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ARITHMETIC PROGRESSION AND GEOMETRIC PROGRESSION

Progressions:

A movement forward especially one that advances toward some achievement, is called a Progression. A Progression is a series that advances in a logical and predictable pattern. Progression has different types. Here we are going to discuss Arithmetic and Geometric progression.

ARITHMETIC PROGRESSION(AP)

A sequence of numbers is called an arithmetic progression if the difference between any two consecutive terms is always same.

- In simple terms, it means that next number in the series is calculated by adding a fixed number to the previous number in the series.
- This fixed number is called the common difference.

ARITHMETIC PROGRESSION(AP)

- For example, 2,4,6,8,10 is an AP because difference between any two consecutive terms in the series (common difference) is same (4 – 2 = 6 – 4 = 8 – 6 = 10 – 8 = 2).
- By an AP of n terms, we mean finite sequence of the form, a, a+d, a+2d, a+3d,…, a+(n-1)d
  - If ‘a’ is the first term and ‘d’ is the common difference, nth term of an AP = a + (n-1) d
  - Arithmetic Mean = Sum of all terms in the AP / Number of terms in the AP
  - Sum of ‘n’ terms of an AP = 0.5 n (first term + last term) = n/2*[2a + (n-1) d]
  - Also, the sum of an AP is equal to, $S_n=n/2*(a_1+a_n)$

Question 01:

Find the15th term of an arithmetic progression whose first term is 2 and the common difference is 3.

A] 45
B] 38
C] 44
D] 40

Answer: C

Explanation:

n th term of A.P = a +(n-1) *d

= 2+(15-1)*3

=2+ (14*3)

=2+ 42

=44

Hence, option C is correct.

Question 02:

What is sum of the first 15 terms of an A.P whose 11th and 7th terms are 5.25 and 3.25 respectively?

A] 56.25
B] 60
C] 52.5
D] None of these

Answer: A

Explanation:

$a + 10d = 5.25$

$a + 6d = 3.25$

$4d = 2$

then, $d = 1/2$

$a + 5 = 5.25$

$a = 0.25 = 1/4$

$S_{15} = (15 / 2) * [(2* 1 / 4) + 14* 1 / 2)]$

$= 15 / 2[(1 / 2) + (14 / 2)]$

$= (15 / 2) * (15 / 2)$

$= 225 / 4$

$= 56.25$

Hence, option A is correct.

Question 03:

If $(1^2 + 2^2 + 3^2 + ... + 10^2) = 385$, then what is the value of $(2^2 + 4^2 + 6^2 + ... + 20^2)$=?

A] 770
B] 1155
C] 1540
D] (385*385)

Answer: C

Explanation:

$2^2 + 4^2 + 6^2 + ... + 20^2 = (1*2)^2 + (2*2)^2 + (2*3)^2 + ... + (2*10)^2$

$= (2^2 * 1^2) + (2^2 * 2^2) + (2^2 * 3^2) + ... + (2^2 * 10^2)$

$= 2^2 [1^2 + 2^2 + ... + 10^2]$

$= 4*385$

$= 1540.$

Hence, option C is correct.

Question 04:

Sum of three numbers in Arithmetic Progression is 24 and the product is 440
What are the terms?

A. 5,8,11
B. 4,8,12
C. 6,8,10
D. 6,7,11

Answer: A

Explanation:

Let the three numbers in A.P. be a – d, a, and a + d.
According to the question :-

(a – d) + (a) + (a + d) = 24 ----- (1)
=) 3a = 24 ➔ a = 8

(a – d) a (a + d) = 440 ---- (2)
=) (8 – d) (8) (8 + d) = 440
=) (8 – d) (8 + d) = 55
=) 64 – d2 = 55
=) d2 = 64 – 55 = 9
=) d = ± 3

Therefore, when d = 3, the numbers are 5, 8, and 11 and when d = –3, the numbers are 11, 8, and 5.
So, the three numbers are 5, 8, and 11.

