symbol:** These questions may also be asked in a format where a series with alphabets, number and different types of symbols (like &, *, $, etc.) may be given, and questions may be asked based on them
- **Only Alphabetic Series:** Series with either missing element or questions with sub-parts may be asked which comprise only English Alphabets and no numbers, set in a specific pattern
- **Only Numerical Series:** Series comprising only numbers, set in a specific pattern may be asked the exam. Questions based on this type may be asked in the form of rearrangement of numbers or digits with the number in ascending, descending or any other order.

Q.1) Three numbers are in the ratio 2:5:7. If the first number, the resulting number on the subtraction of 7 from an arithmetic sequence, then find the numbers.

98, 70, 28

a) 70, 98, 28

b) 28, 98, 70

c) 28, 70, 98

Ans: D

Solution: Let the numbers be 2x, 5x, 7x (x not equal to 0)

Given that, 2x, 5x-7, 7x are in A.P

b-a = c-b

5x-7-2x = 7x-(5x-7)

3x-7 = 2x+7

X = 14

The 3 numbers are 2x14, 5x14,7x14 = 28,70,98.

Q.2) Find the sum of all 3 digit natural numbers, which are divisible by 8.

a) 6848

b) 14896

c) 61376

d) 46745

Ans: C

Solution: The 3-digit natural numbers divisible by 8 are 104, 112, 120…992.

S_n = 104 = 104 + 112 +….+992

a =104; l = 992; d= 112-104 = 8

n = $\frac{l-a}{d} + 1$ = $\frac{992-104}{8} + 1$ = 888/8 +1 = 111+1 = 112

$S_n = n/2(a + l)$ = 112/2(104+992) = 56x1096 = 61376.

Sum of all 3 digit numbers divisible by 8 is 61376.

Q.3) Find the sum of all natural numbers between 300 and 600 which are divisible by 7.

A) 19264

B) 18646

C) 19624

D) 17624

Ans: A

Solution: The natural numbers between 300 and 600 which are divisible by 7 are 301,308, 315, …595.

The sum of all natural numbers between 300 and 600 is 301 + 315 + ….595

The term of above series are in A.P

A = 301, d = 7, l = 595

$n = \frac{l-a}{d} + 1 = \frac{595-301}{7} + 1 = 43$

$S_n = n/2(a + l) = 43/2(301+595) = 19264$

Q.4) The house of a street are numbered from 1 to 49.Senthil's house is numbered such that the sum of numbers of the house prior to Senthil's house is equal to the sum of numbers of the houses following Senthil's house .Find Senthil's house numbers?

A) 45

B) 35

C) 55

D) 25

Ans: B

Solution: Let Senthil's house number be x.

Given that 1 + 2 + 3+….(x-1) = (x+1)+(x+2)+…+49

1 + 2 + 3+….(x-1) = (1 + 2 +3 +….+49) – (1 + 2 + 3 +……+ x)

(x-1)/2[1 +(x-1)] = 49/2[1+49] – x/2[1+x]

X(-1)/2 = (49x50)/2 – x(X+1)/2

x^2-x = 2450-x^2-x

$2x^2 = 2450$

$X^2 = 1225$

X = 35

Therefore, Senthil's house number is 35.

Q.5) The measures of the interior angles taken in order of a polygon form an arithmetic sequence. The least measurement in the sequence is 85°. The greatest measurement is 215°. Find the number of sides in the given polygon.

A) n = 12

B) n = 13

C) n = 14

D) n = 15

Ans: A

Solution: Let n denote the number of sides of the polygon.

Now, the measures of interior angles form an arithmetic sequence.

Let the sum of the interior angles of the polygon be

$S_n=a+(a+d)+(a+2d)+....+l$, where a=85 and l=215.

We have, $S_n=\frac{n}{2}[l+a]$...(1)

We know that the sum of the interior angles of a polygon is $(n-2)\times180^\circ$.

Thus, $S_n=(n-2)\times180$

From (1), we have $2n[l+a]=(n-2)\times180$

$\Rightarrow 2n[215+85]=(n-2)\times180$

$150n=180(n-2)\Rightarrow n=12$.

Hence, the number of sides of the polygon is 12.

Q.6) If a person joins his work in 2010 with an annual salary of Rs.30,000 and receives an annual increment of Rs.600 every year, in which year, will his annual salary be Rs.39,000?

A) 16

B) 18

C) 12

D) 14

Ans: A

Solution: a = 30000, d = 600, t = 39000

$t = a+(n-1)\,d$

$39000 = 30000+(n-1)600$

$39000-30000 = (n-1)600$

9000/600 = n-1

15+1 =n

n = 16

In 2025 the annual salary of the person will be 39000.

Q.7) How many terms of arithmetic series 24 + 21 + 18 + 15 +……., be taken continuously so that their sum is -351.

