# MATHS

## BOOKS - CENGAGE PUBLICATION

## SEQUENCES AND SERIES

**Others**

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**1.** Find the sum of the following series to $n$ terms

$5 + 7 + 13 + 31 + 85 +$

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**2.** Find the sum to $n$ terms of the series

$1/(1 \times 2) + 1/(2 \times 3) + 1/(3 \times 4) + \dots + 1/n(n+1)$

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**3.** If $\displaystyle\sum_{r=1}^{n} T_r = (3^n - 1)$, then find the sum of $\displaystyle\sum_{r=1}^{n} \frac{1}{T_r}$.

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**4.** Find the sum to $n$ terms of the series $3 + 15 + 35 + 63 +$

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**5.** Sum of $n$ terms the series : $1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 + \dots$

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**6.** If $\displaystyle\sum_{r=1}^{n} T_r = n(2n^2 + 9n + 13)$, then find the sum $\displaystyle\sum_{r=1}^{n} \sqrt{T_r}$.

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**7.** Find the sum of the series $31^3 + 32^3 + \ldots + 50^3$.

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**8.** Find the sum of the first $n$ terms of the series $1^3 + 3.2^2 + 3^3 + 3.4^2 + 5^2 + 3.6^2 + \ldots$ when n is odd

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**9.** Find the sum of the series $1. n + 2(n-1) + 3(n-2) + \ldots . n.1.$

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**10.** Find the sum of the series $\dfrac{1^3}{1} + \dfrac{1^3 + 2^3}{1 + 3} + \dfrac{1^3 + 2^3 + 3^3}{1 + 3 + 5} + $ up to $n$ terms.

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**11.** If $a, b, c$ are in A.P., then prove that the following are also in A.P.

$a^2(b + c), b^2(c + a), c^2(a + b)$

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**12.** If $a, b, c$ are in A.P., then prove that the following are also in A.P.

$$\frac{1}{\sqrt{b} + \sqrt{c}}, \frac{1}{\sqrt{c} + \sqrt{a}}, \frac{1}{\sqrt{a} + \sqrt{b}}$$

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**13.** If $a, b, c$ are in A.P., then prove that the following are also in A.P.

$$a\left(\frac{1}{b} + \frac{1}{c}\right), b\left(\frac{1}{c} + \frac{1}{a}\right), c\left(\frac{1}{a} + \frac{1}{b}\right)$$

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**14.** The Fibonacci sequence is defined by $1 = a_1 = a_2$ and

$a_n = a_{n-1} + a_{n-2}, n > 2.$ Find $\dfrac{a_{n+1}}{a_n}$, for n=5.

**15.** Consider the sequence defined by $a_n = an^2 + bn + c$. If $a_1 = 1, a_2 = 5, and a_3 = 11,$ then find the value of $a_{10}$.

**16.** Show that the sequence 9, 12, 15, 18, ... is an A.P. Find its 16th term and the general term.

**17.** A sequence of integers $a_1 + a_2 + ...... + a_n$ satisfies $a_{n+2} = a_{n+1} - a_n$ for $n \geq 1$. Suppose the sum of first 999 terms is 1003 and the sum of the first 1003 terms is -99. Find the sum of the first 2002 terms.

**18.** Write down the sequence whose nth term is $2^n/n$ and (ii) $\left[3 + (-1)^n\right]/3^n$

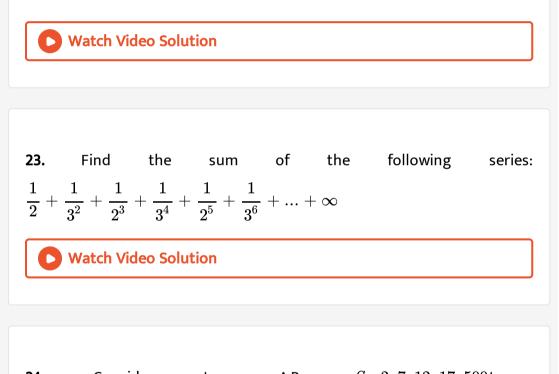**19.** Write the first three terms of the sequence defined by $a_1 = 2, a_{n+1} = \dfrac{2a_n + 3}{a_n + 2}$ .

**20.** Find the sequence of the numbers defined by $a_n = \left\{ \dfrac{1}{n}, \right.$ when n is odd $- \dfrac{1}{n}$ , when n is even

**21.** Find the sum of $n$ terms of the sequence $(a_n), where a_n = 5 - 6n, n \in N.$

**22.** Show that the sequence $\log a$, $\log(ab)$, $\log(ab^2)$, $\log(ab^3)$, is an A.P. Find the nth term.

**23.** Find the sum of the following series:

$$\frac{1}{2} + \frac{1}{3^2} + \frac{1}{2^3} + \frac{1}{3^4} + \frac{1}{2^5} + \frac{1}{3^6} + \ldots + \infty$$

**24.** Consider two A.P.: $S_2 : 2, 7, 12, 17, 500 terms$ $and S_1 : 1, 8, 15, 22, 300 terms$ Find the number of common term. Also find the last common term.

**25.** If pth, qth, and rth terms of an A.P. are $a, b, c,$ respectively, then show that $(a - b)r + (b - c)p + (c - a)q = 0$

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**26.** The sum of the first four terms of an A.P. is 56. The sum of the last four terms is 112. If its first term is 11, then find the number of terms.

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**27.** Given two A.P. $2, 5, 8, 11\ldots\ldots T_{60}$ and $3, 5, 7, 9, \ldots\ldots\ldots T_{50}$. Then find the number of terms which are identical.

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**28.** In a certain A.P., 5 times the 5th term is equal to 8 times the 8th terms then find its 13th term.

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**29.** Find the term of the series $25, 22\dfrac{3}{4}, 20\dfrac{1}{2}, 18\dfrac{1}{4}$ which is numerically the smallest.
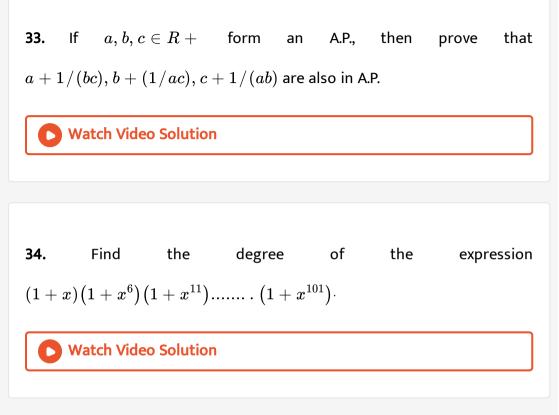
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**30.** How many terms are there in the A.P. 3, 7, 11, ... 407?

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**31.** If $a, b, c, d, e$ are in A.P., the find the value of $a - 4b + 6c - 4d + e$.

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**32.** If $\dfrac{b+c-a}{a}, \dfrac{c+a-b}{b}, \dfrac{a+b-c}{c}$, are in A.P., prove that $\dfrac{1}{a}, \dfrac{1}{b}, \dfrac{1}{c}$ are also in A.P.

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**33.** If $a, b, c \in R+$ form an A.P., then prove that $a + 1/(bc), b + (1/ac), c + 1/(ab)$ are also in A.P.

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**34.** Find the degree of the expression $(1 + x)(1 + x^6)(1 + x^{11})\ldots\ldots. (1 + x^{101})$.

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**35.** In an A.P. of 99 terms, the sum of all the odd-numbered terms is 2550. Then find the sum of all the 99 terms of the A.P.

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**36.** Divide 32 into four parts which are in A.P. such that the ratio of the product of extremes to the product of means is 7:15.

**37.** Show $(m + n)th$ and $(m - n)th$ terms of an A.P. is equal to twice the mth terms.

**38.** If the sum of three consecutive numbers in A.P., is 24 and their product is 440, find the numbers.

**39.** Prove that the sum of $n$ number of terms of two different A.P. s can be same for only one value of $n$.

**40.** In an A.P. if $S_1 = T_1 + T_2 + T_3 + \ldots + T_n$ (n is odd) $S_2 = T_2 + T_4 + T_6 + \ldots + T_{n-1}$, then find the value of $S_1/S_2$ in terms of $n$.

**41.** If the sum of the series 2, 5, 8, 11, ... is 60100, then find the value of $n$.

**42.** The digits of a positive integer, having three digits, are in A.P. and their sum is 15. The number obtained by reversing the digits is 594 less than the original number. Find the number.

**43.** If eleven A.M. 's are inserted between 28 and 10, then find the number of integral A.M. 's.

**44.** Between 1 and 31, m numbers have been inserted in such a way that the resulting sequence is an A. P. and the ratio of $7^{th}$ and $(m-1)^{th}$ numbers is 5 : 9. Find the value of m.
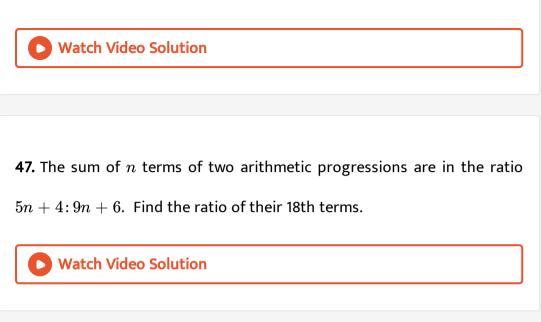
**45.** Find the sum of first 24 terms of the A.P. $a_1, a_2, a_3.......$ , if it is inown that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225.$

**46.** If the arithmetic progression whose common difference is nonzero the sum of first $3n$ terms is equal to the sum of next $n$ terms. Then, find

the ratio of the sum of the $2n$ terms to the sum of next $2n$ terms.

**47.** The sum of $n$ terms of two arithmetic progressions are in the ratio $5n + 4 : 9n + 6$. Find the ratio of their 18th terms.

**48.** If the first two terms of as H.P. are $\dfrac{2}{5}$ and $\dfrac{12}{13}$, respectively. Then find the largest term.

**49.** Insert five arithmetic means  between 8 and 26. or Insert five numbers between 8 and 26 such that the resulting sequence is an A.P.

**50.** If $a, b, c$ are in G.P. and $a - b, c - a, and b - c$ are in H.P., then prove that $a + 4b + c$ is equal to 0.

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**51.** Find the number of terms in the series $20, 19\frac{1}{3}, 18\frac{2}{3}\ldots$ the sum of which is 300. Explain the answer.

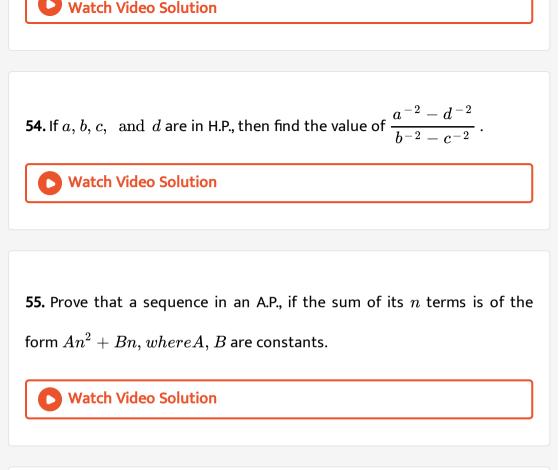▶ Watch Video Solution

**52.** If $a, b and c$ are in A.P., $ax, by, and cz$ in G.P. and $x, y, z$ in H.P. then prove that $\frac{x}{z} + \frac{z}{x} = \frac{a}{c} + \frac{c}{a}$.

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**53.** Find the sum of all three-digit natural numbers, which are divisible by 7.

**54.** If $a, b, c,$ and $d$ are in H.P., then find the value of $\dfrac{a^{-2} - d^{-2}}{b^{-2} - c^{-2}}$ .

**55.** Prove that a sequence in an A.P., if the sum of its $n$ terms is of the form $An^2 + Bn,\ where\ A,\ B$ are constants.

**56.** The product of the three numbers in G.P. is 125 and sum of their product taken in pairs is $\dfrac{175}{2}$ . Find them.

**57.** If the sequence $a_1, a_2, a_3, \ldots\ldots a_n, \cdot$ forms an A.P., then prove that

$$a_1^2 - a_2^2 + a_3^2 - a_4^2 + \ldots\ldots + a_{2n-1}^2 - a_{2n}^2 = \frac{n}{2n-1}\left(a_1^2 - a_{2n}^2\right)$$

**58.** Find the value of $n$ so that $\dfrac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be the geometric mean

between a and b.

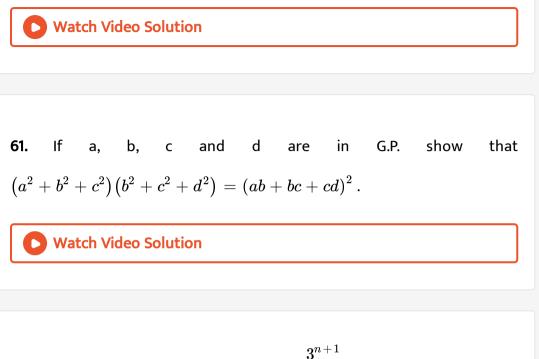**59.** Three non-zero numbers $a, b, c$ are in A.P. Increasing $a$ by 1 or

increasing $c$ by 2, the numbers are in G.P. Then find $b - a$

**60.** A G.P. consists of an even number of terms. If the sum of all the terms

is 5 times the sum of terms occupying odd places, then find its common

ratio.

**61.** If a, b, c and d are in G.P. show that

$$\left(a^2 + b^2 + c^2\right)\left(b^2 + c^2 + d^2\right) = \left(ab + bc + cd\right)^2 .$$

**62.** If the sum of $n$ terms of a G.P. is $3 - \dfrac{3^{n+1}}{4^{2n}}$ , then find the common ratio.

**63.** Which term of the G.P. $2, 1, \dfrac{1}{2}, \dfrac{1}{4}, is \dfrac{1}{128}$ ?

**64.** $'n'$ $A.$ $M's$ are inserted between a and 2b, and then between 2a and

b. If $p^{th}$ mean in each case is a equal, $\dfrac{a}{b}$ is equal to

**65.** If $\dfrac{a^n + b^n}{a^{n-1} + b^{n-1}}$ is the A.M. between a and b, then find the value of n.
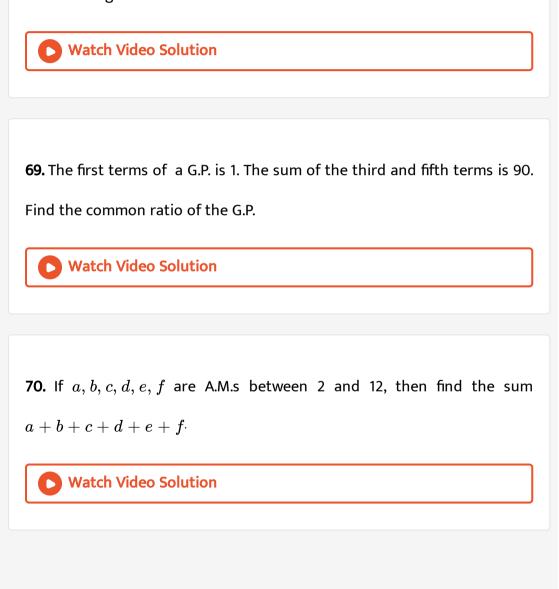
**66.** The first and second terms of a G.P. are $x^{-4}$ and $x^n$, respectively. If $x^{52}$ is the 8th term, then find the value of $n$.

**67.** If $\dfrac{a + bx}{a - bx} = \dfrac{b + cx}{b - cx} = \dfrac{c + dx}{c - dx}$ $(x \neq 0),$ then show that a, b, c and d are in G.P.

**68.** If $n$ arithmetic means are inserted between 2 and 38, then the sum of the resulting series is obtained as 200. Then find the value of $n$.