Question 05:

The first and last terms of an Arithmetic Progression are 8 and 64 respectively. What is the Number of terms?

A. 10
B. 9
C. 8
D. Indeterminate

Answer : D

Question 06:

What is the sum of the series, 2+4+7+5+12+6+……. up to 200 terms?

A. 60600
B. 30300
C. 15150
D. 90900

Answer : B

Question 07:

What is the 12th term of an Arithmetic Progression whose first term is 262 and common difference is -5?

A. 207
B. 212
C. 217
D. 214

Answer : A

Question 08:

Divide 104 into 4 parts which are in Arithmetic Progression such that the product of the first and the fourth part is 32 less than the product of the second and the third parts.

A. 20,32,24,28
B. 19,21,23,25
C. 20,24,28,32
D. 20,24,32,28

Answer : C

Question 07:

Find the arithmetic mean of 256 and 576?

A. 464
B. 444
C. 416
D. 832

Answer : C

Question 08:

Find the 28th term of the sequence 2, 5, 8, 11 ……299 from last?

A. 83
B. 198
C. 248
D. 218

Answer : D

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GEOMETRIC PROGRESSION

- A sequence of numbers is called a geometric progression if the ratio of any two consecutive terms is always same.
- In simple terms, it means that next number in the series is calculated by multiplying a fixed number to the previous number in the series.
- This fixed number is called the common ratio.

GEOMETRIC PROGRESSION

- For example, 2,4,8,16 is a GP because ratio of any two consecutive terms in the series (common difference) is same (4 / 2 = 8 / 4 = 16 / 8 = 2).

- By an GP of n terms, we mean finite sequence of the form, a, ar, ar^2,……., ar^{n-1}.
  - If ‘a’ is the first term and ‘r’ is the common ratio, n-th term of a GP, $T_n = ar^{n-1}$
  - Geometric Mean = nth root of product of n terms in the GP
  - Sum of ‘n’ terms of a GP (r < 1) = [a (1 – r^n)] / [1 – r]
  - Sum of ‘n’ terms of a GP (r > 1) = [a (r^n – 1)] / [r – 1]
  - Sum of infinite terms of a GP (r < 1) = (a) / (1 – r)

Question 01:

Find the 5th term of the G. P.: 1/7,1/14, 1/28 ...

A. 1/108
B. 1/112
C. 1/128
D. 2/115

Answer : B

Question 02:

What are the three numbers in Geometric Progression whose sum is 21 and whose product is 216?

A. 4, 6, 9
B. 6, 6, 9
C. 3, 6,12
D. 7, 8, 6

Answer : C

Question 03:

Find the sum of all terms of following series. 81, 27, 9, 3, 1, 1/3, 1/9, 1/27,.....
Infinite terms.

A. 120
B. 221.5
C. 122.5
D. 121.5

Answer : D

Question 04:

Find the geometric mean of 256 and 576?

A. 364
B. 344
C. 384
D. None

Answer : C

Question 05:

Given A = 2^{65} and B = ($2^{64}+2^{63}+2^{62}+...+2^{0}$)

A. A is larger than B by 1

B. B is 2^{64} larger than A

C. B is larger than A by 1

D. A and B are equal

Answer : A

Question 06:

How many terms are there in G.P 3, 6, 12, 24,....., 384?

A] 9
B] 10
C] 8
D] 7

Answer: C

Explanation:

Here, a= 3 and r = 6/3 = 2.

Let the number of terms be n.

Then, $t_n = 384$ and $ar^{n-1} = 384$

$3*2^{n-1} = 384$

$2^{n-1} = 128 = 2^7$ ----> $n-1 = 7$

Therefore, number of terms, n = 8.

Hence, option C is correct.

12. The sum of the terms of an infinite Geometric Progression is 20 and the sum the squares is 100. The first term of the series is,

A. 6

B. 8

C. 12

D. 16

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