A) 9

B) 26

C) 18

D) 14

Ans: B

Solution: In the given arithmetic series, a = 24, d =- 3.

Sn = -351

-351= n/2[(2a + (n-1) d] = n/2[(48 + (n-1) x (-3)]

n2 - 17n -234 = 0

(n - 26)(n + 9) = 0

n = 26 or n = - 9

Here n, cannot be negative.

So, n = 26

Therefore, 26 terms are needed to get sum -351.

Q.8) In a flower garden, there are 23 rose plants in the first row, 21 in the second row, 19 in the third row and so on. There are 5 rose plants in the last row. How many rows are there in flower garden?

A) 15

B) 13

C) 10

D) 17

Ans: C

Solution: Let n be the number of rows in the flower garden.

The number of rose plant in the 1^{st}, 2^{nd},3^{rd},…..,n^{th} rows are 23,21,19…5

respectively.

Now, $t_k - t_{k-1} = -2$ for k=2,….n.

The sequence 23,21,19,….,5 is in an A.P. We have a =23, d = -2, and l =5.

N =(l-a)/d +1 = (5-23)/(-2) +1 =(-18)/(-2) +1 = 9+1 = 10

So, there are 10 rows in the flower garden.

Q.9) The 13th term of an A.P is 3 and the sum of first 13 terms is 234. Find the common difference and the sum of first 21 terms.

A) 178

B) 138

C) 168

D) 158

Ans: B

Solution: $a_n = a + (n-1)\,d = 3 \Rightarrow a + (13 - 1) * d = 3\} \Rightarrow a + 12*d = 3 \Rightarrow a = 3 - 12*d$

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

$S_{13} = 234 \Rightarrow 13/2[2a + (13-1)\,d = 234$

$2a+12d = 234x2/13$

$2*(3 - 12*d) +12*d = 36$

$6 - 24*d + 12*d = 36$

$6 - 12*d = 36$

$d = 30/(-12) = -2.5$

$a = 3 - 12*(-2.5) = 3 + 30 = 33$

Therefore, first term, a = 33 and common difference = -2.5.

$S_{21} = 21/2[2x33+(21-1)\,x\,(-2.5) = 21/2[66-50] = 168$

Therefore, sum of first 21 terms = 168.

Q.10) A mother divides 207 into three parts such that the amount are in arithmetic progression. and gives it to her three children. The product of the two least amounts that the children had 4623. Find the amount received by each child.

A) 67,69,71

B) 68,78,81

C) 40,45,55

D) 68,74,81

Ans: A

Solution: Let the amount received by three children be in the form of A.P is given that a-d, a, a + d

Sum of a parts is 207.

(a-d) +a+(a + d) = 207

3a = 207

A = 69

Given that the product of the two least amount is 4623

(a-d) a =4623

(69-d)69 =4623

D = 2

Therefore, the amount given by the mother to her three children = (69-2), 69, (69+2) = 67, 69, 71

Q.11) The fifth term of a G.P. is 1875. If the first term is 3, find the common ratio.

A) 11

B) 3

C) 8

D) 5

Ans: D

Solution: $T5=ar^{5-1}=ar^4$

Now substitute a=3, n=5 and T5=1875 in T5=ar4 as follows:

$T5=ar^4$

$\Rightarrow 1875=3r^4$

$\Rightarrow r^4=31875\Rightarrow r=5$

Q.12) If the product of three consecutive terms in Geometric Progression is 216 and sum of their products in pairs is 156, find them.

A) 18, 6, 2

B) 3, 6, 18

C) 21, 6, 18

D) 9, 6, 3

Ans: A

Solution: Let the required numbers be ar, a and ar. Then,

$(a/r)\times a \times ar=216\Rightarrow a^3=216=6^3\Rightarrow a=6$

And, $a/r \times a + a \times ar + ar \times ar=156$

$\Rightarrow a^2(1/r+r+1)=156\Rightarrow(62)(1+r+r2)=156r \quad [\because \ a=6]$

$\Rightarrow \quad 36(r^2+r+1)=156r\Rightarrow 3(r^2+r+1)=13r$

$\Rightarrow \quad 3r^2-10r+3=0\Rightarrow(3r-1)(r-3)=0\Rightarrow r=13$ or $r=3$

So, the required numbers are 18, 6, 2 or 2, 6, 18.

Q.13) A company purchases an office copier machine for Rs.50,000. It is estimated that the copier depreciates in its value at a rate of 15% per year. What will be the value of the copier after 15 years?

A) 4367.71

B) 5367.71

C) 6367.71

D) 7367.71

Ans: A

Solution: Present value(P)=50000 Rs, Rate of depreciation=15%, T=15years

Amount after depreciation: $A=P(1-100/R)\ T$

$A=50000(1-15/100)^{15}=50000(17/20)^{15}=4367.71$

Q.14) Find the sum of the first 20 terms of the geometric series 5/2 + 5/6 + 5/18 + ……..