**69.** The first terms of a G.P. is 1. The sum of the third and fifth terms is 90. Find the common ratio of the G.P.

**70.** If $a, b, c, d, e, f$ are A.M.s between 2 and 12, then find the sum $a + b + c + d + e + f$.

**71.** Three positive numbers from an increasing G.P. If the middle term in this G.P is double , the new numbers are in A.P then the common ratio of the G.P. is :

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**72.** Divide 28 into four parts in an A.P. so that the ratio of the product of first and third with the product of second and fourth is 8:15.

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**73.** The fourth, seventh, and the last term of a G.P. are 10, 80, and 2560, respectively. Find the first term and the number of terms in G.P.

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**74.** If $(b-c)^2, (c-a)^2, (a-b)^2$ are in A.P., then prove that $\dfrac{1}{b-c}, \dfrac{1}{c-a}, \dfrac{1}{a-b}$ are also in A.P.

**75.** If $a, b, c, d$ are in G.P. prove that $(a^n + b^n), (b^n + c^n), (c^n + d^n)$ are in G.P.

**76.** Let $S_n$ denote the sum of first $n$ terms of an A.P. If $S_{2n} = 3S_n$, then find the ratio $S_{3n}/S_n$.

**77.** If $p, q, and r$ are in A.P., show that the pth, qth, and rth terms of any G.P. are in G.P.

**78.** Find four number in an A.P. whose sum is 20 and sum of their squares is 120.

**79.** Find the sum of the following series : $0.7 + 0.77 + 0.777 + \rightarrow n$ terms

**80.** Find the sum of the series $\dfrac{1}{3^2 + 1} + \dfrac{1}{4^2 + 2} + \dfrac{1}{5^2 + 3} + \dfrac{1}{6^2 + 4} + \infty$

**81.** Prove that in a sequence of numbers 49,4489,444889,44448889 in which every number is made by inserting 48-48 in the middle of previous as indicated, each number is the square of an integer.

**82.** Find the sum of first 100 terms of the series whose general term is given by $a_k = (k^2 + 1)k!$

**83.** If the continued product o three numbers in a G.P. is 216 and the sum of their products in pairs is 156, find the numbers.
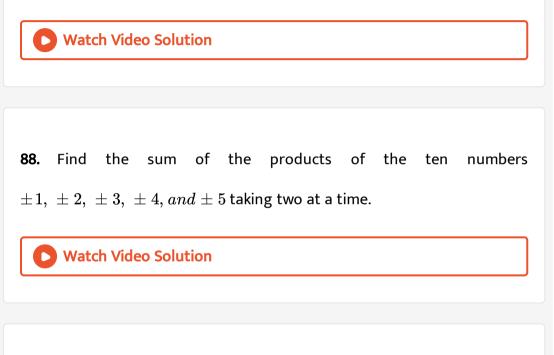
**84.** Find the sum of the series

$$\frac{2}{1 \times 2} + \frac{5}{2 \times 3} \times 2 + \frac{10}{3 \times 4} \times 2^2 + \frac{17}{4 \times 5} \times 2^3 + \quad \rightarrow n \text{ terms.}$$

**85.** The sum of some terms of G. P. is 315 whose first term and the common ratio are 5 and 2, respectively. Find the last term and the number of terms.

**86.** A sequence of numbers $A_n$, $n = 1, 2, 3$ is defined as follows : $A_1 = \frac{1}{2}$ and for each $n \geq 2$, $A_n = \left(\frac{2n-3}{2n}\right)A_{n-1}$ , then prove that

$$\sum_{k=1}^{n} A_k < 1, n \geq 1$$

**87.** The sum of three numbers in GP. is 56. If we subtract 1, 7, 21 from these numbers in that order, we obtain an arithmetic progression. Find the numbers.

**88.** Find the sum of the products of the ten numbers $\pm 1, \pm 2, \pm 3, \pm 4, and \pm 5$ taking two at a time.

**89.** If a, b, c are in A.P., b, c, d are in G.P. and $\dfrac{1}{c}, \dfrac{1}{d}, \dfrac{1}{e}$ are in A.P. prove that a, c, e are in G.P.

a, c, e are in G.P.

**90.** Find the sum $\sum_{r=0}^{} {.}^{n+r} C_r$ .

**91.** Find the sum to $n$ terms of the sequence $(x + 1/x)^2, (x^2 + 1/x)^2, (x^3 + 1/x)^2, ....$

**92.** Write the first five terms of the following sequence and obtain the corresponding series. $a_1 = a_2 = 2, a_n = a_{n-1} - 1, n > 2$

**93.** Prove that the sum to $n$ terms of the series $11 + 103 + 1005 + is \left(\frac{10}{9}\right)(10^n - 1) + n^2.$

**94.** If $a_{n+1} = \dfrac{1}{1 - a_n}$ for $n \geq 1$ and $a_3 = a_1$. then find the value of $(a_{2001})^{2001}$.

**95.** Determine the number of terms in a G.P., if $a_1 = 3, a_n = 96, and S_n = 189$.

**96.** Let $\{a_n\}(n \geq 1)$ be a sequence such that $a_1 = 1, and 3a_{n+1} - 3a_n = 1$ for all $n \geq 1$. Then find the value of $a_{2002}$.

**97.** Let $S$ be the sum, $P$ the product, and $R$ the sum of reciprocals of $n$ terms in a G.P. Prove that $P^2 R^n = S^n$.

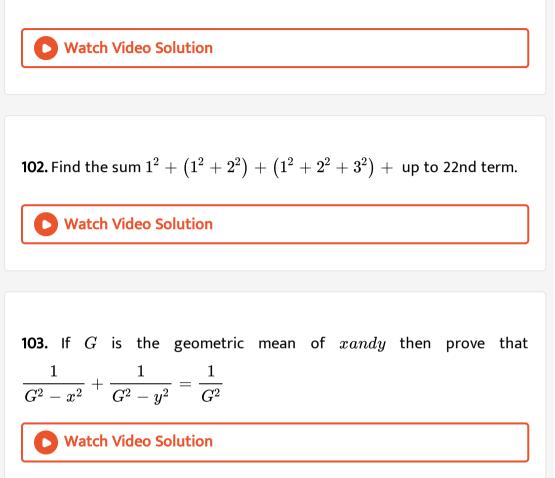**98.** If the pth term of an A.P. is $q$ and the qth term is $p$ , then find its rth

term.

**99.** Find the product of three geometric means between 4 and 1/4.

**100.** if $(m+1)th, (n+1)th$ and $(r+1)th$ term of an AP are in GP.and

m, n and r in HP. . find the ratio of first term of A.P to its common
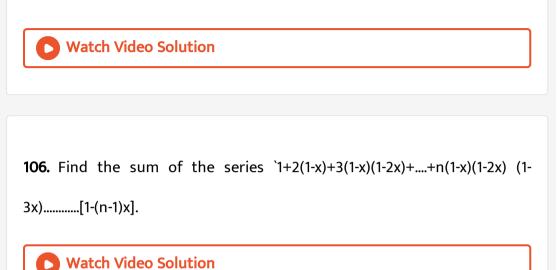
difference

**101.** Insert four G.M.'s between 2 and 486.

**102.** Find the sum $1^2 + \left(1^2 + 2^2\right) + \left(1^2 + 2^2 + 3^2\right) +$ up to 22nd term.

**103.** If $G$ is the geometric mean of $x \, and \, y$ then prove that

$$\frac{1}{G^2 - x^2} + \frac{1}{G^2 - y^2} = \frac{1}{G^2}$$

**104.** If the A.M. of two positive numbers $a \, and \, b (a > b)$ is twice their geometric mean. Prove that : $a : b = \left(2 + \sqrt{3}\right) : \left(2 - \sqrt{3}\right).$

**105.** The sum of infinite number of terms in G.P. is 20 and the sum of their squares is 100. Then find the common ratio of G.P.

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**106.** Find the sum of the series `1+2(1-x)+3(1-x)(1-2x)+....+n(1-x)(1-2x) (1-3x)...........[1-(n-1)x].

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**107.** Prove that $6^{1/2} \times 6^{1/4} \times 6^{1/8}...\infty = 6$.

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**108.** Three numbers are in G.P. whose sum is 70. If the extremes be each multiplied by 4 and the means by 5, they will be in A.P. Find the numbers.

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**109.**                                                                                   If

$$x = a + \dfrac{a}{r} + \dfrac{a}{r^2} + \infty, \, y = b - \dfrac{b}{r} + \dfrac{b}{r^2} + \infty, \, and z = c + \dfrac{c}{r^2} + \dfrac{c}{r^4} + \infty$$

prove that (x y)/z=(a b)/c

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**110.** Find the sum of n terms $1 + 4 + 13 + 40 + 121 + \ldots \cdot$
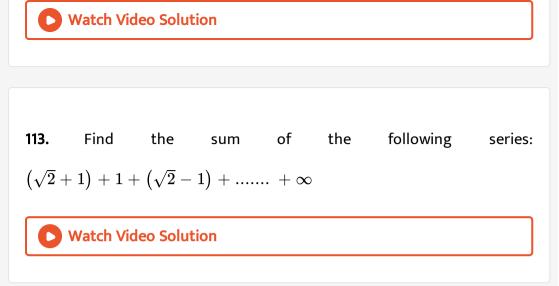
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**111.** If each term of an infinite G.P. is twice the sum of the terms following

it, then find the common ratio of the G.P.

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**112.**        The        sum        to        $n$        terms        of        series

$1 + \left(1 + \dfrac{1}{2} + \dfrac{1}{2^2}\right) + \left(1 + \dfrac{1}{2} + \dfrac{1}{2^2} + \dfrac{1}{2^3}\right) +$ is

**113.** Find the sum of the following series:

$$\left(\sqrt{2}+1\right) + 1 + \left(\sqrt{2}-1\right) + \text{.......} + \infty$$

**114.** If the set of natural numbers is partitioned into subsets $S_1 = \{1\}$, $S_2 = \{2, 3\}$, $S_3 = \{4, 5, 6\}$ and so on then find the sum of the terms in $S_{50}$.

**115.** If $p(x) = \left(1 + x^2 + x^4 + + x^{2n-2}\right) / \left(1 + x + x^2 + + x^{n-1}\right)$ is a polomial in $x$, then find possible value of $n$.

**116.** If the sum of the squares of the first $n$ natural numbers exceeds their sum by $330$, then find $n$.

**117.** If f(x) is a function satisfying f(x+y)=f(x)f(y) for all x,y $\in$ N such that f(1) =3 and $\sum_{x=1}^{n} f(x) = 120$, then the value of n is

**118.** If $\sum_{r=1}^{n} T_r = \frac{n}{8}(n+1)(n+2)(n+3)$ then find $\sum_{r=1}^{n} \frac{1}{T_r}$

**119.** Find the sum to n terms of the series :

$1 \times 2 \times 3 + 2 \times 3 \times 4 + 3 \times 4 \times 5 + ...$

**120.** If the sum to infinity of the series

$$3 + (3 + d)\frac{1}{4} + (3 + 2d)\frac{1}{4^2} + \ldots\ldots\infty \text{ is } \frac{44}{9}, \text{ then find d ..}$$

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**121.** Find the sum to infinity of the series $1^2 + 2^2x + 3^2x^2 + \infty$.

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**122.** If $a, b, c, d$ are in G.P., then prove that

$\left(a^3 + b^3\right)^{-1}, \left(b^3 + c^3\right)^{-1}, \left(c^3 + d^3\right)^{-1}$ are also in G.P.

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**123.** Find the sum of the series $1 - 3x + 5x^2 - 7x^3 + \to n$ terms.

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**124.** In a geometric progression consisting of positive terms, each term equals the sum of the next terms. Then find the common ratio.

**125.** If the A.M. between two numbers exceeds their G.M. by 2 and the GM. Exceeds their H.M. by 8/5, find the numbers.

**126.** The AM of two given positive numbers is 2. If the larger number is increased by 1, the GM of the numbers becomes equal to the AM to the given numbers. Then, the HM of the given numbers is

**127.** Find the sum of the series $1 + 3x + 5x^2 + 7x^3 + \ldots\ldots$ upto $n$ terms.

**128.** If $\dfrac{a-x}{px} = \dfrac{a-y}{qy} = \dfrac{a-z}{rz}$ and $p, q,$ and $r$ are in A.P., then prove that $x, y, z$ are in H.P.

**129.** Find the sum of $n$ terms of the series $1 + \dfrac{4}{5} + \dfrac{7}{5^2} + \dfrac{10}{5^3} + \ldots\ldots$

**130.** Find the sum $\dfrac{1^2}{2} - \dfrac{3^2}{2^2} + \dfrac{5^2}{2^3} - \dfrac{7^2}{2^4} + \ldots \infty.$

**131.** If $H$ is the harmonic mean between $P$ and $Q$ then find the value of $H/P + H/Q$.

**132.** If $T_r = r(r^2 - 1)$, then find $\displaystyle\sum_{r=2}^{\infty} \frac{1}{T_r}$.

**133.** Insert four H.M.'s between 2/3 and 2/13.

**134.** If $a, b, and c$ are respectively, the pth, qth , and rth terms of a G.P., show that $(q - r)\log a + (r - p)\log b + (p - q)\log c = 0$.

**135.** The A.M. and H.M. between two numbers are 27 and 12, respectively, then find their G.M.

**136.** If $a, a_1, a_2, a_3, a_{2n}, b$ are in A.P. and $a, g_1, g_2, g_3, , g_{2n}, b$ . are in G.P. and $h$ s the H.M. of $a and b$, then prove that
$$\frac{a_1 + a_{2n}}{g_1 g_{2n}} + \frac{a_2 + a_{2n-1}}{g_1 g_{2n-1}} + + \frac{a_n + a_{n+1}}{g_n g_{n+1}} = \frac{2n}{h}$$

**137.** If nine arithmetic means and nine harmonic means are inserted between 2 and 3 alternatively, then prove that $A + 6/H = 5$ (where $A$ is any of the A.M.'s and $H$ the corresponding H.M.).

**138.** If $x, 1, and z$ are in A.P. and $x, 2, and z$ are in G.P., then prove that $x, and4, z$ are in H.P.

**139.** Find two numbers whose arithmetic mean is 34 and the geometric mean is 16.

**140.** If a,b,c ,d and p are distinct real number such that $\left(a^2 + b^2 + c^2\right)p^2 - 2(ab + bc + cd)p + \left(b^2 + c^2 + d^2\right) \leq 0$ then a,b,c,d are in

**141.** If A.M. and G.M. between two numbers is in the ratio $m:n$ then prove that the numbers are in the ratio $\left(m + \sqrt{m^2 - n^2}\right) : \left(m - \sqrt{m^2 - n^2}\right)$.

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**142.** Prove that $(666....6)^2 + (888....8) = 4444.....4$.

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**143.** If $a$ is the A.M. of $b$ and $c$ and the two geometric mean are $G_1$ and $G_2$, then prove that $G_1^3 + G_2^3 = 2abc$

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**144.** If a,b,c ,d are distinct integer in AP such that $d = a^2 + b^2 + c^2$, then a+b+c+d is

**145.** The 8th and 14th term of a H.P. are 1/2 and 1/3, respectively. Find its 20th term. Also, find its general term.

**146.** Find the number of common terms to the two sequences 17,21,25,...,417 and 16,21,26,...,466.

**147.** If the 20th term of a H.P. is 1 and the 30th term is -1/17, then find its largest term.

**148.** Find the sum $\dfrac{3}{2} - \dfrac{5}{6} + \dfrac{7}{18} - \dfrac{9}{54} + \ldots\infty$.

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**149.** If $a, b, c$ and $d$ are in H.P., then prove that $(b + c + d)/a, (c + d + a)/b, (d + a + b)/c$ and $(a + b + c)/d$ , are in A.P.

