MATHS

BOOKS - KC SINHA ENGLISH

AP - FOR BOARDS

Solved Examples

1. Write the first three terms of the sequence difined by $a_n = n(n+1)$

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2. Write the first three terms in each of the equences defined by the following: $t_n = \frac{n^2}{n+2}$

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3. What is the 15th term of the sequence defined by $t_n = \frac{1}{2n-10}$

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4. Find the first five terms of the sequence for which $t_1 = 1, t_2 = 2$ and $t_{n+2} = t_n + t_{n+1}$

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5. Show that the sequence defined by $a_n = m + (2n - 1)$ d, where m and d are constants , is an A.P. Find its common difference .

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6. Show that the sequence defined by $a_n = 2n^2 + 1$ is not an A.P.

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7. Show that the sequence $(p+q)^2, (p^2+q^2), (p-q)^2 \ldots$ is an A.P.

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8. Show that the sequence $\log a, \log\left(\frac{a^2}{b}\right), \log\left(\frac{a^3}{b^2}\right), \log\left(\frac{a^4}{b^3}\right),$ forms an A.P.

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9. How many terms are there in the A.P. 20, 25, 30, ...100.

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10. Find the A.P. whose 7th and 13th terms are respectively 34 and 64

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11. The 11th term of an A.P. is 80 and the 16th term is 110. Find the 31st term.

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12. Is 55 a term of te seqwuence 1,3,5,7..? If yes find which term it is.

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13. Find the first negative termof the sequence 2000, 1995, 1990, 1985,.....

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14. How many terms are identical in the two arithmetic progressions $2, 4, 6, 8, \ldots\ldots$ up to 100 terms and $3, 6, 9, \ldots.$ up to 80 terms.

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15. If m times the mth term of an A.P. is equal to n times the nth term and $m \neq n$, show that its (m+n)th term is zero.

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17. Find the numberof integer between 100 and 1000 that are i. divisible by 7 ii. not divisible by 7.

18. the sum of terms equidistant from the beginning and end in an AP is equal to ..... .

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19. The sum of three numbers in A.P. is 27 and the sum of their squares is 293. Find the numbers.

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20. The sum of four integers in $A.P.$, is 24, and their product is 945 find

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21. Divide 69 into three parts which are in A.P. and the product of the two smaller parts is 483.

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22. If the sum of n tems of a series be $5n^2 + 3n$, find its nth term. Are the terms of this series in A.P.?

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23. Find the sum to n terms of an A.P. whose nth terms is $t_n = 5 + 6n, n \in N$.

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24. Find the sum of the series $99 + 95 + 91 + 87 + \ldots$to 20 terms.

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25. If the sum of a certain number of terms of the AP $25, 22, 19\ldots$ is 116. Find the last term.

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27. Find the sum of all even integers between 101 and 999.

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28. Solve: $1 + 4 + 7 + 10 + \ldots + x = 590.$

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29. Let the sum of n, 2n, 3n terms of an A.P. be $S_1, S_2$and S_3, respectively, show that $S_3 = 3(S_2 - S_1)$.

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30. The sums of n terms of three arithmetical progressions are $S_1, S_2 and S_3 \cdot$ The first term of each unityand the common differences are $1, 2 and 3$ respectively. Prove that $S_1 + S_3 = 2S_2 \cdot$

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31. If there are $(2n+1)$ terms in A.P. , then prove that the ratio of the sum of odd terms and the sum of even terms is $(n+1):n$

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32. The sum of the first p, q, r terms of an A.P. are a, b, c respectively. Show that

$$\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0$$

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

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34. The interior angles of a polygon are in A.P. the smallest angle is 120^0 and the common difference is 5^0. Find the number of sides of the polygon.

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35. The ratio of the sum of n terms of two A.P.\'s is $(3n+1):(4n+3)$. Find the ratio of their mth terms.

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36. 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.

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37. Find the sum of the integers between 1 and 200 which are multiples of 3.

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38. If a,b,c are in A.P. prove that $b+c, c+a, a+b$ are also in A.P.

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39. If a^2, b^2, c^2 are in A.P. prove that $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are in A.P.

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41. If a , b , c are in A.P. , prove that $a\left(\frac{1}{b}+\frac{1}{c}\right), b\left(\frac{1}{c}+\frac{1}{a}\right), c\left(\frac{1}{a}+\frac{1}{b}\right)$ are in

A.P. $(a, b, c, \neq 0)$

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42. If $a^2(b+c), b^2(c+a), c^2(a+b),$ are in A.P. show that either a, b, c are in A.P., or $ab + bc + ca = 0.$

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43. Insert five arithetic means between 5 and 29.

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44. If n A.M.'s are inserted between 1 and 31 such

that the ratio of the 7^{th} and $(n-1)^{th}$ mean is $5:9$

then the value of n is

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45. For what value of n, $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ is the arithmetic mean of a and b?

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46. Prove that the sum of n arithmetic means between two numbers in n times the single. A.M. between them.

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47. If x, y, z are in A.P. and A_1 is the A.M. of $xandyandA_2$ is the A.M. of $yandz$, then prove that the A.M. of A_1andA_2isy .