A) $S_{20} = 15/4\ (1-(1/3)^{20})$

B) $S_{20} = 16/4\ (1-(1/3)^{20})$

C) $S_{20} = 17/4\ (1-(1/3)^{20})$

D) $S_{20} = 18/4\ (1-(1/3)^{20})$

Ans: A

Solution: We find the common ratio 'r' by dividing the second term by first term as shown below:

$r= (5/6) / (5/2) = 1/3 <1$

We know that the sum of a geometric series with first term a and

Common ratio r is Sn= [a(1−r^n)]/ 1−r if r<1

S20=5/2 * [1−$(1/3)^{20}$] / [1-(1/30] = **15/4 (1-$(1/3)^{20}$)**

Q.15) Find S_n for each of the geometric series described below. a = 3, t_8 = 384, n = 8

A) 567

B) 645

C) 848

D) 765

Ans: D

Solution: We know that the general term of an geometric progression with first term 'a' and common ratio 'r' is Tn=ar^{n-1}, therefore,

T8=$3r^{8-1}$⇒384=$3r^7$⇒r^7=3384⇒r=2>1

We know that the sum of a geometric series with first term a and Common ratio r is

Sn=[a(r^n-1)]/ r−1

S8=3[2^8−1] / 2-1 = 765

Q.16) How many consecutive terms starting from the first term of the series2 + 6 + 18 + …. would sum to728?

A) 4

B) 6

C) 9

D) 12

Ans: B

Solution: The given series is 2+6+18+…+t_n = 728

Here a = 2, r = 3, S_n = 728

Sn=[a(r^n-1)]/ r−1 if r>1

728 = 2[3^n-1]/[3-1] ⇒3^n= 729 = 3^6

n = 6

Q.17) The second term of a geometric series is '3 and the common ratio is 4/5. Find the sum of first 23 consecutive terms in the given geometric series.

A) $74/4\ (1-(6/5)^{23})$

B) $73/4\ (1-(2/5)^{22})$

C) $72/4\ (1-(3/5)^{23})$

D) $75/4\ (1-(4/5)^{23})$

Ans: D

Solution: Let first term is 'a', Given second term = 3, Common ratio (r) = 4/5

so, second term = $ar^{2-1} = ar$

$3 = a \times 4/5 \Rightarrow a = 15/4$

Now, sum of first n terms , $Sn = a[1 - r^n]/(1 - r)$ [when r < 1]

$S_{23} = (15/4)\ [1 - (4/5)^{23}]/(1 - 4/5) = (15/4)\ [1 - (4/5)^{23}]/(1/5) = (75/4)[1 - (4/5)^{23}]$

Q.18) Suppose that five people are ill during the first week of an epidemic and each sick person spreads the contagious disease to four other people by the end of the second week and so on. By the end of 15th week, how many people will be affected by the epidemic?

A) $S_{15} = 5\ (4^{15} - 1) / 3$

B) $S_{16} = 5\ (4^{16} - 1) / 3$

C) $S_{17} = 5\ (4^{17} - 1) / 3$

D) $S_{18} = 5\ (4^{18} - 1) / 4$

Ans: A

Solution: Let us write this as sequence as follows:**5,5(4),5(4) 2,.....** or **5,20, 80,....**

We need to make this sequence as series because we have to find total number of people affected by the epidemic so the above sequence will become, **5+20+80+.....**

In the above series, the first term is **a1=5**, the second term is **a2=20** and so on.

We find the common ratio (r) = **20/4 =4**

$Sn = [a(r^n - 1)] / r - 1$ if $r > 1$

$S_{15} = 5\ [4^{15} - 1] / [4 - 1] =$ **$5\ (4^{15} - 1) / 3$**

Q.19) A geometric series consists of four terms and has a positive common ratio. The sum of the first two terms is 9 and sum of the last two terms is 36. Find the series.

a) 3+ 6+ 12+….

c) 5+8+12+….

b) 4+ 8+ 12+….

d) 6+ 12+ 18+….

Ans: A

Solution: Let a , ar , ar^2 , ar^3 are in GP

sum of first two terms = (a + ar) = 9

a(1 + r) = 9----(1)

sum of last two terms = (ar^2 + ar^3) = 36

ar^2(1 + r) = 36 -------- (2)

dividing equation (2) by (1)

ar^2 (1 + r)/a(1 + r) = 36/9

r^2 = 4

r = ± 2

but in question , r is positive so, r = 2

Now, [put r = 2 In equation (1)]

a (1 + 2) = 9

3a = 9

a = 3, Hence series are 3 , 6 , 12 , 24

Q.20) In a Geometric progression t_2= 3/5, t_3= 1/5. Then the common ratio is:

a) 5

b) 1/5

c) 1/3

d) 1

Ans: C

Solution: Common ratio, r = t_3 / t_2 = (1/5) / (3/5) = 1/3

Q.21) Study the following alphanumeric sequence carefully and answer the questions based on it.