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**150.** The harmonic mean between two numbers is 21/5, their A.M. $'A'$ and G.M. $'G'$ satisfy the relation $3A + G^2 = 36$. Then find the sum of square of numbers.

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**151.** The mth term of a H.P is $n$ and the nth term is $m$ . Proves that its rth term is $\dfrac{mn}{r}$

**152.** The pth term of an A.P. is $a$ and qth term is $b$. Then find the sum of its $(p+q)$ terms.

**153.** If $a > 1, b > 1$ and $c > 1$ are in G.P., then show that $\dfrac{1}{1 + \log_e a}, \dfrac{1}{1 + \log_e b}$ and $\dfrac{1}{1 + \log_e c}$ are in H.P.

**154.** Solve the equation $(x + 1) + (x + 4) + (x + 7) + \dots + (x + 28) = 155.$

**155.** If $a, b, and c$ be in G.P. and $a + x, b + x,$ and $c + x$ in H.P. then find the value of x(a ,b and c are distinct numbers) .

**156.** The ratio of the sum of m and n terms of an A.P. is $m^2 : n^2$. Show that the ratio mth and nth term is (2m-1) : (2n-1).

**157.** If first three terms of the sequence $\dfrac{1}{16}, a, b, \dfrac{1}{6}$ are in geometric series and last three terms are in harmonic series, then find the values of $a, b.$

**158.** The sum of $n, 2n, 3n$ terms of an A.P. are $S_1 S_2, S_3,$ respectively. Prove that $S_3 = 3(S_2 - S_1)$.

**159.** In a certain A.P., 5 times the 5th term is equal to 8 times the 8th terms then find its 13th term.

**160.** If $x$ is a positive real number different from 1, then prove that the numbers $\dfrac{1}{1 + \sqrt{x}}, \dfrac{1}{1 - x}, \dfrac{1}{1 - \sqrt{x}}, ,$ are in A.P. Also find their common difference.

**161.** Which term of the sequence $20, 19\dfrac{1}{4}, 18\dfrac{1}{2}, 17\dfrac{3}{4}, \cdot$ is the first negative term?

**162.** If $S_n = nP + \dfrac{n(n-1)}{2}Q$, where $S_n$ denotes the sum of the first $n$
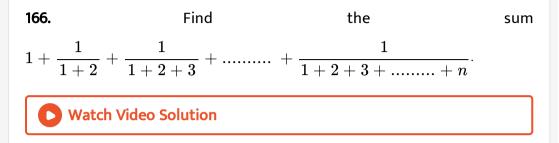
terms of an A.P., then find the common difference.

**163.** Find the sum $\displaystyle\sum_{r=1}^{n} r(r+1)(r+2)(r+3)$

**164.** Find the sum $\displaystyle\sum_{r=1}^{n} \dfrac{r}{(r+1)!}$ where n!=1 × 2 × 3.... $n$.

**165.** Find the sum $\displaystyle\sum_{r=1}^{n} r(r+1)(r+2)(r+3)$

**166.** Find the sum

$$1 + \frac{1}{1+2} + \frac{1}{1+2+3} + \dots\dots + \frac{1}{1+2+3+\dots\dots+n}.$$

**167.** Find the sum to n terms of the series

$$\frac{1}{1+1^2+1^4} + \frac{2}{1+2^2+2^4} + \frac{3}{1+3^2+3^4} + \dots$$

**168.** Find the sum to $n$ terms of the series

$$3/\left(1^2 \times 2^2\right) + 5/\left(2^2 \times 3^2\right) + 7/\left(3^2 \times 4^2\right) + \cdot$$

**169.** Find the sum $\displaystyle\sum_{r=1}^{n} \frac{1}{(ar+b)(ar+a+b)}$.

**170.** If $x = \displaystyle\sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} c^n, where ra, b, and c$ are in A.P.

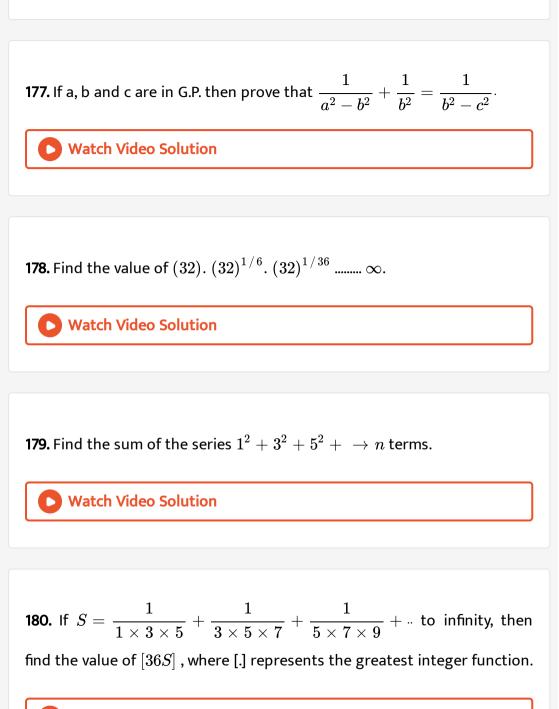and $|a| < , |b| < 1, and |c| < 1,$ then prove that $x, y and z$ are in H.P.

**171.** If the sum of the series $\displaystyle\sum_{n=0}^{\infty} r^n, |r| < 1$ is $s,$ then find the sum of the

series $\displaystyle\sum_{n=0}^{\infty} r^{2n}$.

**172.** Find the sum of the series $\displaystyle\sum_{k=1}^{360} \left( \frac{1}{k\sqrt{k+1} + (k+1)\sqrt{k}} \right)$

**173.** Find the sum

$$\frac{1^4}{1 \times 3} + \frac{2^4}{3 \times 5} + \frac{3^4}{5 \times 7} + \ldots\ldots + \frac{n^4}{(2n-1)(2n+1)}$$

**174.** Find the value of $11^2 + 12^2 + 13^2 + + 20^2$.

**175.** Find the sum $2 + 5 + 10 + 17 + 26 + \ldots$

**176.** Find the sum up to 20 terms.

$$1 + \frac{1}{2}(1+2) + \frac{1}{3}(1+2+3) + \frac{1}{4}(1+2+3+4) + \ldots$$

**177.** If a, b and c are in G.P. then prove that $\dfrac{1}{a^2 - b^2} + \dfrac{1}{b^2} = \dfrac{1}{b^2 - c^2}$.

**178.** Find the value of $(32). (32)^{1/6}. (32)^{1/36}$ ......... $\infty$.

**179.** Find the sum of the series $1^2 + 3^2 + 5^2 + \to n$ terms.

**180.** If $S = \dfrac{1}{1 \times 3 \times 5} + \dfrac{1}{3 \times 5 \times 7} + \dfrac{1}{5 \times 7 \times 9} + ..$ to infinity, then find the value of $[36S]$ , where [.] represents the greatest integer function.

**181.** If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, then prove that $\dfrac{a}{c}, \dfrac{b}{a}$ and $\dfrac{c}{b}$ are in H.P.

**182.** Let $T_r$ denote the rth term of a G.P. for $r = 1, 2, 3,$ If for some positive integers $m$ and $n,$ we have $T_m = 1/n^2$ and $T_n = 1/m^2$ , then find the value of $T_{m+n/2}.$

**183.** Prove that $\dfrac{b^2 + c^2}{b + c} + \dfrac{c^2 + a^2}{c + a} + \dfrac{a^2 + b^2}{a + b} > a + b + c$

**184.** If $yz + zx + xy = 12$, and $x, y, z$ are positive values, find the greatest value of $xyz$.

**185.** If $S = a_1 + a_2 + \ldots + a_n$, $a_i \in R^+$ for i=1 to n, then prove that

$$\frac{S}{S - a_1} + \frac{S}{S - a_2} + \ldots + \frac{S}{S - a_n} \geq \frac{n^2}{n - 1}, \ \forall n \geq 2$$

**186.** If $m > 1, n \in N$ show that

$$1^m + 2^m + 2^{2m} + 2^{3m} + \ldots + 2^{nm - m} > n^{1 - m}(2^n - 1)^m$$

**187.** If $a, b > 0$ such that $a^3 + b^3 = 2$, then show that $a + b \leq 2$.

**188.** Prove that $2^n > 1 + n\sqrt{2^{n-1}}$, $\forall n > 2$ where $n$ is a positive integer.

**189.** In a triangle $ABC$ prove that $\dfrac{a}{a+c} + \dfrac{b}{c+a} + \dfrac{c}{a+b} < 2$

**190.** Find the least value of $\sec A + \sec B + \sec C$ in an acute angled triangle.

**191.** Prove that $[(n+1)/2]^n > (n!)$.

**192.** If $a_1 + a_2 + a_3 + \ldots\ldots + a_n = 1 \forall a_i > 0, i = 1, 2, 3, \ldots\ldots, n,$ then find the maximum value of $a_1 a_2 a_3 a_4 a_5 \ldots\ldots a_n.$

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**193.** If $a, b, c$ are positive, then prove that $a/(b+c) + b/(c+a) + c/(a+b) \geq 3/2.$

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**194.** If $(\log)_{10}(x^3 + y^3) - (\log)_{10}(x^2 + y^2 - xy) \leq 2,$ and $x, y$ are positive real number, then find the maximum value of $xy.$

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**195.** If $\log_2(a + b) + \log_2(c + d) \geq 4$ . Then the minimum value of the expression a+b+c+d is
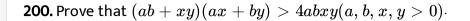
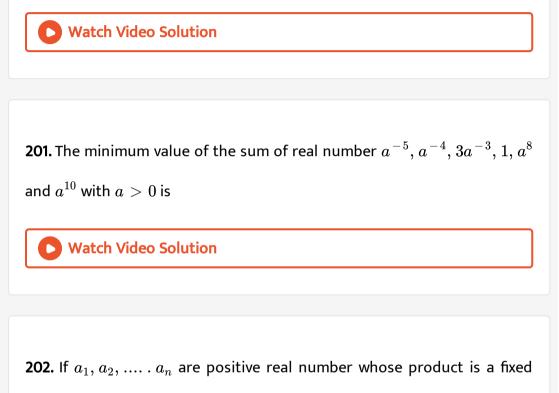▶ Watch Video Solution

**196.** If $a + b + c = 1$, then prove that $\dfrac{8}{27abc} > \left\{\dfrac{1}{a} - 1\right\}\left\{\dfrac{1}{b} - 1\right\}\left\{\dfrac{1}{c} - 1\right\} > 8.$

**197.** If $a, b, and c$ are distinct positive real numbers such that $a + b + c = 1$, then prove that (1-a)(1-b)(1-c)> 8.`

**198.** If $a^2 + b^2 + c^2 - ab - bc - ca = 0$ then, prove that a=b=c

**199.** Find the minimum value of $4\sin^2 x + 4\cos^2 x$ .

**200.** Prove that $(ab + xy)(ax + by) > 4abxy(a, b, x, y > 0).$

**201.** The minimum value of the sum of real number $a^{-5}, a^{-4}, 3a^{-3}, 1, a^8$ and $a^{10}$ with $a > 0$ is

**202.** If $a_1, a_2, ..... a_n$ are positive real number whose product is a fixed number c, then the minimum value of $a_1 + a_2 + ...... + a_{n-1} + a_n$ is

**203.** If a,b,c,d are positive real number such that a+b+c+d=2 , then M= (a+b)(c+d) satisfies the relation:

**204.** A straight line through the vertex $P$ of a triangle $PQR$ intersects the side $PQ$ at the point $S$ and the circumcircle of the triangle $PQR$ at the point $T$. If $S$ is not the center of the circumcircle, then $\frac{1}{PS} + \frac{1}{ST} < \frac{2}{\sqrt{QSxSR}}$   $\frac{1}{PS} + \frac{1}{ST} > \frac{2}{\sqrt{QSxSR}}$ $\frac{1}{PS} + \frac{1}{ST} < \frac{4}{QR}$ (d) $\frac{1}{ps} + \frac{1}{ST} > \frac{4}{QR}$

**205.** If $\alpha \in \left(0, \dfrac{\pi}{2}\right)$, then $\sqrt{x^2 + x} + \dfrac{\tan^2 \alpha}{\sqrt{x^2 + x}}$ is always greater than or equal to (a) $2 \tan \alpha$ (b)1 (c) 2 (d) $\sec 2\alpha$

**206.** In triangle $ABC$, prove that $\cos ec\dfrac{A}{2} + \cos ec\dfrac{B}{2} + \cos ec\dfrac{C}{2} \geq 6.$

**207.** Prove that in $ABC, \tan A + \tan C \geq 3\sqrt{3},$ where $A, B, C$ are circle angles.
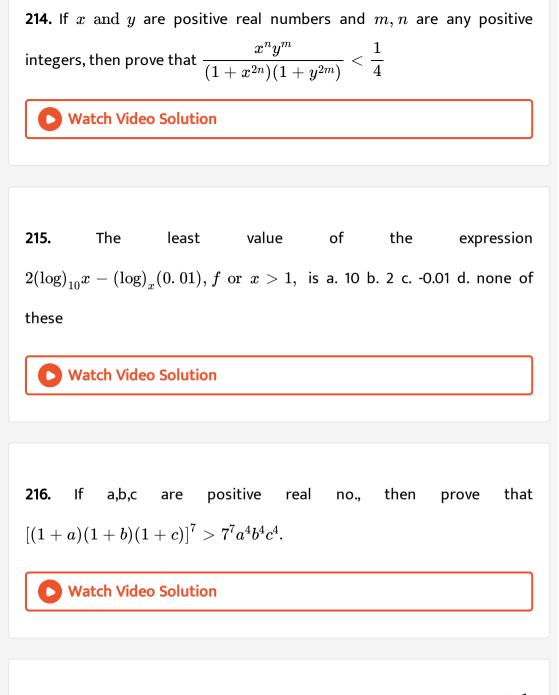
**208.** If $a, b, and c$ are distinct positive real numbers such that $a + b + c = 1,$ then prove that (1-a)(1-b)(1-c)> 8.`

**209.** If $a^2 + b^2 + c^2 = x^2 + y^2 + z^2 = 1,$ then show that $ax + by + cz \leq 1.$

**210.** Prove that $a^4 + b^4 + c^4 > abc(a + b + c)$. [a,b,c are distinct positive real number]..

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**211.** Prove that the greatest value of $xy$ is $\dfrac{c^3}{\sqrt{2ab}}$, if $a^2x^4 + b^2y^4 = c^6$.

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**212.** If $y = \sin^{-1}(10x) + \dfrac{\pi}{2}$ then find the value of $\dfrac{dy}{dx}$ .

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**213.** If $a + b = 1, a > 0,$ prove that $\left(a + \dfrac{1}{a}\right)^2 + \left(b + \dfrac{1}{b}\right)^2 \geq \dfrac{25}{2}$.

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**214.** If $x$ and $y$ are positive real numbers and $m, n$ are any positive integers, then prove that $\dfrac{x^n y^m}{(1 + x^{2n})(1 + y^{2m})} < \dfrac{1}{4}$

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**215.** The least value of the expression $2(\log)_{10} x - (\log)_x (0.01)$, $f$ or $x > 1$, is a. 10 b. 2 c. -0.01 d. none of these

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**216.** If a,b,c are positive real no., then prove that $[(1 + a)(1 + b)(1 + c)]^7 > 7^7 a^4 b^4 c^4$.

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**217.** True / False For every intger $n > 1$, the inequality $(n!)^{1/n} < \dfrac{n + 1}{2}$ holds

**218.** If $x, y \in R^+$ satisfying $x + y = 3$, then the maximum value of $x^2 y$ is.

**219.** For any $x, y, \in R^+$, $xy > 0$. Then the minimum value of $\dfrac{2x}{y^3} + \dfrac{x^3 y}{3} + \dfrac{4y^2}{9x^4}$ is.