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48. The sum of two numbers is $\frac{13}{6}$. An even number of arithmetic means are being inserted between them and sum exceeds their number by 1. find the number of means inserted.

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49. n arithmetic means are inserted between x and 2y and then between 2x and y. If the rth means in each case be equal, then find the ratio x/y.

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Exercise

1. Write the indicated terms in each of the following sequences whose nth terms are:

$t_n = n(n+2) : t_5, t_7$

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2. Write the indicated terms in each of the following sequences whose nth terms are:

$t_n = \frac{n^2}{n+1} : t_1, t_{10}$

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3. Write the indicated terms in each of the following sequences whose nth terms are:

$t_n = n^2(n+1) : t_4, t_5$

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4. Write the indicated terms in each of the following sequences whose nth terms are:

$t_n = \frac{n(n^2+5)}{4} : t_4, t_5$

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5. Find the indicated terms in each of the following sequences whose nth nth terms are:

$t_n = (-1)^{n-1} t^{n-1}, t_3$

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6. Find the indicated terms in each of the following sequences whose nth nth terms are:

$t_n = \frac{n^2}{2^n}, t_4, t_6$

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7. Find the indicated terms in each of the following sequences whose nth nth terms are:

$4n - 3, t_{17}, t_{24}$

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8. Find the indicated terms in each of the following sequences whose nth nth terms are:

$t_n = (-1)^{n-1}.n^3, t_9$

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9. Find the indicated terms in each of the following sequences whose nth nth terms are:

$$t_n = \frac{n^2(n+1)}{3}, t_1, t_2$$

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10. Find the indicated terms in each of the following sequences whose nth nth terms are:

$$t_n = \frac{n(n-2)}{n+3}, t_{20} \text{ and } t_{10}$$

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11. Find the indicated terms in each of the following sequences whose nth nth terms are:

$t_n = (n-1)(2-n)(3+n), t_{20}$

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12. Find the indicated terms in each of the following sequences whose nth nth terms are:

$\frac{t_{n-1}}{n^2}, t_1 = 3, t_2, t_3 (n \geq 2)$

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13. Write the next three terms of the following sequences: $t_2 = 2, t_n = t_{n-1} + 1, (n \geq 3)$

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14. Write the next three terms of the following sequences:

$t_1 = 3, t_n = 3t_{n-1} + 2f \text{ or } alln > 1$

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15. Write the next three terms of the following sequences: $t_1 = 1, t_n = \frac{t_{n-1}}{n}, (n \geq 2)$

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16. Write the next three terms of the following sequences: $t_1 = 2, t_n = t_{n-1} - 1, n \geq 2$

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17. Find the first five terms of the following sequences and write down the coresponding series: $t_1 = 1, t_n = t_{n-1} + 2f \text{ or } n \geq 2$

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18. If nth term of a sequences is $4n^2 + 1,$ find the sequence. Is this sequences at A.P.?

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19. Find the indicated terms in each of the following arithmetic progression

$a = 3, d = 2, t_n, t_{10}$

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20. Find the indicated terms in each of the following arithmetic progression

$5, 2, -1. \ldots . t_{10}$

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21. Find the indicated terms in each of the following arithmetic progressions

$a = 21, d = -5, t_n, t_{25}$

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22. Find the 10th term of the sequence 10,5,0,-5,-10,...

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23. If pth, qth, and rth terms of an A.P. are $a, b, c,$ respectively, then show that

$(1) a(q-r)+b(r-p)+c(p-q)=0$

$(2)(a-b)r+(b-c)p+(c-a)q=0$

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24. In an A.P. if m^{th} term is n and the n^{th} term is m, where $m \neq n$, find the pth term.

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25. For an A.P. show that $t_m + t_{2n+m} = 2t_{m+n}$

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26. For an A.P. show that $t_m + t_{2n+m} = 2t_{m+n}$

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27. Show that the sequence $\log a, \log(ab), \log\left(ab^2\right), \log\left(ab^3\right),$ is an A.P. Find its nth term.

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28. A man starts repaying a loan as first instalment of Rs. 100. If he increases the instalments by Rs. 5 every month, what amount he will pay in the 30th instalment?

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29. The sum of three numbers in A.P. is 27 and the sum of their squares is 275 . Find the numbers .

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30. Divide 15 into three parts which are in A.P. and the sum of their squares is 83.

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31. Find the sum of the following series: $1 + 4 + 7 + 10 + \ldots \rightarrow 40$ terms

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32. Find the sum of the following series:

$\frac{3}{\sqrt{5}} + \frac{4}{\sqrt{5}} + \ldots$ 25 terms

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33. Find the sum of the following series:

$1 + 5 + 3 + 9 + 5 + 13 + 7 + \ldots$ 20 terms

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34. How many term of the A.P. 15 , 12, 9 ., - are needed to give the sum 15 ? Explain the duble answer .

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35. Find the sum of all odd numbers between 100 and 200.

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36. Find the sum of odd integers from 1 to 2001.

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37. Find the sum of first 30 terms of an A.P. whose second term is 2 and seventh term is 22.

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39. How many terms of the A.P. -6, $-\frac{11}{2}$, -5.. are needed to give the sum -?