E # 4 Y Q % G 8 A 5 * U ! B 2 9 > X + P 3 Z ^ | S 7 M C 6 @ J K : W

Which of the following elements is fifth to the right of twelfth element from left end?

A) 2

B) 9

C) >

D) +

Ans: C

Solution: The twelfth element from left end is 'U' and fifth to the right of U is '>'.

Q.22) Directions: Following question are based on the five three-digit numbers given below:

284 312 437 585 696

What will be the resultant number if the second digit of the second lowest number is divided by the third digit of the highest number?

A) 1/2

B) 1/3

C) 1

D) 1/6

Ans: D

Solution: The given sequence: 284 312 437 585 696

The numbers are arranged in ascending order: 284 312 437 585 696

2nd digit of 2nd lowest number: 1

3rd digit of highest number: 6

Required ratio: 1/6

Q.23) Directions: Read the following alphanumeric series carefully and answer the question given beside.

8 H P & 6 R 4 % X $ U 3 O # B A ! 2 L C ? 5 E S 7 @ D

What is the sum of the second even number from left end in the series and second odd number from right end in the series?

A) 11

B) 18

C) 4

D) 9

Ans: D

Solution: The second even number from left end in the series is 6 and the second odd number in the series is 3.

Required sum = 9.

Q.24) Direction: The following question is based on the two digit numbers given below:

91 82 64 49 81

If numeric '3' is put at the end of the each of the two-digit numbers given, then the digits of the newly formed numbers are reversed and the numbers thus formed are written in descending order, what will be the sum of the digits of the number that lies in middle of the arrangement?

A) 17

B) 11

C) 15

D) 13

Ans: D

Solution: The given sequence: 91 82 64 49 81

After putting 3 at the end of each of the numbers: 913 823 643 493 813

Reversing the digits: 319 328 346 394 318

Writing the numbers in descending order: 394 346 328 319 318

Sum of the digits of the number that comes in the middle=9+4+2+1+1 = 17

Q.25) Directions: Study the following arrangement carefully and answer the following question given below.

E 4 B % R 3 A 6 # F H @ I 2 D 9 © K U $ W 1 M P 5 * Q 8 T

How many such numbers are there in the above arrangement each of which is immediately preceded by a symbol and immediately followed by a letter?

A) None

B) One

C) Two

D) Three

Ans: A

Solution: There is no such combination.

Q.26) **Directions: These question are based on the following arrangement of symbols, letters and numbers:**

↑ 9 B Q = $ 2 5 R J δ L 3 @ Y M E 6 8 * ÷ D F 4 β H 7 ©

Total number of pairs of adjacent symbol and letter (X), total number of pairs of adjacent letter and number (Y) and total number of pairs of adjacent number and symbol (Z) in the above arrangement are written in the descending order. Which of the following will indicate the same?

A) X, Y, Z

B) X, Z, Y

C) Y, X, Z

D) All the three are equal in number

Ans: D

Solution: Adjacent symbol-letters pairs are δ L, @ Y, ÷ D, β H. So, X = 4.

Adjacent letter-numbers pairs are L 3, E 6, F 4, H 7. So, Y = 4.

Adjacent number-symbol pairs are 3 @, 8 *, 4 β, 7 ©. So, Z = 4.

Thus, X = Y = Z.

Q.27) **Directions: These questions are based on the following arrangement:**

J Y 2 = S £ α E G M Δ 7 $ H P 9 K L β @ W Q 1 3 # C D ©

Four of the following five are alike in a certain way based on the positions of the elements in the above arrangement and hence form a group. Which one does not belong to the group?

A) 2 Y C D

B) £ S 1 3

C) J S © 3

D) = # 2 C

Ans: E

Solution: In all other groups, the third and fourth elements occupy the same positions from the right in the given arrangement as the first and second elements respectively occupy from the left end.

Q.28) Direction: Study the following arrangement carefully and answer the questions given below:

8 C M @ N £ T 2 Y 6 S α Q $ 7 * W # Z 3 U E % A 4

Four of the following five are alike in a certain way with respect to their position in the above arrangement. Which is the one that is different from the other four?

A) T Y S

B) 7 W Z

C) U % 4

D) Q 7 *

E) C @ £

Ans: D

Solution: In all other groups, the first and second elements each move two steps forward to give the second and third elements respectively.

Q.29) Directions: Study the following numbers carefully and answer the questions given beside:

867 495 736 592 619

If all the odd numbers in the sequence are written in a reverse order and then placed in descending order, which of the following numbers will be the second from the right end of the sequence?