**220.** If $a, b,$ and $c$ are positive and $9a + 3b + c = 90$, then the maximum value of $(\log a + \log b + \log c)$ is (base of the logarithm is 10).

**221.** Given that $x, y, z$ are positive real such that $xyz = 32$. If the minimum value of $x^2 + 4xy + 4y^2 + 2z^2$ is equal $m$, then the value of $m/16$ is.

**222.** If the product of $n$ positive numbers is $n^n$ , then their sum is (a)$a$ positive integer (b). divisible by $n$ (c)equal to $n + 1/n$ (d)never less than $n^2$

**223.** If a,b,c are different positive real numbers such that $b + c - a, c + a - b$ and $a + b - c$ are positive, then $(b + c - a)(c + a - b)(a + b - c) - abc$ is a. positive b. negative c. non-positive d. non-negative
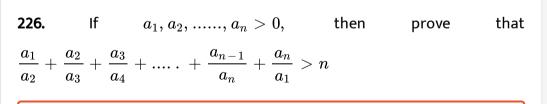
**224.** Find the greatest value of $x^2y^3$, where $x$ and $y$ lie in the first quadrant on the line $3x + 4y = 5$.

**225.** Find the maximum value of $(7 - x)^4(2 + x)^5$ when $x$ lies between $-2$ and $7$.

**226.** If $a_1, a_2, ......, a_n > 0$, then prove that

$$\frac{a_1}{a_2} + \frac{a_2}{a_3} + \frac{a_3}{a_4} + ..... + \frac{a_{n-1}}{a_n} + \frac{a_n}{a_1} > n$$

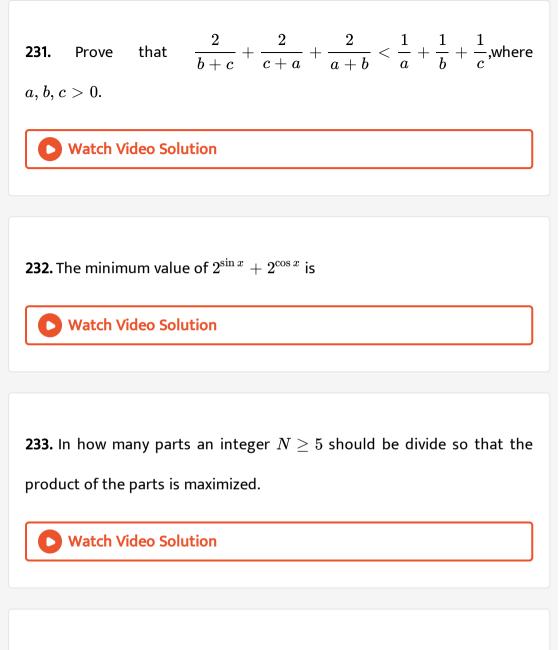**227.** If $a > b$ and $n$ is a positive integer, then prove that

$$a^n - b^n > n(ab)^{(n-1)/2}(a - b).$$

**228.** If $a, b, and c$ are positive and $a + b + c = 6$, show that

$(a + 1/b)^2 + (b + 1/c)^2 + (c + 1/a)^2 \geq 75/4.$

**229.** Prove that

$$\left[\frac{x^2 + y^2 + z^2}{x + y + z}\right]^{x+y+z} > x^x y^y z^z > \left[\frac{x + y + z}{3}\right]^{x+y+z} \quad (x, y, z > 0)$$

**230.** Prove that $1^1 \times 2^2 \times 3^3 \times \ldots \times n^n \leq \left[\frac{2n + 1}{3}\right]^{n\frac{n+1}{2}}, \, n \in N.$

**231.** Prove that $\dfrac{2}{b+c} + \dfrac{2}{c+a} + \dfrac{2}{a+b} < \dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{c}$, where $a, b, c > 0$.

**232.** The minimum value of $2^{\sin x} + 2^{\cos x}$ is

**233.** In how many parts an integer $N \geq 5$ should be divide so that the product of the parts is maximized.

**234.** In $\triangle ABC$ internal angle bisector AI,BI and CI are produced to meet opposite sides in $A'$, $B'$, $C'$ respectively. Prove that the maximum value of $\dfrac{AI \times BI \times CI}{AA' \times BB' \times CC'}$ is $\dfrac{8}{27}$

**235.** The minimum value of $\dfrac{x^4 + y^4 + z^2}{xyz}$ for positive real numbers $x, y, z$ is (a) $\sqrt{2}$ (b) $2\sqrt{2}$ (c) $4\sqrt{2}$ (d) $8\sqrt{2}$

**236.** If $x, y, z$ are positive real number, then show that $\sqrt{(x^{-1}y)} \times \sqrt{(y^{-1}z)} \times \sqrt{(z^{-1}x)} = 1$

**237.** The least value of $6\tan^2\varphi + 54\cot^2\varphi + 18$ is $(I)54$ when $A.M. \geq GM.$ Is applicable for $6\tan^2\varphi, 54\cot^2\varphi, 18$ $(II)54$ when $A.M. \geq GM.$ Is applicable for $6\tan^2\varphi, 54\cot^2\varphi$ and $18$ is added further $(III)78$ when $\tan^2\varphi = \cot^2\varphi$ $(IV)$ none

**238.** A rod of fixed length $k$ slides along the coordinates axes, If it meets the axes at $A(a, 0) and B(0, b)$ , then the minimum value of $\left(a + \dfrac{1}{a}\right)^2 + \left(b + \dfrac{1}{b}\right)^2$ (a)0 (b)8 (c)$k^2 + 4 + \dfrac{4}{k^2}$ (d)$k^2 + 4 + \dfrac{4}{k^2}$

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**239.** If $y = 3^{x-1} + 3^{-x-1}$ , then the least value of $y$ is (a)2 (b)6 (c)2/3 (d) 3/2

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**240.** If $ab^2c^3, a^2b^3c^4, a^3b^4c^5$ are in A.P. $(a, b, c > 0)$, then the minimum value of $a + b + c$ is (a) 1 (b) 3 (c) 5 (d) 9

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**241.** If the product of $n$ positive numbers is $n^n$ , then their sum is a positive integer b. divisible by $n$ equal to $n + 1/n$ never less than $n^2$

**242.** Minimum value of $(b + c)/a + (c + a)/b + (a + b)/c$ (for real positive numbers $a, b, c$) is (a)1 (b)2 (c)4 (d)6

**243.** Prove that $px^{q-r} + qx^{r-p} + rx^{p-q} > p + q + r$ where p,q,r are distinct number and $x > 0, x = !1$.

**244.** Given are positive rational numbers $a, b, c$ such that $a + b + c = 1$, then prove that $a^a b^b c^c + a^b b^c c^a + a^c b^a c^b < 1$.

**245.** Prove that $\left[\dfrac{a^2 + b^2}{a + b}\right]^{a+b} > a^a b^b > \left\{\dfrac{a + b}{2}\right\}^{a+b}.$

**246.** Prove that $a^p b^q < \left(\dfrac{ap + bq}{p + q}\right)^{p+q}.$

**247.** Let $x_1, x_2, , x_n$ be positive real numbers and we define $S = x_1 + x_2 + + x_n.$ Prove that
$$(1 + x_1)(1 + x_2)(1 + x_n) \le 1 + S + \dfrac{S^2}{2!} + \dfrac{S^3}{3!} + + \dfrac{S^n}{n!}$$

**248.** If $2x^3 + ax^2 + bx + 4 = 0$ (a and b are positive real numbers) has 3 real roots, then prove that $a + b \geq 6\left(2^{\frac{1}{3}} + 4^{\frac{1}{3}}\right)$.

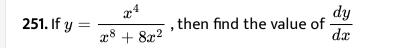**249.** Find the greatest value of $x^2 y^3 z^4$ if $x + y + z = 1, where x, y, z$ are positive.

**250.** Prove that

$$.^n C_1 + 2 \times .^n C_2 + 3 \times .^n C_3 + \dots + n \times .^n C_n = n2^{n-1}.$$

Hence, prove that

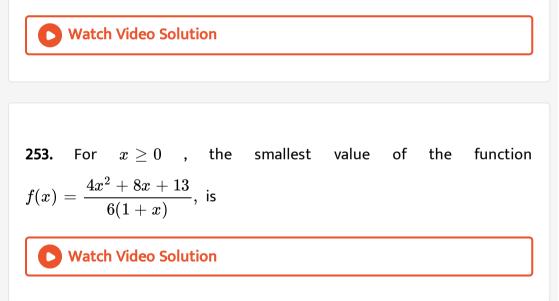$$.^n C_1 . (.^n C_2)^2 . (.^n C_3)^3 \dots (.^n C_n)^n \leq \left(\frac{2^n}{n+1}\right)^{.^{n+1} C_2} \quad \forall n \in N.$$

**251.** If $y = \dfrac{x^4}{x^8 + 8x^2}$ , then find the value of $\dfrac{dy}{dx}$

**252.** If $a, b, c$ are three distinct positive real numbers in G.P., then prove that $c^2 + 2ab > 3ac$

**253.** For $x \geq 0$ , the smallest value of the function $f(x) = \dfrac{4x^2 + 8x + 13}{6(1 + x)}$, is

**254.** If the first and the $(2n - 1)^{t}h$ term of an A.P,G.P anf H.P are equal and their nth term are a,b,c respectively,then

**255.** For positive real numbers $a, bc$ such that $a + b + c = p$, which one holds? 
(a) $(p - a)(p - b)(p - c) \leq \dfrac{8}{27}p^3$ 
(b) $(p - a)(p - b)(p - c) \geq 8abc$ 
(c) $\dfrac{bc}{a} + \dfrac{ca}{b} + \dfrac{ab}{c} \leq p$ 
(d) none of these

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**256.** If $x, y, z$ are positive numbers is $A\dot{P};\,then$ 
(a) $y^2 \geq xz$ 
(b) $xy + yz \geq 2xz$ 
(c) $\dfrac{x + y}{2y - x} + \dfrac{y + z}{2y - z} \geq 4$ 
(d) none of these

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**257.** Find $\displaystyle\int \dfrac{1}{(1 - x^2)\sqrt{1 + x^2}}\,dx$

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**258.** If $a > 0,$ then least value of $\left(a^3 + a^2 + a + 1\right)^2$ is (a)$64a^2$ (b)$16a^4$ (c)$16a^3$ (d)d. none of these

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**259.** The minimum value of $|z - 1| + |z - 3|$ is

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**260.** If $a, b, c, d \in R^+$ such that $a + b + c = 18$ , then the maximum value of $a^2 b^3 c^4$ is equal to a. $2^{18} \times 3^2$ b. $2^{18} \times 3^3$ c. $2^{19} \times 3^2$ d. $2^{19} \times 3^3$

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**261.** If $x, y$ and $z$ are positive real umbers and $x = \dfrac{12 - yz}{y + z}$ . The maximum value of $xyz$ equals.

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**262.** Let $x^2 - 3x + p = 0$ has two positive roots $a$ and $b$, then minimum value if $\left(\dfrac{4}{a} + \dfrac{1}{b}\right)$ is,

**263.** If $a, b, c \in R^+$, then the minimum value of $a(b^2 + c^2) + b(c^2 + a^2) + c(a^2 + b^2)$ is equal to (a)$abc$ (b)$2abc$ (c)$3abc$ (d)$6abc$

**264.** If $a, b, c, d \in R^+$ and $a, b, c, d$ are in H.P., then (a)$a + d > b + c$ (b) $a + b > c + d$ (c)$a + c > b + d$ (d)none of these

**265.** The minimum value of $P = bcx + cay + abz$, when $xyz = abc$, is

a. $3abc$ b. $6abc$ c. $abc$ d. $4abc$

**266.** If $l, m, n$ are the three positive roots of the equation $x^3 - ax^2 + bx - 48 = 0$, then the minimum value of $(1/l) + (2/m) + (3/n)$ equals a1 b2 c$\frac{3}{2}$ d$\frac{5}{2}$

**267.** If positive numbers $a, b, c$ are in H.P., then equation $x^2 - kx + 2b^{101} - a^{101} - c^{101} = 0 (k \in R)$ has (a)both roots positive (b)both roots negative (c)one positive and one negative root (d)both roots imaginary

**268.** For $x^2 - (a+3)|x| + 4 = 0$ to have real solutions, the range of $a$ is

a. $(-\infty, -7] \cup [1, \infty)$ b. $(-3, \infty)$ c. $(-\infty, -7)$ d. $[1, \infty)$

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**269.** If $a, b, c$ are the sides of a triangle, then the minimum value of

$\dfrac{a}{b+c-a} + \dfrac{b}{c+a-b} + \dfrac{c}{a+b-c}$ is equal to (a)3 (b)6 (c)9 (d)12

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**270.** If $a, b, c, d \in R^{\pm}\{1\}$, then the minimum value of

$(\log)_d a + (\log)_b d + (\log)_a c + (\log)_c b$ is (a)4 (b)2 (c)1 (d)none of these

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**271.** If $a, b, c \in R^{+}$, then $\dfrac{bc}{b+c} + \dfrac{ac}{a+c} + \dfrac{ab}{a+b}$ is always (a)

$\leq \dfrac{1}{2}(a+b+c)$ (b) $\geq \dfrac{1}{3}\sqrt{abc}$ (c) $\leq \dfrac{1}{3}(a+b+c)$ (d) $\geq \dfrac{1}{2}\sqrt{abc}$

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**272.** If $a, b, c \in R^+$ then $(a + b + c)\left(\dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{c}\right)$ is always (a) $\geq 12$ (b) $\geq 9$ (c) $\leq 12$ (d)none of these

**273.** The first term of an arithmetic progression is $1$ and the sum of the first nine terms equal to $369$. The first and the ninth term of a geometric progression coincide with the first and the ninth term of the arithmetic progression. Find the seventh term of the geometric progression.