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41. Solve : $2 + 22 + 19 + 16 + \ + x = 115$

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42. Find the sum of integers from 1 to 100 that are divisible by 2 or 5.

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43. Find the sum of all natural numbers lying between 100 and 1000, which are multiples of 5.

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44. Find the sum of all numbers between 200 and 400 which are divisible by 7.

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45. If the sum to n terms of a sequence be $n^2 + 2n$ then prove that the sequence is an A.P.

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46. Find the sum of n terms of an A.P. whose kth terms is $5k + 1$.

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47. Find the sum of all two digit numbers which when divided by 4, yields 1 as remainder.

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48. If the sum of n terms of an A.P. is $3n^2 + 5n$ and its mth term is 164, find the value of m.

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49. If the sum of n terms of an A.P. is $\left(pn + qn^2\right)$, where p and q are constants, find the common difference.

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50. If the sum of n terms of an A.P. in $nP \quad + \frac{1}{2}n(n-1)Q,$ where P and Q are constants, find the common difference.

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51. If the sum of 8 terms of an A.P. is 64 and the sum of 19 terms is 361, find the sum of n terms.

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52. The first , second and the last terms of an A.P. are a, b, c respectively. Prove that the sum is $\frac{(a+c)(b+c)(c-2a)}{2(b-a)}$.

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53. If the m^{th} term of an A.P. is $\frac{1}{n}$ and the n^{th} terms is $\frac{1}{m}$, show that the sum of mn terms is $\frac{1}{2}(mn+1)$.

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54. If 12th term of an A.P. is -13 and the sum of the first four terms is 4, what is the sum of first 10 terms ?

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55. If there are $(2n+1)$ terms in A.P. , then prove that the ratio of the sum of odd terms and the sum of even terms is $(n+1):n$

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56. If the sum of first m terms of an A.P. is the same as the sum of its first n terms, show that the sum of tis $(m+n)$ terms is zero.

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57. In an A.P. the first term is 2 and the sum of the first five terms is one fourth of the next five terms. Show that 20th term is -112.

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58. the income of a person is Rs. 300,000 in the first year and he receivers in increase of Rs. 10000 to his income per year for the next 19 years. Find the total amount, he received in 20 years.

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59. A man starts repaying a loan as first instalment of Rs. 100. If he increases the instalments by Rs. 5 every month, what amount he will pay in the 30th instalment?

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60. The interior angle of polygon are in A.P., the smallest angle is 75^0 and the common difference is 10^0. Find the numberof sieds of the polygon.

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61. If S_n, be the sum of n terms of an $A.P.$; the value of $S_n - 2S_{n-1} + S_{n-2}$, is

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62. The sum of first 7 terms of an A.P. is 10 and that of next 7 terms is 167. Find the progression.

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63. The pth and qth terms of an A.P. are x and y respectively. Prove that the sum of (p + q) terms is.

$$\frac{p+q}{2}\left[x+y+\frac{x-y}{p-q}\right].$$

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64. The sum of n terms of two arithmetic progressions are in the ratio $(3n+8):(7n+15)$. Find the ratio of their 12^{th}terms.

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

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67. If $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in A.P. and $a+b+c \neq 0$ prove that $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are in A.P.

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68. If a^2, b^2, c^2 are in A.P prove that $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in A.P.

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69. If a, b, c are in A.P., prove that: (i) $\frac{1}{bc}, \frac{1}{ca}, \frac{1}{ab}$ are in A.P. (ii) $(b+c)^2 - a^2, (a+c)^2 - b^2, (b+a)^2 - c^2$ are in A.P.

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70. If a, b, c are in A.P., prove that:

(i) $\frac{1}{bc}, \frac{1}{ca}, \frac{1}{ab}$ are in A.P.

(ii)

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

are in A.P.

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71. 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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72. If $\frac{b+c-a}{a}, \frac{c+a-b}{b}, \frac{a+b-c}{c}$, are in A.P., prove that $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are also in A.P.

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

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74. If a, b, c are in A.P, show that

$(i) a^3 + b^3 + 6abc = 8b^3$ (ii)

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

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75. Find the single arithmetic mean between:

$7 \text{ and } 31$

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76. Find the single arithmetic mean between:

$(a-b)$ and $(a+b)$

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77. Find the single arithmetic mean between:

6 and -18

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78. Insert 6 numbers between 3 and 24 such that the resulting sequence is an A. P.

79. Insert 7 A.M.'s between 2 and 34.

80. Insert five numbers between 8 and 26 such that the resulting sequence is an A.P.

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82. If A_1, A_2, A_3, A_4 and A_5 are the five A.M.'s between 2 nd 8, then find the value of $A_1 + A_2 + A_3 + A_4 + A_5$

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83. If n arithemetic means are inserted between 20 and 80 such that the ratio of first mean to the last mean is $1:3,$ then find the value of $n.$

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84. if the A.M. between pth and qth terms of an A.P. be equal to the A.M. between rth and sth terms of the A.P., then show that $p+q=r+s$

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85. the sum of terms equidistant from the beginning and end in an AP is equal to ..... .

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