A) 592

B) 594

C) 916

D) 768

Ans: B

Solution: The given sequence:867 495 736 592 619

Writing all the odd numbers in a reverse order, we get768 594 736 592 916

The final sequence of numbers in descending order:916 768 736 594 592

Hence, the second number from the right end will be: 594

Q.30) Directions: Study the following arrangement carefully and answer the questions given below:

R E 5 D A P $ 3 T I Q 7 9 B # 2 K% U 1 M W 4 * J 8

Four of the following five are alike in a certain way based on their position in the above arrangement and so form a group. Which is the one that does not belong to that group?

A) B K 7

B) M * U

C) D P E

D) W J 1

E) 3 Q P

Ans: C

Solution: In all other groups, the first element moves 3 steps forward to give the second elements, which in turn moves 5 steps backward to give the third element.

Q.31) Directions: The questions are based upon the following series.

T % U 4) 6 & K Y ^ A 2 $ 8 L G | 3 M @ F P 7 ! C ~ H 9 Q : E 1 B 5

What will be the resultant when second prime number from left end is multiplied with the first composite number from left end of the series?

A. 8

B. 12

C. 10

D. 16

E. None of these

Ans: B

Solution: Series given: T % U 4) 6 & K Y ^ A 2 $ 8 L G | 3 M @ F P 7! C ~ H 9 Q: E 1 B 5

Second prime number from left end is 3.

First composite number from left end is 4.

Product = 12.

Q.32) Directions: Following questions are based on the five three-digit numbers given below.

785 243 634 397 572

If 1 is added to each even digit and 1 is subtracted from each odd digit and then how many numbers so formed will be fully divisible by 2?

A. 1

B. 2

C. 3

D. 4

E. 5

Ans: C

Solution: Series given: 785 243 634 397 572

New series: 694 352 725 286 463

Clearly only 3 numbers are fully divisible by 2.

Q.3) Directions: The questions are based on the 5 four-digit numbers given below.

2764 7983 9862 5493 6278

If first and third digits of each number are interchanged and then numbers are arranged in ascending order then which of the following will be the second number from right end?

A. 2764

B. 9862

C. 7983

D. 5493

E. 6278

Ans: B

Solution: Given Sequence: 2764 7983 9862 5493 6278

New Sequence: 6724 8973 6892 9453 7268

Ascending order:6724 6892 7268 8973 9453

Here second number from right end is "8973" which represents "7983".

Q.34) Directions: These questions are based on the following arrangement of letters/numbers/ symbols. Study them carefully and answer the questions given beside.

5 H β 3 % T I L 4 $ E 6 F 1 R M @ A # B D 2 8 U & C

Four of the five are alike in a certain way based on their positions in the above arrangement and hence form a group. Find out the one that does not belong to that group?

A. 35
B. 4T
C. 64
D. RA
E. 8B

Ans: D

Solution:5 H β 3 % T I L 4 $ E 6 F 1 R M @ A # B D 2 8 U & C
In all the permutations except given as option D, the second element is 3 steps left to the first element. In option D, the second element is 3 steps right to the first element.

Q.35) Directions: Study the following arrangement carefully and answer the questions given beside.

6 7 8 9 9 8 7 9 7 7 8 9 7 8 7 6 9 6 8 9 7 7 9 8 9 7 6 6 8 7

How many odd numbers are there in the numeric series which are immediately preceded by a number, which is a perfect cube?

A. Six
B. Seven
C. Eight
D. More than eight
E. None of these

Ans: B

Solution: The given series:6 7 8 **9** 9 8 **7** 9 7 7 8 **9** 7 8 **7** 6 9 6 8 **9** 7 7 9 8 **9** 7 6 6 8 **7**
Following the above series, we can say that there are seven such numbers which are immediately preceded by a perfect cube.

Q.36) Directions: The following questions are based on the three-digit numbers given below:

972 938 895 863 692 536

If the sum of the highest and the lowest number is divided by the difference of the third highest and the third lowest number and the resultant is then multiplied by 8, which of the following numbers will we finally get?

A. 256
B. 284
C. 310
D. 377
E. 436

Ans:

Solution: The given sequence:972 938 895 863 692 536
Sum of the highest and the lowest number is 972 + 536 = 1508
Difference of the third highest and the third lowest number is 895 – 863 = 32
(1508/32)×8 = 377 The number we get is 377

Q.37) Directions: These questions are based on the following arrangement of letters/numbers/ symbols. Study them carefully and answer the questions given beside.

W 1 R % 4 J E # 7 M T 2 I 9 B H 3 A $ 9 F Q 5 D G 6 U S P

If the positions of E and A are interchanged and similarly the positions of R and U are interchanged then how many symbols will be there each of which is either preceded or followed by a vowel ?

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

Ans: D

Solution: Such symbols in the new arrangement may be indicated as follows
W 1 U %4 J A #7 M T 2 I 9 B H 3 E $9 F Q 5 D G 6 R S P
There are three symbols (%, #, $) that satisfy the given condition.

Q.38) Directions: Study the following numbers carefully and answer the questions given beside:

5836 7469 8251 6293 4172

Find the number the sum of all the digits of which is equal to the sum of all the smallest digits taken from all the numbers.