**274.** Let a, b , c be positive integers such that 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 $\dfrac{a^2 + a - 14}{a + 1}$ is

**275.** Suppose that all the terms 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 in between 130 and 140, then the common difference of this A.P. is

**276.** If the sides of a right-angled triangle are in A.P., then the sines of the acute angles are $\dfrac{3}{5}, \dfrac{4}{5}$ b. $\dfrac{1}{\sqrt{3}}, \sqrt{\dfrac{2}{3}}$ c. $\dfrac{1}{2}, \dfrac{\sqrt{3}}{2}$ d. none of these

**277.** The sum of an infinite geometric series is 162 and the sum of its first $n$ terms is 160. If the inverse of its common ratio is an integer, then which of the following is not a possible first term? 108 b. 144 c. 160 d. none of these

**278.** If $a, b, c$ are digits, then the rational number represented by

0. $cababab$ ...... is a. $\dfrac{cab}{990}$ b. $\dfrac{99c + ba}{990}$ c. $\dfrac{99c + 10a + b}{99}$ d. $\dfrac{99c + 10a + b}{990}$

**279.** If $a = \underbrace{111..... .1}_{55 \text{times}}, b = 1 + 10 + 10^2 + 10^3 + 10^4$ and $c = 1 + 10^5$

$+ 10^{10} + .... + 10^{50}$ then prove that a=bc

**280.** Consider the ten numbers $ar, ar^2, ar^3, ..... , ar^{10}$. If their sum is 18

and the sum of their reciprocals is 6, then the product of these ten

numbers is a.81 b. 243 c. 343 d.324

**281.** The sum of 20 terms of a series of which every even term is 2 times the term before it, every odd term is 3 times the term before it, the first term being unity is a. $\left(\dfrac{2}{7}\right)(6^{10} - 1)$ b. $\left(\dfrac{3}{7}\right)(6^{10} - 1)$ c. $\left(\dfrac{3}{5}\right)(6^{10} - 1)$ d. none of these

**282.** Let $a_n$ be the nth term of a G.P. of positive numbers. Let $\displaystyle\sum_{n=1}^{100} a_{2n} = \alpha$ and $\displaystyle\sum_{n=1}^{100} a_{2n-1} = \beta$, such that $\alpha \neq \beta$, then the common ratio is
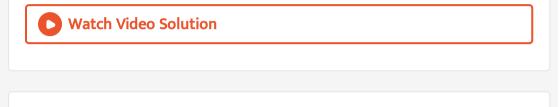
(a) $\alpha/\beta$ b. $\beta/\alpha$ c. $\sqrt{\alpha/\beta}$ d. $\sqrt{\beta/\alpha}$

**283.** If the pth, qth, and rth terms of an A.P. are in G.P., then the common ratio of the G.P. is a.$\dfrac{pr}{q^2}$ b. $\dfrac{r}{p}$ c. $\dfrac{q+r}{p+q}$ d. $\dfrac{q-r}{p-q}$

**284.** In a G.P. the first, third, and fifth terms may be considered as the first, fourth, and sixteenth terms of an A.P. Then the fourth term of the A.P., knowing that its first term is 5, is 10 b. 12 c. 16 d. 20

**285.** If a,b,c,d be in G.P. show that $(b-c)^2 + (c-a)^2 + (d-b)^2 = (a-d)^2$.

**286.** If the pth, qth, rth, and sth terms of an A.P. are in G.P., then $p-q, q-r, r-s$ are in a. A.P. b. G.P. c. H.P. d. none of these

**287.** $ABC$ is a right-angled triangle in which $\angle B = 90^0$ and $BC = a.$ If $n$ points $L_1, L_2, , L_n on AB$ is divided in $n+1$ equal parts and

$L_1M_1$, $L_2M_2$, , $L_nM_n$ are line segments parallel to $BC$ and $M_1$, $M_2$, , $M_n$ are on $AC$, then the sum of the lengths of $L_1M_1$, $L_2M_2$, , $L_nM_n$ is $\dfrac{a(n+1)}{2}$ b. $\dfrac{a(n-1)}{2}$ c. $\dfrac{an}{2}$ d. none of these

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**288.** If $(1-p)(1+3x+9x^2+27x^3+81x^4+243x^5) = 1 - p^6$, $p \neq 1$, then the value of $\dfrac{p}{x}$ is

a. $\dfrac{1}{3}$ b. 3 c. $\dfrac{1}{2}$ d. 2

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**289.** ABCD is a square of length a, $a \in N$, a > 1. Let $L_1$, $L_2$, $L_3$... be points on BC such that $BL_1 = L_1L_2 = L_2L_3 = ....$ 1 and $M_1$, $M_2$, $M_3$, .... be points on CD such that $CM_1 = M_1M_2 = M_2M_3 = ... = 1$. Then $\displaystyle\sum_{n=1}^{a-1}\left((AL_n)^2 + (L_nM_n)^2\right)$ is equal to :

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**290.** Let $T_r and S_r$ be the rth term and sum up to rth term of a series, respectively. If for an odd number $n$, $S_n = n and T_n = \dfrac{T_n - 1}{n^2}$, then $T_m$ ( $m$ being even) is $\dfrac{2}{1 + m^2}$ b. $\dfrac{2m^2}{1 + m^2}$ c. $\dfrac{(m + 1)^2}{2 + (m + 1)^2}$ d. $\dfrac{2(m + 1)^2}{1 + (m + 1)^2}$

**291.** If $(1 + 3 + 5 + \; + p) + (1 + 3 + 5 + \; + q) = (1 + 3 + 5 + \; + r)$ where each set of parentheses contains the sum of consecutive odd integers as shown, the smallest possible value of $p + q + r (where p > 6)$ is 12 b. 21 c. 45 d. 54

**292.** If $ax^3 + bx^2 + cx + d$ is divisible by $ax^2 + c$, then $a, b, c, d$ are in a. A.P. b. G.P. c. H.P. d. none of these

**293.** If the lines 3x + by + 5 = 0 and ax − 5y + 7 = 0 are perpendicular to each other, find the relation connecting a and b.

**294.** In a geometric series, the first term is $a$ and common ratio is $r$. If $S_n$ denotes the sum of the terms and $U_n = \sum_{n=1}^{n} S_n$ ,then $rS_n + (1 - r)U_n$ equals a.0 b. $n$ c. $na$ d. $nar$

**295.** If $x, y, and z$ are distinct prime numbers, then (a).$x, y, and z$ may be in A.P. but not in G.P. (b)$x, y, and z$ may be in G.P. but not in A.P. (c). $x, y, and z$ can neither be in A.P. nor in G.P. (d).none of these

**296.** If $x, y,$ and $z$ are in G.P. and $x + 3, y + 3,$ and $z + 3$ are in H.P., then

a.$y = 2$ b. $y = 3$ c. $y = 1$ d. $y = 0$

**297.** If A.M., G.M., and H.M. of the first and last terms of the series of $100, 101, 102, \ldots(n - 1), n$ are the terms of the series itself, then the value of $n$ is $(100 < n < 500)$

**298.** The sum $1 + 3 + 7 + 15 + 31 + \ldots \to 100$ terms is a. $2^{100} - 102$ b. $2^{99} - 101$ c. $2^{101} - 102$ d. none of these

**299.** The sum of first 15 terms of an A.P. is 750 and its first term is 15. Find its 20th term.

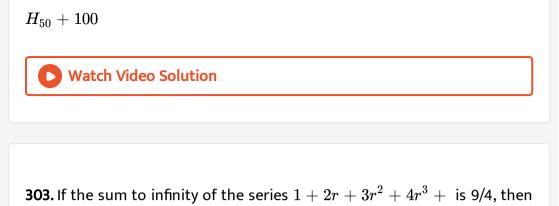**300.** The coefficient of $x^{49}$ in the product $(x-1)(x-3)(x-99)is$ a. $-99^2$ b. 1 c. $-2500$ d. none of these

**301.** Let $S = \dfrac{4}{19} + \dfrac{44}{19^2} + \dfrac{444}{19^3} + up \to \infty$ . Then $s$ is equal to a. $40/9$ b. $38/81$ c. $36/171$ d. none of these

**302.** If $H_n = 1 + \dfrac{1}{2} + ... + \dfrac{1}{n}$ , then the value of $S_n = 1 + \dfrac{3}{2} + \dfrac{5}{3} + ... + \dfrac{99}{50}$ is a. $H_{50} + 50$ b. $100 - H_{50}$ c. $49 + H_{50}$ d.

$H_{50} + 100$

**303.** If the sum to infinity of the series $1 + 2r + 3r^2 + 4r^3 +$ is 9/4, then value of $r$ is (a)$1/2$ b. $1/3$ c. $1/4$ d. none of these

**304.** The sum o f series $1 + \dfrac{4}{5} + \dfrac{7}{5^2} + \dfrac{10}{5^3} + \infty$ is a. $7/16$ b. $5/16$ c. $104/64$ d. $35/16$

**305.** The sum 20 terms of a series whose rth term is given by $T_r = (-1)^r \left( \dfrac{r^2 + r + 1}{r!} \right)$ is

**306.** Consider the sequence 1,2,2,4,4,4,4,8,8,8,8,8,8,8,8,... Then 1025th terms will be (a)$2^9$ b. $2^{11}$ c. $2^{10}$ d. $2^{12}$

**307.** If the first term of an A.P. is – 18 and its 10th term is zero, then find its common difference.

**308.** Suppose that F(n + 1) = $\dfrac{2F(n) + 1}{2}$ for n = 1,2,3,,,, and F(1) = 2. Then F(101) is

**309.** If the numbers n – 2, 4n – 1 and 5n + 2 are in A.P., find the value of n.

**310.** The first and the last terms of an A.P. are 17 and 350 respectively. If the common difference is 9, how many terms are there and what is their sum?

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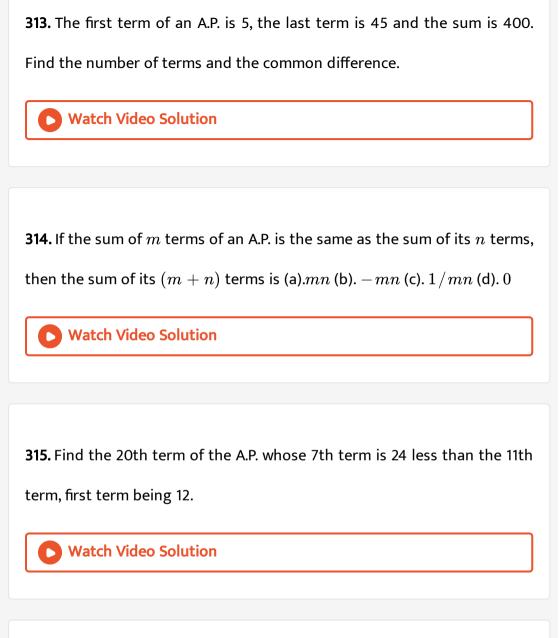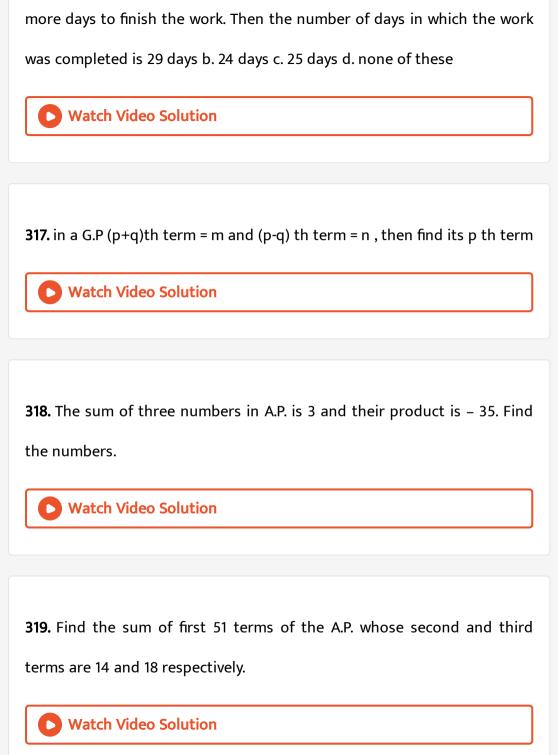**311.** If $a, b,$ and $c$ are in A.P., then $a^3 + c^3 - 8b^3$ is equal to (a).$2abc$ (b). $6abc$ (c). $4abc$ (d). none of these

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**312.** The number of terms of an A.P. is even. The sum of the odd terms is 24, and of the even terms is 30, and the last term exceeds the first by $10\frac{1}{2}$ then the number of terms in the series is a. 8 b. 4 c. 6 d. 10

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**313.** The first term of an A.P. is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.

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**314.** If the sum of $m$ terms of an A.P. is the same as the sum of its $n$ terms, then the sum of its $(m + n)$ terms is (a).$mn$ (b). $-mn$ (c). $1/mn$ (d). 0

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**315.** Find the 20th term of the A.P. whose 7th term is 24 less than the 11th term, first term being 12.

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**316.** About 150 workers were engaged to finish a piece of work in a certain number of days. Four workers stopped working on the second day, four more workers stopped their work on the third day and so on. It took 8

more days to finish the work. Then the number of days in which the work was completed is 29 days b. 24 days c. 25 days d. none of these

**317.** in a G.P (p+q)th term = m and (p-q) th term = n , then find its p th term

**318.** The sum of three numbers in A.P. is 3 and their product is − 35. Find the numbers.

**319.** Find the sum of first 51 terms of the A.P. whose second and third terms are 14 and 18 respectively.

**320.** Let $S_1, S_2, \ldots$, be squares such that for each $n \geq 1$ the length of a side of $S_n$ equals the length of a diagonal of $S_{n+1}$. If the length of a sides of $S_1$ is 10 cm, then for which of the following values of n in the ares of $S_n$ less than 1 sq. cm ?

**321.** Find the 6th term from the end of the list of numbers 3, – 6, 12, – 24, ..., 12288.

**322.** Determine the 12th term of a G.P. whose 8th term is 192 and common ratio is 2.

**323.** Consider a sequence $\{a_n\}$ with $a_1 = 2$ and $a_n = \dfrac{a_{n-1}^2}{a_{n-2}}$ for all $n \geq 3$, terms of the sequence being distinct. Given that $a_1$ and $a_5$ are positive integers and $a_5 \leq 162$ then the possible value(s) of $a_5$ can be (a) 162 (b) 64 (c) 32 (d) 2

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**324.** Which of the following can be terms of any A.P.? a. 1,6,19 b. $\sqrt{2}, \sqrt{50}, \sqrt{98}$ c. $\log 2, \log 16, \log 128$ d. $\sqrt{2}, \sqrt{3}, \sqrt{7}$

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**325.** x, x + 3, x + 9 are first three terms of a G.P. Find the value of x.

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**326.** Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: If both the statements are true and Statement 2 is the correct explanation of statement 1. If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is True. Statement 1: $\dfrac{\sin \pi}{18}$ is a root of $8x^3 - 6x + 1 = 0$ Statement 2: For any $\theta \in R, \sin 3\theta = 3\sin\theta - 4\sin^3\theta$

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**327.** Find the sum of the following A.P.s : (i)1/15, 1/12, 1/10, ... to 11 terms

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**328.** Find the value of x such that, (i) -2/7, x, -7/2 are three consecutive terms of a G.P.

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**329.** Let $a_1, a_2, \ldots, a_{100}$ be an arithmetic progression with $a_1 = 3$ and

$S_p = \displaystyle\sum_{j=1}^{p} a_j, 1 \le p \le 100.$ $F$ or $any \int e \ge rnwith1$    le    n    le    20

,  $\le tm = 5n,$   if  S_m / S_ndoes $\neg n,$ thena_2` is

**330.**          If          $1^2 + 2^2 + 3^2 + + 2003^2 = (2003)(4007)(334)$ and

$(1)(2003) + (2)(2002) + (3)(2001) + + (2003)(1) = (2003)(334)(x),$

then $x$ is equal to a. 2005 b. 2004 c. 2003 d. 2001

**331.** The value of $\displaystyle\sum_{i=1}^{n}\sum_{j=1}^{i}\sum_{k=1}^{j} 1 = 220,$  then the value of $n$ equals a.11 b.

12 c.10 d. 9

**332.** The sum of $0.2 + 0.004 + 0.00006 + 0.0000008 + \ldots$ to $\infty$ is a. $\dfrac{200}{891}$ b. $\dfrac{2000}{9801}$ c. $\dfrac{1000}{9801}$ d. none of these

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**333.** If $t_n = \dfrac{1}{4}(n+2)(n+3)$ for $n = 1, 2, 3, \ldots.$ then

$$\dfrac{1}{t_1} + \dfrac{1}{t_2} + \dfrac{1}{t_3} + \ldots. + \dfrac{1}{t_{2003}} =$$

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**334.** The coefficient of $x^{19}$ in the polynomial $(x-1)(x-2)\left(x-2^2\right)\left(x-2^{19}\right)$ is $2^{20} - 2^{19}$ b. $1 - 2^{20}$ c. $2^{20}$ d. none of these

**335.** If $1 - \dfrac{1}{3} + \dfrac{1}{5} - \dfrac{1}{7} + \dfrac{1}{9} - \dfrac{1}{11} + = \dfrac{\pi}{4}$ , then value of $\dfrac{1}{1 \times 3} + \dfrac{1}{5 \times 7} + \dfrac{1}{9 \times 11} +$ is $\pi/8$ b. $\pi/6$ c. $\pi/4$ d. $\pi/36$

**336.** Find the value of p, given that the line y/2 = x – p passes through the point (– 4, 4)

**337.** If $t_n$ denotes the nth term of the series $2 + 3 + 6 + 11 + 18 + \ldots$ then $t_{50}$ a.$49^2 - 1$ b. $49^2$ c. $50^2 + 1$ d. $49^2 + 2$

**338.** The number of positive integral ordered pairs of $(a, b)$ such that $6, a, b$ are in harmonic progression is _____.

