Assignment -1

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I. Comprehension Based Questions

Passage - 2

Let A_1, G_1, H_1 denote the arithmetic, geometric and harmonic means, respectively, of two distinct positive numbers. For $n \geq 2$, Let A_{n--1} and H_{n--1} have arithmetic, geometric and harmonic means as A_n, G_n, H_n respectively.

4) Which one of the following statements is correct ?
   a) $G_1 > G_2 > G_3 > \ldots$ [2007-4marks]
   b) $G_1 < G_2 < G_3 < \ldots$
   c) $G_1 = G_2 = G_3 = \ldots$
   d) $G_1 < G_3 < G_5 < \ldots$ and $G_2 > G_4 > G_6 > \ldots$
5) Which one of the following statements is correct ?
   a) $A_1 > A_2 > A_3 > \ldots$ [2007-4marks]
   b) $A_1 < A_2 < A_3 < \ldots$
   c) $A_1 > A_3 > A_5 > \ldots$ and $A_2 < A_4 < A_6 < \ldots$
   d) $A_1 < A_3 < A_5 < \ldots$ and $A_2 > A_4 > A_6 > \ldots$
6) Which one of the following statements is correct ?
   a) $H_1 > H_2 > H_3 > \ldots$ [2007-4marks]
   b) $H_1 < H_2 < H_3 < \ldots$
   c) $H_1 > H_3 > H_5 > \ldots$ and $H_2 < H_4 < H_6 < \ldots$
   d) $H_1 < H_3 < H_5 < \ldots$ and $H_2 > H_4 > H_6 > \ldots$

II. Assertion & Reason Type Questions

1) Suppose four positive numbers a_1, a_2, a_3, a_4 are in G.P. Let $b_1 = a_1, b_2 = b_1 + a_2, b_3 = b_2 + a_3$ and $b_4 = b_3 + a_4$.
   STATEMENT-1 : The numbers b_1, b_2, b_3, b_4 are neither in A.P. nor in G.P. and
   STATEMENT-2 : The numbers $b_1, b_2, b_3, b4$ are in H.P. [2008]
   a) STATEMENT-1 is True, STATEMENT-2 IS True; STATEMENT-2 is the correct explanation for STATEMENT-1
   b) STATEMENT-1 is True, STATEMENT-2 is True;
      STATEMENT-2 is **NOT** a correct explanation for STATEMENT-1
   c) STATEMENT-1 is True, STATEMENT-2 is False
   d) STATEMENT-1 is False, STATEMENT-2 is True

III. Integer Value Correct Type

1) Let $S_k, k = 1, 2, \ldots, 100$, denote the sum of the infinite geometric series whose first term is $\frac{k-1}{k!}$ and the common ratio is $\frac{1}{k}$. Then the value of $\frac{100^2}{100!} + \sum_{k=1}^{100} \left|\left(k^2 - 3k + 1\right) S_k\right|$ is [2010]
2) let $a_1, a_2, a_3, \ldots, a_{11}$ be real numbers satisfying $a_1 = 15, 27 - 2a_2 > 0$ and $a_k = 2a_{k-1} - a_{k-2}$ for $k = 3, 4 \ldots 11$. If $\frac{a_1^2 + a_2^2 + \cdots + a_{11}^2}{11} = 90$ then the value of $\frac{a_1 + a_2 + \cdots + a_{11}}{11}$ is equal to (2010)
3) $a_1, a_2, a_3 \ldots a_{100}$ be an arithmetic progression with $a_1 = 3$ and $S_p = \sum_{i=1}^{p} a_i, 1 \leq p \leq 100$. For an integer n with $1 \leq n \leq 20, 4$let $m = 5n$. If $\frac{S_m}{S_n}$ does not depend on n, then a_2 is (2011)
4) A pack contains n cards numbered for 1 to n, two consecutive numbered cards are removed from the pack and then the sum of the on the remaining cards is 1224. If the smaller of the numbers on the removed cards is k, then $k - 20 =$ (JEE.Adv.2013)
5) Let a, b, c be positive integers such that $\frac{b}{a}$ is an integer. If a,b,c are in geometric progression and the arithmetic mean of a, b, c is $b+2$, then the value of $\frac{a^2+a-14}{a+1}$ is (JEE.Adv.2014)
6) Suppose all the numbers of an arithmetic progression(A.P.) are natural numbers. If the ratio of the sum of the first seven terms to the sum of the first eleven terms is 6 : 11 and the seventh term lies between 130 and 140 then the common difference of the A.P. is (JEE.Adv.2015)
7) The coefficient of x^9 in the expansion of $(1 + x)\left(1 + x^2\right)\left(1 + x^(3)\right) \ldots \left(1 + x^{100}\right)$ is

(JEE.Adv.2015)

8) The sides of a right angled triangle are in arithmetic progression. If the triangle has area 24, what is the length of its smallest side?

(JEE.Adv.2018)

9) Let X be the set consisting of the first 2018 terms of the arithmetic progression 1, 6, 11,..., and Y be the set consisting of the first 2018 terms of the arithmetic progression 9, 16,23.... Then, the number of elements in the set $X \cup Y$ is (JEE.Adv.2018)

10) Let AP$(a; d)$ denote the set of all the terms of an infinite arithmetic progression with the first term a and the common differnce $d > 0$. If AP$(1; 3)$AP$(2; 5)$AP$(3; 7)$ +AP$(a; d)$ then $a + d$ equals (JEE.Adv.2019)