A. 5836
B. 4172
C. 6293
D. 8251
E. None of these

Ans: E

Solution: We have, the given sequence = 5836 7469 8251 6293 4172
The smallest digit of each number – 3, 4, 1, 2, 1
The sum of all smallest digits of each number, 3 + 4 + 1 + 2 + 1=11
The sum of all digits of each number, 5 + 8 + 3 + 6 = 22, 7 + 4 + 6 + 9 = 26, 8 + 2 + 5 + 1 = 16,
6 + 2 + 9 + 3 = 20, 4 + 1 + 7 + 2 = 14,
The sum of all the digits of each number is not equal to the sum of all the smallest digits taken from all the numbers.

Q.39) Directions: Study the following information carefully and answer the questions given beside.

A E % 6 Y B R & # P U W © 2 I $ 3 * L O M V

If every letter in the given sequence is replaced by the previous letter in the English alphabet, which element will be the second to the left of the ninth element from the right end?

A. C
B. X
C. W
D. V
E. None of these

Ans: D

Solution: There sultant position =9^{th}+2^{nd}=11^{th}fromtheright
Counting from the right, the 11th element is W and the previous letter to Win English Alphabet is V.

Q.40) Directions: Study the following numeric arrangement and answer the questions given beside.

9 4 9 2 3 2 1 5 7 9 3 5 8 5 2 5 6 1 8 5 9 7 2 6 2 4 2 5 8 3 1 6 2 4

How many 5's are there in the arrangement each of which is immediately preceded as well as followed by an odd number?

A. 0
B. 1
C. 2
D. 3
E. None of these

Ans: B

Solution: 4 9 4 9 2 3 2 1 5 7 9 3 5 8 5 2 5 6 1 8 5 9 7 2 6 2 4 2 5 8 3 1 6 2 4
Clearly, only 1 such 5 is there which is immediately preceded as well as followed by an odd number.

Q.41) The first term of an A.P. is 6 and the common difference is 5. Find the A.P. and its general term,

a) A.P 6, 11, 16 ..., 511+1
b) A.P 8, 14, 20 611+1
c) A.P 7, 11, 16 3n+1
d) A.P 9, 10, 15 4n+1

Ans: A

Solution: First term, a = 6; Common difference, d = 5
We know that the AP is in the form of a, a + d, a + 2d, a + 3d … a + (n – 1) d, a + nd …
⇒ AP = 6, 6 + 5, 6 + 2(5), 6 + 3(5) …
= 6, 11, 6 + 10, 6 + 15 …
= 6, 11, 16, 21 …
∴ The required A.P. is 6, 11, 16, 21 …

Q.42) Find the common difference and 15th term of the A.P. 125, 120, 115, 110,...

a) 65
b) 60
c) 55
d) 50

Ans: C

Solution: Common Difference (d) = a2 - a1 = 120 - 125 = -5 ⇒d = -5

a =125, d = -5, n = 15

an = a + (n – 1)d

a15 = 125 +(15 - 1) ×-5

a15 = 125 +(14×-5)

a15 = 125 - 70

a15 = 55

Q.43) The 10th and 18th terms of an A.P. are 41 and 73respectively. Find the 27th term.

a) 99

d) 117

c) 109

b) 103

Ans: C

Solution: We know that the general term of an arithmetic progression with first term 'a' and common difference d is Tn a + (n — l) d, therefore,

T10 = a + (10-1) d

41 = a + 9d.....(1)

T18 = a +(18-1)d

73 = a+ 17d.....(2)

Now subtract equation (1) from equation (2) as follows:

(a-a) +(17d - 9d) = 73-41

8d = 32

D=4

Substitute the value of d in equation (1):

we get a= 5

T27 = 5 + (27-1) = 109

Q.44) How many two-digit numbers are divisible by 13?

a) 7

b) 9

c) 11

d) 13

Ans: A

Solution: a=13, d=13, tn= 91

tn = a+(n-1)*d
tn = 13+(13n-13)
91 = 13n
N=7

Q.45) A man has saved Rs.640 during the first month, Rs.720 in the second month and Rs.800 in the third month. If he continues his savings in this sequence, what will be his savings in the 25th month?

a) Rs. 2160
b) Rs. 2560
c) Rs. 2730
d) Rs. 2340

Ans:

Solution: A man's savings forms a A.P. series: 640,720,800….

From the series a=720, d=80

We know that the general term of an arithmetic progression with first term 'a' and common difference 'd' is Tn=a+(n−1) d

T25= 640 + (25-1) 80 = 2560

Q.46) The sum of three consecutive terms in an A.P. is 6and their product is -120. Find the three numbers.

a) 10, 2, -6
c) 14, 20, -9
b) 12, 2, -7
d) 13, 2, -8

Ans: A

Solution: We know that the three consecutive terms of an A.P. may be taken as a – d, a, a + d.