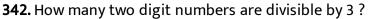**339.** Let $a, b > 0$, let $5a - b, 2a + b, a + 2b$ be in A.P. and $(b + 1)^2, ab + 1, (a - 1)^2$ are in G.P., then the value of $(a^{-1} + b^{-1})$ is _____.

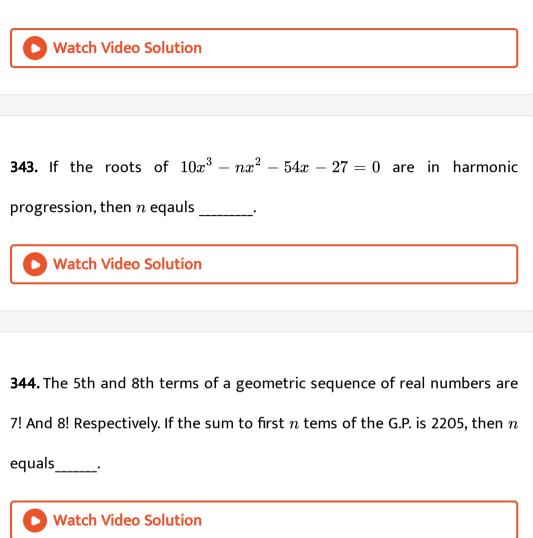**340.** The difference between the sum of the first $k$ terms of the series $1^3 + 2^3 + 3^3 + \ldots + n^3$ and the sum of the first $k$ terms of $1 + 2 + 3 + \ldots + n$ is 1980. The value of $k$ is _____.

**341.** The value of the $\sum\limits_{n=0}^{\infty} \dfrac{2n + 3}{3^n}$ is equal to_____.

**342.** How many two digit numbers are divisible by 3 ?

**343.** If the roots of $10x^3 - nx^2 - 54x - 27 = 0$ are in harmonic progression, then $n$ eqauls _____.

**344.** The 5th and 8th terms of a geometric sequence of real numbers are 7! And 8! Respectively. If the sum to first $n$ tems of the G.P. is 2205, then $n$ equals_____.

**345.** Find the 31st term of an A.P. whose 11th term is 38 and 6th term is 73.

**346.** Find 23rd term of the AP 7, 3, 1, -1, .... ,-3.

**347.** The 5th and 13th term of an A.P are 5 and -3 respectively. Find the A.P and the 30th term.

**348.** If the sum of the first 14 terms of an AP is 1050 and its first term is 10 , find the 20th term .

**349.** The next term of the G.P. $x$, $x^2 + 2$, $and x^3 + 10$ is $\dfrac{729}{16}$ b. 6 c. 0 d. 54

**350.** If $x^2 + 9y^2 + 25z^2 = xyz\left(\dfrac{15}{x} + \dfrac{5}{y} + \dfrac{3}{z}\right)$, then $x, y,$ $and z$ are in

a. H.P. b. A.P. c. G.P. d. None of These

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**351.** If the sum of $n$ terms of an A.P. is given by $S_n = a + bn + cn^2$, $where a, b, c$ are independent of $n,$ $then$ (a) $a = 0$ (b) common difference of A.P. must be $2b$ (c) common difference of A.P. must be $2c$ (d) first term of A.P. is $b + c$

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**352.** Find the sum of 20th term of the A.P (x+y), (x-y), (x-3y), ....

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**353.** Find the sum of the series 2+5+8+11+.....+191

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**354.** If $p, q, and r$ are inA.P., show that the pth, qth, and rth terms of any G.P. are in G.P.

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**355.** If $n > 1$ , the value of the positive integer $m$ for which $n^m + 1$ divides $a = 1 + n + n^2 + \ddot{} + n^{63}$ is/are a.8 b. 16 c. 32 d. 64

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**356.** For an increasing A.P. $a_1, a_2, a_n$ if $a_1 + a_3 + a_5 = -12$ and $a_1 a_3 a_5 = 80$, then which of the following is/are true? a.$a_1 = -10$ b. $a_2 = -1$ c. $a_3 = -4$ d. $a_5 = +2$

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**357.** If $p(x) = \left(1 + x^2 + x^4 + \; + x^{2n-2}\right) / \left(1 + x + x^2 + \; + x^{n-1}\right)$ is a polomial in $x$, then find possible value of $n$.

**358.** Find the sum of all even integers between 101 and 199.

**359.** Match the statements/expressions given in column I with the values given in Column II. Column I, Column II In $R^2$, if the magnitude of the projection vector of the vector $a\hat{i} + \beta\hat{j}$ on $\sqrt{3}\hat{i} + \hat{j} is \sqrt{3}$ and if $|a|$ is /are, (p) 1 Let $a and b$ be real numbers such that the function $f(x) = \{ -3ax^2 - 2, x < 1 bx + a^2, x \geq 1$ Differentiable for all $x \in R$. Then possible value $(s)$ of a is/are, (q) 2 Let $w \neq 1$ be a complex cube root of unity. If $\left(3 - 3w + 2w^2\right)^{4n+3} + \left(2 + 3w - 3w^2\right)^{4n+3} + \left(-3 - 2w + 3w^2\right)^{4n+3} = 0$, then possible values (s) of $n$ is /are, (r) 3 Let the harmonic mean of two

positive real numbers $a$ and $b$ be 4. If $q$ is a positive real number such that $a, 5, q, b$ is an arithmetic progressin, then the values $(s) of |q - a|$ is /are, (s) 4 , (t) 5

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**360.** Prove that $1 + i^2 + i^4 + i^6$ =0

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**361.** if $a, b, c$ are in G.P.,then $(\log)_a 10, (\log)_b 10, (\log)_c 10$ are in____

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**362.** The 15th term of the series $2\dfrac{1}{2} + 1\dfrac{7}{13} + 1\dfrac{1}{9} + \dfrac{20}{23} + .... is$ $\dfrac{10}{39}$ b. $\dfrac{10}{21}$ c. $\dfrac{10}{23}$ d. none of these

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**363.** Let $a_1, a_2, a_3, \ldots\ldots a_{11}$ be real number satisfying $a_1 = 15, 27 - 2a_2 > 0$ and $a_k = 2a_{k-1} - a_{k-2}$ for k=3,4,....11. If $\dfrac{a_1^2 + a_2^2 + \ldots\ldots a_{11}^2}{11} = 90,$ then the value of $\dfrac{a_1 + a_2 + \ldots\ldots a_{11}}{11}$ is equal to

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**364.** The coefficients of $x^n$ in $\left(1 + \dfrac{x}{1!} + \dfrac{x^2}{2!} + \ldots\ldots + \dfrac{x^n}{n!}\right)^2$ is
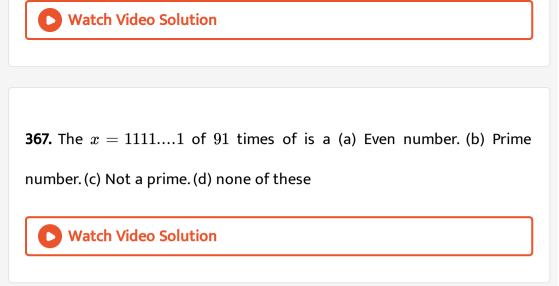
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**365.** If $x^2 + 9y^2 + 25z^2 = xyz\left(\dfrac{15}{x} + \dfrac{5}{y} + \dfrac{3}{z}\right)$, then $x, y, and z$ are in

a. H.P. b. A.P. c. G.P. d. None of These

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**366.** Find the conjugate of the following: $\sqrt{-3}$

**367.** The $x = 1111....1$ of 91 times of is a (a) Even number. (b) Prime number. (c) Not a prime. (d) none of these

**368.** Which term of the AP 64, 60, 56, 52, 48 ,.... is 0 .

**369.** Statement 1: Sum of the series $1^3 - 2^3 + 3^3 - 4^3 + + 11^3 = 378$. - Statement 2: For any odd integer $n \geq 1, n^3 - (n-1)^3 + + (-1)^{n-1}1^3 = \frac{1}{4}(2n-1)(n+1)^2$.

**370.** Statement 1: $1^{99} + 2^{99} + \ldots + 100^{99}$ is divisible by 10100.

Statement 2: $a^n + b^n$ is divisible by $a + b$ if $n$ is odd.

Only conclusion I follows Only

conclusion II follows

Either I or II follows

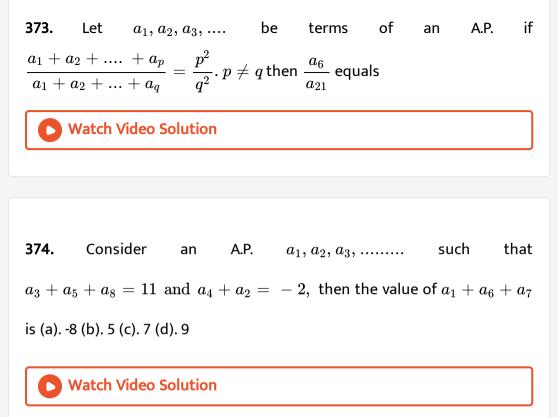Neither I nor II follows

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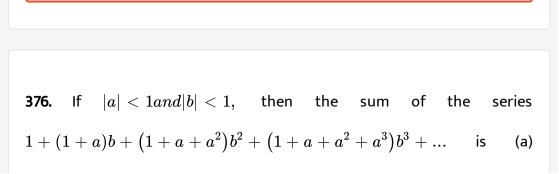**371.** Find the nth term of the AP 8, 3, -2, -7, -12,....

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**372.** The sum of three consecutiveterms of an AP is 21, and the sum of the squares of thesetrems is 165. Find these terms.

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**373.** Let $a_1, a_2, a_3, \ldots.$ be terms of an A.P. if

$$\frac{a_1 + a_2 + \ldots + a_p}{a_1 + a_2 + \ldots + a_q} = \frac{p^2}{q^2}. \, p \neq q \text{ then } \frac{a_6}{a_{21}} \text{ equals}$$

**374.** Consider an A.P. $a_1, a_2, a_3, \ldots\ldots$ such that

$a_3 + a_5 + a_8 = 11$ and $a_4 + a_2 = -2$, then the value of $a_1 + a_6 + a_7$

is (a). -8 (b). 5 (c). 7 (d). 9

**375.** If the sum of n terms of an A.P is $cn(n-1)$ where $c \neq 0$ then find

the sum of the squares of these terms.

**376.** If $|a| < 1 and |b| < 1$, then the sum of the series

$1 + (1+a)b + (1 + a + a^2)b^2 + (1 + a + a^2 + a^3)b^3 + \ldots$ is (a)

$$\frac{1}{(1-a)(1-b)}$$ (b). $$\frac{1}{(1-a)(1-ab)}$$ (c.) $$\frac{1}{(1-b)(1-ab)}$$ (d.)

$$\frac{1}{(1-a)(1-b)(1-ab)}$$

**377.** Find the sum of odd intergers from 1 to 201.

**378.** If $a_1, a_2, a_3 (a_1 > 0)$ are three successive terms of a G.P. with common ratio $r$, for which $a_3 > 4a_2 - 3a_1$ holds true is given by a. $1 < r < -3$ b. $-3 < r < -1$ c. $r > 3$ or $r < 1$ d. none of these

**379.** Three numbers form an increasing G.P. If the middle number is doubled, then the new numbers are in A.P. The common ratio of the G.P. is

(A) $2 - \sqrt{3}$ (B) $2 + \sqrt{3}$ (C) $\sqrt{3} - 2$ (D) $3 + \sqrt{2}$

**380.** If $S_1, S_2, S_3, S_m$ are the sums of $n$ terms of $m$ A.P. 's whose first terms are $1, 2, 3, , m$ and common differences are $1, 3, 5, , (2m-1)$ respectively. Show that $S_1 + S_2, + S_m = \dfrac{mn}{2}(mn+1)$

**381.** If $S_1, S_2$ and $S_3$ be respectively the sum of n, 2n and 3n terms of a G.P., prove that $S_1(S_3 - S_2) = ((S_2) - (S_1))^2$

**382.** There are $4n + 1$ terms in a sequence of which first $2n + 1$ are in Arithmetic Progression and last $2n + 1$ are in Geometric Progression the common difference of Arithmetic Progression is $2$ and common ratio of Geometric Progression is $\dfrac{1}{2}$. The middle term of the Arithmetic Progression is equal to middle term of Geometric Progression. Let middle

term of the sequence is $T_m$ and $T_m$ is the sum of infinite Geometric Progression whose sum of first two terms is $\left(\dfrac{5}{4}\right)^2 n$ and ratio of these terms is $\dfrac{9}{16}$.

1. Number of terms in the given sequence is equal to -

(a) 9

(b) 17

(c) 13

(d) none

2. Middle term of the given sequence, i.e. $T_m$ is equal to

(a) 16/7

(b) 32/7

(c) 48/7

(d) 16/9

3. First term of given sequence is equal to -

(a) –8/7, –20/7

(b) –36/7

(c) 36/7

(d) 48/7

**383.** If $(p + q)th$ term of a G.P. is $a$ and its $(p - q)th$ term is $b$ where $a, b$ in $R^+$, then its pth term is (a). $\sqrt{\dfrac{a^3}{b}}$ (b). $\sqrt{\dfrac{b^3}{a}}$ (c). $\sqrt{ab}$ (d). none of these

**384.** Find the sum of $n$ terms of the series whose nth term is $T(n) = \dfrac{\tan x}{2^n} \times \dfrac{\sec x}{2^{n-1}}$.

**385.** Evaluate, $\displaystyle\sum_{i=0}^{i} \infty \sum_{j=0}^{\infty} \sum_{k=0}^{\infty} \dfrac{1}{3^i \cdot 3^j \cdot 3^k} (i \neq j \neq k)$

**386.** The first trem of a GP is -3 and the square of the second term is equal to its 4th term. Find its 7th term.

**387.** If $\log_2(5.2^x + 1)$, $\log_4(2^{1-x} + 1)$ and 1 are in A.P, then x equals

**388.** Find the geometric series whose 5th and 8th terms are 80 and 640 respectively.

**389.**

$$0 < \theta < \frac{\pi}{2}, \quad \text{if} \quad x = \sum_{n=0}^{\infty} \cos^{2n}\theta, y = \sum_{n=0}^{\infty} \sin^{2n}\theta, z = \sum_{n=0}^{\infty} \cos^{2n}\theta\sin^{2n}\theta$$

**390.** The real numbers $x_1, x_2, x_3$ satisfying the equation $x^3 - x^2 + bx + \gamma = 0$ are in A.P. Find the intervals in which $\beta$ and $\gamma$ lie.
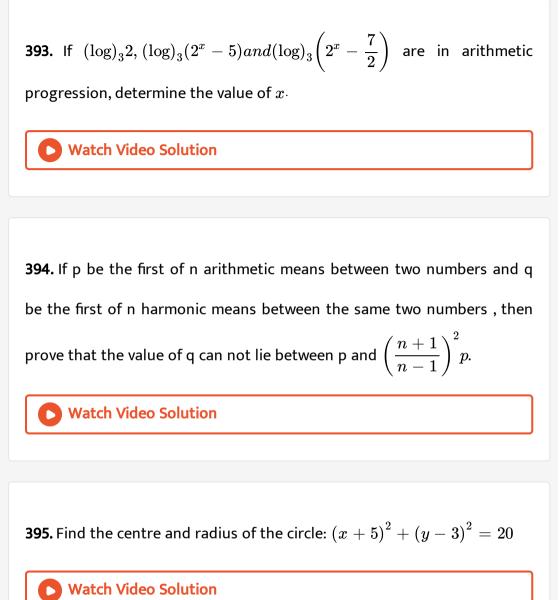
**391.** Let $a, b, c, d$ be real numbers in $G.\,P.$ If $u, v, w$ satisfy the system of equations $u + 2v + 3w = 6$, $4u + 5v + 6w = 12$ and $6u + 9v = 4$ then show that the roots of the equation $\left(\dfrac{1}{u} + \dfrac{1}{v} + \dfrac{1}{w}\right)x^2 + \left[(b-c)^2 + (c-a)^2 + (d-b)^2\right]x + (u+v+w) =$ and $20x^2 + 10(a-d)^2 x - 9 = 0$ are reciprocals of each other.