Given, a – d + a + a + d = 6

⇒ 3a = 6⇒ a = 6/3 = 2

Also given (a – d) (a) (a + d) = -120

We know that (a – b) (a + b) = a2 – b2

⇒ $(a^2 – d^2)$ (2) = -120⇒ $(2^2 – d^2)$ = -120/2

⇒ $4 – d^2 = -60$⇒ $d^2 = 60 + 4 = 64$⇒ d = 8

So, the numbers are⇒ a – d = 2 – 8 = -6, ⇒ a = 2, ⇒ a + d = 2 + 8 = 10

∴ The three consecutive numbers are -6, 2, 10.

Q.47) A construction company will be penalised each day for delay in construction of a bridge. The penalty will be Rs.4000 for the first day and will increase by Rs. 1000 for each following day. Based on its budget, the company can afford to pay a maximum ofRs.1,65,000 towards penalty. Find the maximum number of days by which the completion of work can be delayed

A) 18
B) 16
C) 17
D) 15

Ans: D

Solution: The amount to be paid first paid = ₹4000
It increases each day by = ₹1000
Total amount that can be paid = ₹165000
a = 4000, d = 1000, Sum = 165000

Sum of terms $= \frac{n}{2}(2a + (n-1)d)$

$\Rightarrow 165000 = \frac{n}{2}(2 \times 4000 + (n-1) \times 1000)$

$\Rightarrow 165 = \frac{n}{2} \times (8 + 1(n-1))$

$\Rightarrow 330 = n(n + 7)$

$\Rightarrow n^2 + 7n - 330 = 0$

$\Rightarrow n^2 - 15n + 22n - 330 = 0$

$\Rightarrow n(n-15) + 22(n-15) = 0$

$\Rightarrow (n-15)(n + 22) = 0$

$\Rightarrow n = 15$ or $n = -22$

As negative value of n is not possible, n = 15
Therefore, number of days that construction can be delayed = 15days.

Q.48) In a winter season let us take the temperature of Ooty from Monday to Friday to be in A.P. The sum of temperatures from' Monday to Wednesday is 0 degree Celsius and the sum of the temperatures from Wednesday to Friday is 18 degrees Celsius. Find the temperature on each of the five days.

A) -3, 0, 3, 6, 9 [all are in degree Celsius]
B) 6, 9, 0, -3, 3 [all are in degree Celsius]

C) -2, 0, 3, 7, 11 [all are in degree Celsius]

D) -1, 0, 2, 12, 10 [all are in degree Celsius]

Ans: a

Solution: Let the five days temperature be (a — d), a, a + d, a + 2d, a + 3d.

The three days sum = + a + a + d =0

⇒ 3a=0 ⇒ a=0 ...Given)

a + a + 2d + a + 3d = 18

3a + 6d = 18

3(0) + 6d = 18

6d = 18

d=3

The temperature of each five days is a -d, a, a + d, a + 2d, a + 3d

Therefore the temperatures are-3, 0, 3, 6, 9 [all are in degree Celsius]

Q.49) Priya earned Rs.15000 in the first month. There after her salary increased by Rs.1500 per year. Her expenses are Rs.13,000 during the first year and the expenses increases by Rs.900 per year. How long will it take for her to save Rs.20,000 per month.

A) 41

B) 31

C) 51

D) 21

Ans: B

Solution: We find that the yearly savings are in A.P. with a1 = 2000 and d = 600.

We are required to find how many years are required to save 20,000 a year……

an = 20,000

an = a + (n-1) d

20000 = 2000 + (n-1)600

(n - 1)600 = 18000

n = 31 years

Q.50) Find the sum of all natural numbers between 602and 902 which are not divisible by 4.

a) 168228

b) 168448

c) 158248

d) 167428

Ans: B

Solution: First find the sum of all the natural's number between 602 and 902

Here a = 603, d =1, I = 901

n= [(l-a)/d] +1 = [(901 – 603)/1]+1 = 298 +1 = 299

Sn =n/2 (a + l)

Sn1= 299/2 * 1504

= 299 x 752= 224848

Find the sum of all the numbers between 602 and 902 which are divisible by 4.

Here a = 604; I = 900; d = 4

n= [(l-a)/d] +1 = [(900– 604)/1]+1 = 74 +1 = 75

Sn =n/2 (a + l)

Sn2= 75/2 * 1504

= 75 x 752= 56400

Sum of the numbers which are not divisible by 4 = Sn1 - Sn2= 224848 - 56400

Sum of the numbers =168448

Q.51) Find the number of terms in the following G.P. 4, 8, 16, ……,8192?

A) 7

B) 12

C) 13

D) 14

Ans:

Solution: a=4, r=8/4=2, tn= 8192

$tn = ar^{n-1}$

$8192 = 4 \times 2^{n-1}$

$2^{n-1} = 2048$

$2^{n-1} = 2^{11}$

$n-1 = 11 \Rightarrow n = 11 + 1 = 12$

No. of terms (n)= 12

Q.52) Find the 10th term of a G.P. whose 8th term is 768 and the common ratio is 2.

a) 5072

b) 4072

c) 3072

d) 1072

Ans:

Solution: $t8 = 768 = ar^7$, r=2

$t10 = ar^9$

$= ar^7 \times r \times r$

$= 768 \times 2 \times 2$

$= 3072$

Q.53) Sara shared a message with 5 unique people at 1 am. At 2 am, each of her friends shared it with 5 unique people. Then at 3 pm each of their friends shared with 5 unique people. In this sequence, how many unique people would have received the message by 8 am?

A) 490,282

B) 488,280

C) 486,282

D) 490,288

Ans: B

Solution: The number of unique people who received messages after each hour starting at 1 AM are 5, 25,125, ...

Clearly, this is a GP with a = 5 and r = 5. We must find the GP sum for 8 terms (8 PM).

Using the sum of GP formula,

$S_n = a(r^n - 1) / (r - 1)$

$S_8 = 5(5^8 - 1) / (5 - 1) = 488,280$

Q.54) A man joined a company as Assistant Manager. The company gave him a starting salary of Rs.60000 and agreed to increase his salary 5% annually. What will be his salary after 5 years?

a) 75767

b) 76577

c) 78576

d) 87556

Ans: B

Solution: salary after 5 years = 60000

(105/100)(105/100)*(105/100)*(105/100)*(105/100) = 76577

Q.55) Sivamani is attending an interview for a job and the company gave two offers to him. Offer A: 20,000to start with followed by a guaranteed annual increase of 6% for the first 4 years. Offer B: 22,000 to start with followed by a guaranteed annual increase of 6% for the first 4 years. What is his salary in the 4th year with respect to the offers A and B?

a) 22820, 23400
b) 23820, 23955
C) 24220, 25320
d) 21230, 22310

Ans: b

Solution: The amount of money that he will get from both the companies will be.
From the company A he will get:
For first year the salary will be 20000
while in the next year it will be20000+6% of 20000 = 21200
for the third year 21200 + 6% of 21200 = 22472and
for the fourth year it will be 23820.32 thus from company A he will get23,820 in the end of fourth year.
From company B he will get:
For first year the salary will be 22000
while in the next year it will be22000+6% of 22000 = 21320
for the third year 21320 + 6960f 21320 =22599.2 and
for the fourth year it will be 23955.15 thus from company B he will get 23955.15 in the end of fourth year.

Q.56) Find the first term of the G.P whose common ratio 5 whose sum to first 6 terms is 46872.

a) 14
b) 12
c) 11
d) 13

Ans: B

Solution: Common ratio r = 5, S6= 46872
$S_n = [a (r^n-1)]/ r-1$ if r>1
$46872 = = a [5^6-1] / [5-1]$
a = 187488/15624
First term = 12

Q.57) If the first term of an infinite G.P. is 8 and its sum to infinity is 32/3 then find the common ratio.

a) 3/4
b) 1/4
c) 5/4
d) 7/4

Ans:

Solution: $S\infty = a/1-r$
$32/3 = 8 / (1-r)$
$1-r = 32/ (3*8)$
$r= 1/4$

Q.58) A man saved Rs.16500 in ten years. In each year after the first he saved Rs.100 more than he did in the preceding year. How much did he save in the first year?

a) 1300
b) 1100
c) 1200
d) 1000

Ans: C

Solution: Sn= 16500,n =10, d=100
Sn = n/2 [2a+(n-1)d]
16500 =10/2 [2a+(10-1)100]
16500 = 5[2a + 900]
16500 =10a + 4500
10a=12000
a= 1200

Q.59) Rekha has 15 square colour papers of sizes 10cm, 11cm, 12cm….24 cm. How much area can be decorated with these colour papers?

a) 4625
b) 4635
c) 4615
d) 4605

Ans: C

Solution: It forms a following series: $10^2+11^2+12^2+…..+24^2$
$=(1^2+2^2+3^2+…..+24^2)-(1^2+2^2+3^2+…..+9^2)$

$Sn=[\frac{n(n+1)(2n+1)}{6}]_{n=24} - [\frac{n(n+1)(2n+1)}{6}]_{n=9}$

=[(24*25*49)/6] - [(9*10*19)/6] = 4900-285

Sn=4615

Q.60) The value of a motor cycle depreciates at the rate of 15% per year. What will be the value of the motor cycle 3 year hence, which is now purchased for Rs.45,000?

a) 27653.63

b) 27658.53

c) 27635.63

d) 27832.62

Ans: C

Solution: Value of motor cycle after 3 years = 45000 *(85/100)*(85/100)*(85/100) = 27635.63