**392.** The 5th, 8th and 11th terms of a GP are a,b,c respectively. Show that, $b^2 = ac$

**393.** If $(\log)_3 2,\ (\log)_3(2^x - 5)\ and\ (\log)_3\left(2^x - \dfrac{7}{2}\right)$ are in arithmetic progression, determine the value of $x$.

**394.** If p be the first of n arithmetic means between two numbers and q be the first of n harmonic means between the same two numbers , then prove that the value of q can not lie between p and $\left(\dfrac{n+1}{n-1}\right)^2 p.$

**395.** Find the centre and radius of the circle: $(x+5)^2 + (y-3)^2 = 20$

**396.** The interior angles of a polygon are in arithmetic progression. The smallest angle is $120°$ and the common difference is $5°$ . Find the number of sides of the polygon.
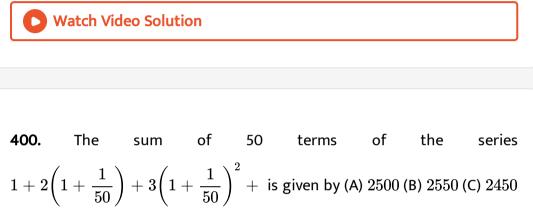
**397.** If $a_1, a_2, a_3, ....... a_n$ are in AP where $a_1 > 0 \forall i$ then the value of

$$\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + ... \frac{.1}{\sqrt{a_{n-1}} + \sqrt{a_n}} =$$

**398.** Does there exist a GP containing 27,8 and 12 as three of its terms ? If it exists, how many such progressions are possible ?

**399.** Find three numbers a,b,c between 2 & 18 such that; their sum is 25; the numbers 2,a,b are consecutive terms of an AP & the numbers b,c,18 are consecutive terms of a G.P.

**400.** The sum of 50 terms of the series $1 + 2\left(1 + \dfrac{1}{50}\right) + 3\left(1 + \dfrac{1}{50}\right)^2 +$ is given by (A) $2500$ (B) $2550$ (C) $2450$ (D) none of these

**401.** The sum of 50 terms of the series $\dfrac{3}{1^2} + \dfrac{5}{1^2 + 2^2} + \dfrac{7}{1^2 + 2^2 + 3^2} + \ldots\ldots\ldots$ is (a). $\dfrac{100}{17}$ (b). $\dfrac{150}{17}$ (c). $\dfrac{200}{51}$ (d). $\dfrac{50}{17}$

**402.** Which term of the AP 3,10, 17,... will be 84 more than its 13th term?

**403.** The sum of the series $a - (a + d) + (a + 2d) - (a + 3d) + \ldots$ up to $(2n + 1)$ terms is: a. $-nd$. b. $a + 2nd$. c. $a + nd$. d. $2nd$

**404.** If $a, b, and c$ are in G.P. and $x, y,$ respectively, are the arithmetic means between $a, b, and b, c$, then the value of $\dfrac{a}{x} + \dfrac{c}{y}$ is 1 b. 2 c. $1/2$ d. none of these

**405.** Find the number of multiples of 4 lies between 10 and 250.

**406.** Find the sum $\dfrac{3}{1 \times 2} \times \dfrac{1}{2} + \dfrac{4}{2 \times 3} \times \left(\dfrac{1}{2}\right)^2 + \dfrac{5}{3 \times 4} \times \left(\dfrac{1}{2}\right)^3 +$

to $n$ terms.

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**407.** Find the sum of the series upto n terms

$\left(\dfrac{2n+1}{2n-1}\right) + 3\left(\dfrac{2n+1}{2n-1}\right)^2 + 5\left(\dfrac{2n+1}{2n-1}\right)^3 + \ldots .$

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**408.** If k, 2(k+1), 3(k+1) are in GP, Then find the value of k.

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**409.** If the first and the nth terms of a G.P are $a$ and $b$, respectively, and if $P$ is the product of the first $n$ terms then prove that $P^2 = (ab)^n$.

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**410.** Find the sum of first 10 evenwhole number.

**411.** Find the sum of the natural numbers less than 100, which are divisible by 4.

**412.** If the terms of the A.P, $\sqrt{a-x}, \sqrt{x}, \sqrt{a+x}$ are all in integers, where $a > x > 0,$ then find the least composite value of $a.$

**413.** For $a, x, > 0$ prove tht at most one term of the G.P. $\sqrt{a-x}, \sqrt{x}, \sqrt{a+x}$ can be rational.

**414.** If $\dfrac{1}{1^2} + \dfrac{1}{2^2} + \dfrac{1}{3^2} + ....$ upto $\infty = \dfrac{\pi^2}{6}$ , then, find $\dfrac{1}{1^2} + \dfrac{1}{3^2} + \dfrac{1}{5^2} + ......upto\infty$

**415.** Coefficient of $x^{18}$ in $\left(1 + x + 2x^2 + 3x^3 + + 18x^{18}\right)^2$ equal to 995 b. 1005 c. 1235 d. none of these

**416.** Let $\alpha$ , $\beta$ be the roots of $x^2 - x + p = 0$ and $\gamma, \delta$ be the roots of $x^2 - 4x + q = 0$. If $\alpha, \beta, \gamma$ are in GP , then the integer values of p and q respectively are:

**417.** If the sum of the first 2n terms of the AP 2,5,8.....is equal to the sum of the first n terms of the AP 57,59,61, ....then n equals

**418.** Statement 1: If the arithmetic mean of two numbers is 5/2 geometric mean of the numbers is 2, then the harmonic mean will be 8/5. Statement 2: For a group of positive numbers $\left(G\dot{M}.\right)^2 = \left(A\dot{M}.\right)\left(H\dot{M}.\right)$.

**419.** Number of positive integral ordered pairs of (x,y), so that 8,x,y are in H.P. is a. 0 b. 1 c. 2. d. 3

**420.** If three positive real numbers $a, b, c$ are in A.P such that $abc = 4$ , then the minimum value of $b$ is a)$2^{1/3}$ b) $2^{2/3}$ c) $2^{1/2}$ d) $2^{3/23}$

**421.** Consider an infinite geometric series with first term $a$ and common ratio $r$. If its sum is 4 and the second term is 3/4, then (a) $a = \dfrac{4}{7}, r = \dfrac{3}{7}$ (b). $a = 2, r = \dfrac{3}{8}$ (c). $a = \dfrac{3}{2}, r = \dfrac{1}{2}$ (d). $a = 3, r = \dfrac{1}{4}$

**422.** The maximum sum of the series $20 + 19\dfrac{1}{3} + 18\dfrac{2}{3} + \ldots\ldots$ is (A) 310 (B) 300 (C) 320 (D) none of these
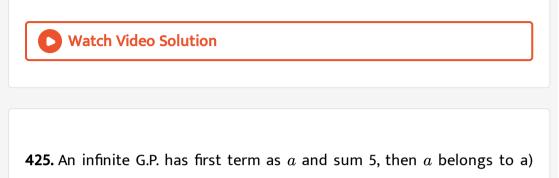
**423.** The sum of n terms of a progression is $(2^n - 1)$. Show that it is a GP and Find its common ratio.

**424.** Let $a_1, a_2, \ldots$ be in harmonic progression with $a_1 = 5$ and $a_{20} = 25$. The least positive integer n for which $a_n < 0$
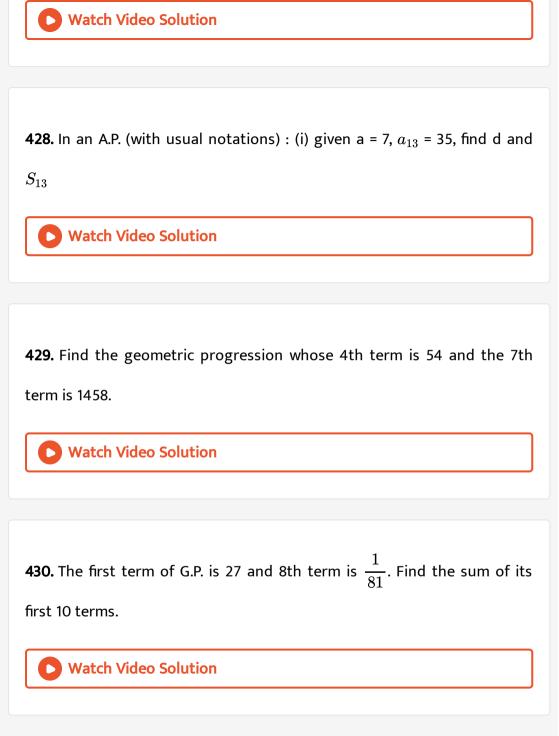
**425.** An infinite G.P. has first term as $a$ and sum 5, then $a$ belongs to a) $|a| < 10$ b) $-10 < a < 0$ c) $0 < a < 10$ d) $a > 10$

**426.** Let $S \subset (0, \pi)$ denote the set of values of $x$ satisfying the equation $8^{1 + |\cos x| + \cos^2 x + |\cos^{3x}| \to \infty} = 4^3$ . Then, $S = \{\pi/3\}$ b. $\{\pi/3, 2\pi/3\}$ c. $\{-\pi/3, 2\pi/3\}$ d. $\{\pi/3, 2\pi/3\}$

**427.** Find the number of terms of a G.P. whose first term is ¾, common ratio is 2 and the last term is 384.

**428.** In an A.P. (with usual notations) : (i) given a = 7, $a_{13}$ = 35, find d and $S_{13}$

**429.** Find the geometric progression whose 4th term is 54 and the 7th term is 1458.

**430.** The first term of G.P. is 27 and 8th term is $\frac{1}{81}$. Find the sum of its first 10 terms.

**431.** The greatest integer by which $1 + \sum\limits_{r=1}^{30} r \times r!$ is divisible is a. composite number b. odd number c. divisible by 3 d. none of these

**432.** $(\lim)_{n \to \infty} \sum\limits_{r=1}^{n} \dfrac{r}{1 \times 3 \times 5 \times 7 \times 9 \times \; ..... \; \times (2r+1)}$ is equal to $\dfrac{1}{3}$ b. $\dfrac{3}{2}$ c. $\dfrac{1}{2}$ d. none of these
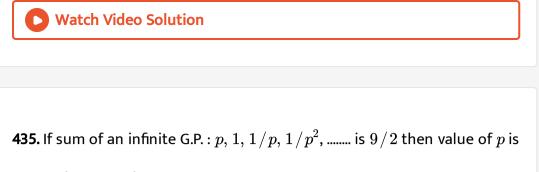
**433.** Value of $\left(1 + \dfrac{1}{3}\right)\left(1 + \dfrac{1}{3^2}\right)\left(1 + \dfrac{1}{3^4}\right)\left(1 + \dfrac{1}{3^8}\right)........ \infty$ is equal to a.3 b. $\dfrac{6}{5}$ c. $\dfrac{3}{2}$ d. none of these

**434.** Find the third term of a G.P. whose common ratio is 3 and the sum of whose first seven terms is 2186

**435.** If sum of an infinite G.P. : $p, 1, 1/p, 1/p^2, \ldots\ldots$ is $9/2$ then value of $p$ is

a. 1 b. 3/2 c. 3 d. 9/2

**436.** The sum of $i - 2 - 3i + 4$ up to 100 terms, where $i = \sqrt{-1}$ is

$50(1 - i)$ b. $25i$ c. $25(1 + i)$ d. $100(1 - i)$

**437.** The 24th term of an A.P. is twice its 10th term. Show that its 72nd term is four times its 15th term.

**438.** If the seventh term of an A.P. is $\dfrac{1}{9}$ and its ninth term is $\dfrac{1}{7}$, find its 63rd term.

**439.** For the series,

$$S = 1 + \dfrac{1}{(1+3)}(1+2)^2 + \dfrac{1}{(1+3+5)}(1+2+3)^2 + \dfrac{1}{(1+3+5+7)}($$

$+...$

a. 7th term is 16

b. 7th term is 18

c. Sum of first 10 terms is $\dfrac{505}{4}$

d. Sum of first 10 terms is $\dfrac{45}{4}$

**440.** If the first and the $(2n-1)^{t}h$ term of an A.P,G.P anf H.P are equal and their nth term are a,b,c respectively,then

**441.** Find the value of k for which $k + 12, k - 6, 3$ are in GP.

**442.** IF $a_1, a_2, a_3, ....a_{10}$ be in AP and $h_1, h_2, h_3, ....h_{10}$ be in HP. If $a_1 = h_1 = 2$ and $a_{10} = h_{10} = 3$, then find value of $a_4 h_7$.

**443.** The harmonic mean of the roots of the equation $(5 + \sqrt{2})x^2 - (4 + \sqrt{5})x + 8 + 2\sqrt{5} = 0$ is 2 b. 4 c. 6 d. 8

**444.** If a,b,c are in GP, Prove that, $a(b^2 + c^2) = c(a^2 + b^2)$

**445.** If $\ln(a + c)$, $\ln(a - c)$ and $\ln(a - 2b + c)$ are in A.P., then (a) $a, b, c$ are in A.P. (b) $a^2, b^2, c^2$, are in A.P. (c) $a, b, c$ are in G.P. (d) $a, b, c$ are in H.P.

**446.** If a,b,c are in G.P., then the equations $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root if d/a,e/b,f/c are in

**447.** Sum of the first $n$ terms of the series $\dfrac{1}{2} + \dfrac{3}{4} + \dfrac{7}{8} + \dfrac{15}{16} + \ldots\ldots\ldots$ is equals to (a).$2^n - n - 1$ (b). $1 - 2^{-n}$ (c). $n + 2^{-n} - 1$ (d).None of these

**448.** The third term of a geometric progression is 4. Then the product of the first five terms is a.$4^3$ b. $4^5$ c. $4^4$ d. none of these

**449.** In triangle ABC medians AD and CE are drawn, if AD=5, $\angle DAC = \dfrac{\pi}{8}$ and $\angle ACE = \dfrac{\pi}{4}$, then the area of triangle ABC is equal to a. $\dfrac{25}{8}$ b. $\dfrac{25}{3}$ c. $\dfrac{25}{18}$ d. $\dfrac{10}{3}$

**450.** If $t_k$ is the kth term of a G.P., then show that $t_{n-k}, t_n, t_{n+k}$ also form a GP for any positive integer k.

**451.** If pth, qth, and rth term of an AP are equal to corresponding terms of a GP and these terms are respectively x,y,z, then $x^{y-z}y^{z-x}z^{x-y}$ equals

**452.** Sum of

$$\frac{1}{\sqrt{2}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{8}} + \frac{1}{\sqrt{8}+\sqrt{11}} + \frac{1}{\sqrt{11}+\sqrt{14}} + .. \to n$$

terms= (A) $\dfrac{n}{\sqrt{3n+2}-\sqrt{2}}$ (B) $\dfrac{1}{3}\left(\sqrt{2}-\sqrt{3n+2}\right)$ (C) $\dfrac{n}{\sqrt{3n+2}+\sqrt{2}}$

(D) none of these

**453.** If fourth term of an HP is $\dfrac{3}{5}$ and its 8th term is $\dfrac{1}{3}$, then find its first term.

**454.** If a,b, c are in GP, Prove that $a^2, b^2, c^2$ are in GP.

**455.** If $a, b, c$ are in A.P., the $\dfrac{a}{bc}, \dfrac{1}{c}, \dfrac{1}{b}$ will be in a. A.P b. G.P. c. H.P. d. none of these
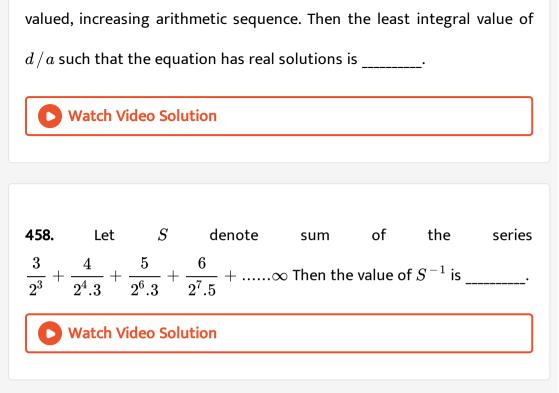
**456.** If $\left(p^2 + q^2\right), (pq + qr), \left(q^2 + r^2\right)$ are in GP then Prove that $p, q, r$ are in G.P.

**457.** The coefficient of the quadratic equation $ax^2 + (a + d)x + (a + 2d) = 0$ are consecutive terms of a positively

valued, increasing arithmetic sequence. Then the least integral value of $d/a$ such that the equation has real solutions is _____.

**458.** Let $S$ denote sum of the series $\frac{3}{2^3} + \frac{4}{2^4.3} + \frac{5}{2^6.3} + \frac{6}{2^7.5} + \ldots\ldots\infty$ Then the value of $S^{-1}$ is _____.

**459.** Let the sum of first three terms of G.P. with real terms be $\frac{13}{12}$ and their product is $-1$. If the absolute value of the sum of their infinite terms is $S,$ then the value of $7S$ is _____.

**460.** Given a,b,c are in A.P.,b,c,d are in G.P and c,d,e are in H.P .If a=2 and e=18 , then the sum of all possible value of c is _____.

**461.** The terms $a_1, a_2, a_3$ form an arithmetic sequence whose sum is 18.The terms sum of all possible common difference of the A.P is _____.

**462.** Let $f(x) = 2x + 1$. Then the number of real number of real values of $x$ for which the three unequal numbers $f(x), f(2x), f(4x)$ are in G.P. is 1 b. 2 c. 0 d. none of these

**463.** Concentric circles of radii $1, 2, 3, \ldots, 100cm$ are drawn. The interior of the smallest circle is colored red and the angular regions are colored alternately green and red, so that no two adjacent regions are of the same color. Then, the total area of the green regions in sq. cm is equal to $1000\pi$ b. $5050\pi$ c. $4950\pi$ d. $5151\pi$

**464.** Let $\{t_n\}$ be a sequence of integers in G.P. in which $t_4 : t_6 = 1 : 4$ and $t_2 + t_5 = 216.$ Then $t_1$ is (a).12 (b). 14 (c). 16 (d). none of these
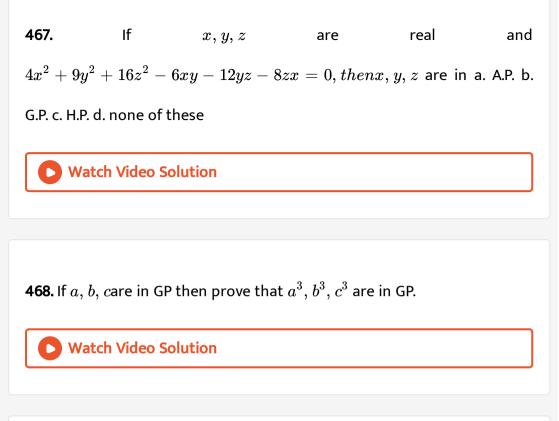
**465.** If $x, 2y, 3z$ are in A.P., where the distinct numbers $x, y, z$ are in G.P, then the common ratio of the G.P. is a.3 b. $\dfrac{1}{3}$ c. 2 d. $\dfrac{1}{2}$

**466.** If $a, b, c, d$ are in GP then prove that, $\left(a^2 - b^2\right), \left(b^2 - c^2\right), \left(c^2 - d^2\right)$ are in GP.

**467.** If $x, y, z$ are real and

$4x^2 + 9y^2 + 16z^2 - 6xy - 12yz - 8zx = 0, then x, y, z$ are in a. A.P. b.

G.P. c. H.P. d. none of these

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**468.** If $a, b, c$ are in GP then prove that $a^3, b^3, c^3$ are in GP.

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**469.** The second term of an H.P. is $\dfrac{3}{14}$ and the fifth term is $\dfrac{1}{10}$. Find the

sum of its 6th and the 7th term.

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**470.** A pack contains n cards numbered from 1 to n. Two consecutive

numbered cards are removed from the pack and the sum of the numbers

on the remaining cards is 1224. If the smaller of the numbers on the removed cards is k, then $k - 20$ is equal to

**471.** If the sixth term of an H.P. is 10 and the 11th term is 18 Find the 16th term.

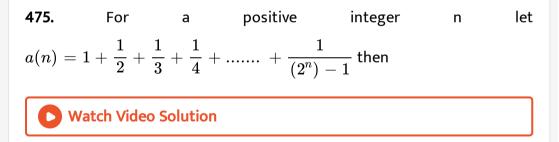**472.** If he equation $x^3 + ax^2 + bx + 216 = 0$ has three real roots in G.P., then $b/a$ has the value equal to _____.

**473.** Let $T_r$ be the rth term of an A.P., for $r = 1, 2, 3, ....$ . If for some positive integers $m, n$, we have $T_m = \dfrac{1}{n} and T_n = \dfrac{1}{m}$, $then T_{mn}$ equals

a. $\dfrac{1}{mn}$ b. $\dfrac{1}{m} + \dfrac{1}{n}$ c. 1 d. 0

**474.** Let $A_n = \left(\dfrac{3}{4}\right) - \left(\dfrac{3}{4}\right)^2 + \left(\dfrac{3}{4}\right)^3 + \ldots + (-1)^{n-1}\left(\dfrac{3}{4}\right)^n$,

B_n = 1 - A_n . Find a least odd natural number $n_0$, so that

$B_n > A_n \, \forall n \geq n_0$.

**475.** For a positive integer n let

$a(n) = 1 + \dfrac{1}{2} + \dfrac{1}{3} + \dfrac{1}{4} + \ldots + \dfrac{1}{(2^n) - 1}$ then

**476.** If $x > 1, y > 1, and z > 1$ are in G.P., then

$\dfrac{1}{1 + \ln x}, \dfrac{1}{1 + lny} and \dfrac{1}{1 + lnz}$ are in a. $A\dot{P}$. b. $H\dot{P}$. c. $G\dot{P}$. d. none of

these

**477.** Compute the 100th term of HP if the 10th and 20th term of HP are 20 and 40 respectively.

**478.** Find the 6th and nth term of the GP 2, 6, 18, 54,.....

**479.** If a,b,c are in AP and $a^2$, $b^2$, $c^2$ are in HP, then

**480.** Let $a, b$ be positive real numbers. If $a, A_1, A_2, b$ be are in arithmetic progression $a, G_1, G_2, b$ are in geometric progression, and $a, H_1, H_2, b$ are in harmonic progression, show that $\dfrac{G_1 G_2}{H_1 H_2} = \dfrac{A_1 + A_2}{H_1 + H_2}$

**481.** The sum of an infinite G.P. is 57 and the sum of their cubes is 9747, then the common ratio of the G.P. is $1/2$ b. $2/3$ c. $1/6$ d. none of these

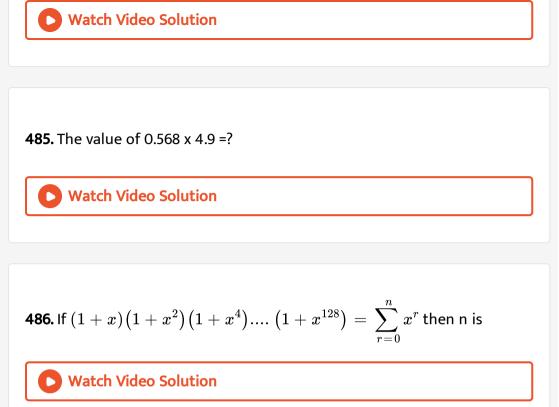**482.** If $a^2 + b^2$, $ab + bc$ and $b^2 + c^2$ are in G.P., then $a, b, c$ are in a. A.P. b. G.P. c. H.P. d. none of these

**483.** If $y^2 = xz$ and $a^x = b^y = c^z$, then prove that $(\log)_6 a = (\log)_c b.$

**484.** The geometric mean between -9 and -16 is a.12 b. $-12$ c. $-13$ d. none of these

**485.** The value of 0.568 x 4.9 =?

**486.** If $(1+x)(1+x^2)(1+x^4)....(1+x^{128}) = \sum_{r=0}^{n} x^r$ then n is

**487.** The number of terms common between the series 1+ 2 + 4 + 8..... to 100 terms and 1 + 4 + 7 + 10 +... to 100 terms is

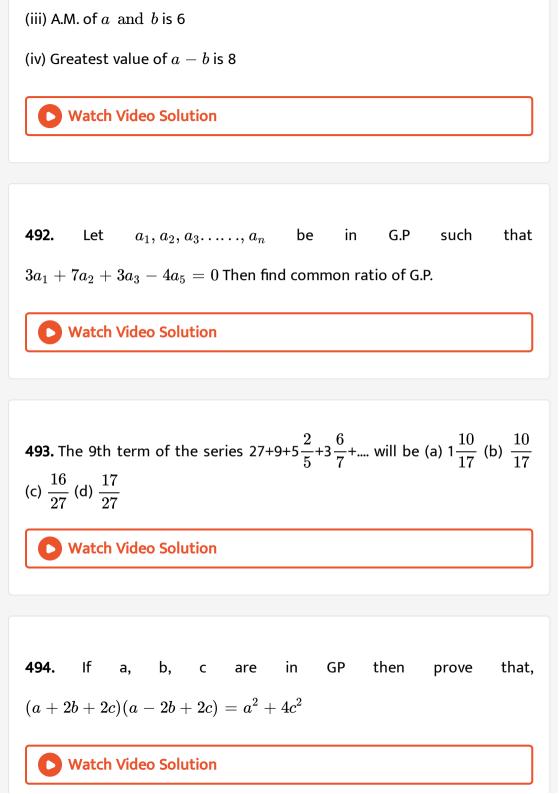**488.** Express the given complex number in $(a+ib)$ form: $(5-2i)^2$

**489.** If $S$ denotes the sum to infinity and $S_n$ the sum of $n$ terms of the series $1 + \dfrac{1}{2} + \dfrac{1}{4} + \dfrac{1}{8} +$ , such that $S - S_n < \dfrac{1}{1000}$, then the least value of $n$ is 8 b. 9 c. 10 d. 11

**490.** If (a-b), (b-c), (c-a) are in GP then prove that

$(a + b + c)^2 = 3(ab + bc + ca).$ .

**491.** Given that $x + y + z = 15 when a, x, y, z, b$ are in A.P. and $\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z} = \dfrac{5}{3} when a, x, y, z, b$ are in H.P. Then

(i) G.M. of $a$ and $b$ is 3

(ii) One possible value of $a + 2b$ is 11

(iii) A.M. of $a$ and $b$ is 6

(iv) Greatest value of $a - b$ is 8

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**492.** Let $a_1, a_2, a_3......, a_n$ be in G.P such that

$3a_1 + 7a_2 + 3a_3 - 4a_5 = 0$ Then find common ratio of G.P.

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**493.** The 9th term of the series $27+9+5\dfrac{2}{5}+3\dfrac{6}{7}+....$ will be (a) $1\dfrac{10}{17}$ (b) $\dfrac{10}{17}$ (c) $\dfrac{16}{27}$ (d) $\dfrac{17}{27}$

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**494.** If $a$, $b$, $c$ are in GP then prove that,

$(a + 2b + 2c)(a - 2b + 2c) = a^2 + 4c^2$

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**495.** If $\displaystyle\sum_{r=1}^{n} r(r+1)(2r+3) = an^4 + bn^3 + cn^2 + dn + e,$ then (a) $a - b = d - c$ (b) $e = 0$ (c) $a, b - 2/3, c - 1$ are in A.P. (d) $(b + d)/a$ is an integer

**496.** If a,b,c,d are in GP then prove thst $(b + c)(b + d) = (c + a)(c + d)$

**497.** If a,x,b are in A.P.,a,y,b are in G.P. and a,z,b are in H.P. such that x=9z and a>0, b>0, then (a) y=3z. (b) x=3y (c) 2y= x+z (d) none of these

**498.** If a,b, and c are in G.P then a+b,2b and b+ c are in

**499.** If in a progression $a_1, a_2, a_3, \ldots\ldots\ldots$ etc; $(a_r - a_{r+1})$ bears a constant ratio with $a_r \times a_{r+1}$ , then the terms of the progression are in

a. A.P b. G.P. c. H.P. d. none of these

**500.** a ,b ,c $x \in R^+$ such that $a, b,$ and $c$ are in A.P. and $b, c$ and $d$ are in H.P., then $ab = cd$ b. $ac = bd$ c. $bc = ad$ d. none of these

**501.** Let $\alpha, \beta \in R.$ If $\alpha, \beta^2$ are the roots of quadratic equation $x^2 - px + 1 = 0 and \alpha^2, \beta$ is the roots of quadratic equation $x^2 - qx + 8 = 0$ , then the value of $r$ if $\dfrac{r}{8}$ is the arithmetic mean of $p$ and $q,$ is a. $\dfrac{83}{2}$ b. $83$ c. $\dfrac{83}{8}$ d. $\dfrac{83}{4}$

**502.** Let $a \in (0, 1]$ satisfies the equation $a^{2008} - 2a + 1 = 0$ and $S = 1 + a + a^2 + \ldots + a^{2007}$ Then sum of all possible values of S is a. 2010 b. 2009 c. 2008 d. 2

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**503.** If $a$, $b$ and $c$ are in A.P. and $b - a$, $c - b$ and $a$ are in G.P., then $a : b : c$ is (a). $1 : 2 : 3$ (b). $1 : 3 : 5$ (c). $2 : 3 : 4$ (d). $1 : 2 : 4$

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**504.** If $a$, $b$, $and c$ are in A.P. $p$, $q$, $and r$ are in H.P., and $ap$, $bq$, $and cr$ are in G.P., then $\dfrac{p}{r} + \dfrac{r}{p}$ is equal to a. $\dfrac{a}{c} + \dfrac{c}{a}$ b. $\dfrac{a}{c} - \dfrac{c}{a}$ c. $\dfrac{b}{q} + \dfrac{q}{b}$ d. $\dfrac{b}{q} - \dfrac{q}{b}$

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**505.** The sum of three numbers in G.P. is 14. If one is added to the first and second numbers and 1 is subtracted from the third, the new numbers are in ;A.P. The smallest of them is a. 2    b. 4    c. 6    d. 10

**506.** If $x$, $2x + 2$ and $3x + 3$ are the first three terms of a G.P., then the fourth term is a. 27 b. -27 c. 13.5 d. -13.5

**507.** The harmonic mean of two numbers is 4. Their arithmetic mean A and the geometric mean A and the geometric mean G satisfy the relation $2A + G^2 = 27$ . Find the numbers.