MATHS

BOOKS - KC SINHA MATHS (HINGLISH)

GP - FOR BOARDS

Solved Examples

1. Find the 15th term of the G.P. $\frac{3}{2}, \frac{3}{4}, \frac{3}{8}, \ldots\ldots$

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2. Which term of the G.P. 5,20,80,.....,5120 is 1280`?

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3. How many terms are there in the G.P. $2, 2\sqrt{2}, 4, \ldots 128$?

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4. The fifth term of a G.P. is 81 whereas its second term is 24. Find the series and sum of its first eight terms.

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5. The seventh term of a GL.P. is 8 times the fourth term and the term is 48. Find the G.P.

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

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7. The third term of a G.P. is 3. Find the product of its first five terms.

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8. If the first and the nth terms of a G.P., are $aandb,$ respectively, and if P is hte product of the first n terms prove that $P^2 = (ab)^n.$

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9. If a,b,c, be the pth,qth nd rth terms respectively of a Geometric progression, and a,b,cgt0 then show that: $(q-r)\log a + (r-p)\log b + (p-q)\log c = 0$

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10. In a finite G.P. the product of the terms equidistant from the beginning and the end is always same and equal to the product of first and last term.

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11. If the product of three numbers in G.P. be 216 and their sum sum is 19, find the numbers.

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12. If the continued product of three numbers in G.P. is 216 and the sum of their products in pairs is 156, find the numbers.

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13. The sum of three numbers in G.P. is 21 and the sum of their squares is 189. Find the numbers.

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14. The sum of first three terms of a G.P. is $\frac{39}{10}$ and their product is 1. Find the common ratio and the terms.

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15. Find four numbers forming a geometric progression in which the third term is greater than the first term by 9, and the second term is greater than the 4^{th} by 18.

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16. A number consists of three digits in $G.P.$ The sum of unit's digit and hundred's digit exceeds twice the ten's digit by 1. The sum of the hundred's digit and ten's digit is two third of the sum of the ten's and unit's digits. Find the numbers

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17. In a set of four numbers, the first three are in GP & the last three are in AP, with common difference 6. If the first number is the same as the fourth, find the four numbers.

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18. Find the $1+1/2+\frac{1}{4}+\frac{1}{8}+\ldots\rightarrow n$terms

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19. Find the sum of n terms of the series $(a+b)+\left(a^2+2b\right)+\left(a^2+3b\right)+\ldots\ldots$

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20. Find the sum of n term so the G.P. $\sqrt{7}, \sqrt{21}, 3\sqrt{7}$ .....Also find the 8th term of the G.P.

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21. Find the sum to n terms of the sequence, 8, 88, 888, 8888 . . . .

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22. How many terms of the series $1+3+3^2+3^3+3+\ldots\ldots+3^{n-1}$must be taken to make the sum

equal to 3280.

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23. Find the value off $\sum_{k1}^{10}\left(2+3^{k}\right)$

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24. Evaluate: $\sum_{r=1}^{n}\left(3^{r}-2^{r}\right)$

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

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

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

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28. If a,b,c,d be in G.P. show that $\left(a^2+b^2+c^2\right)\left(b^2+c^2+d^2\right)=(ab+bc+cd)^2$

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29. If x, y, z are in G.P. and $a^x = b^y = c^z$, then (a) $\log ba = \log_a c$ (b) $\log_c b = \log_a c$ (c) $\log_b a = \log_c b$ (d) none of these

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

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31. If a, b, c, d and p are different real numbers such that: $\left(a^2+b^2+c^2\right)p^{I2} - 2(ab+bc+cd)p + \left(b^2+c^2+d^2\right) \leq 0$,

then show that a, b, c and d are in G.P.

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32. Let a, b are roots of equation $x^2 - 3x + p = 0$ and c, d are roots of equation $x^2 - 12x + q = 0$. If a, b, c, d (taken in that order) are in geometric progression then $\frac{q+p}{q-p}$ is equal to (A) $\frac{5}{7}$ (B) $\frac{15}{17}$ (C) $\frac{17}{15}$ (D) $\frac{7}{5}$

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33. If p, q, r are in G.P. and the equations, $px^2 + 2qx + r = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in A.P.

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34. What will Rs 500 amounts to in 10 years after its deposit in a bank which pays annual interest rate of 10% compounded annually?

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35. A manufacturer reckons that the value of a machine, which costs him Rs. 15625, will depreciate each year by 20%. Find the estimated value at the end of 5 years.

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36. A person writes a letter to four of his friends. He asks each one of them to copy the letter and mail to four different persons with instruction that they move the chain similarly. Assuming that the chain is not broken and that it costs 50 paise

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37. Insert seven geometric means between 2 and 162.

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38. Find the value of n so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be the geometric mean between $aandb$.

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39. If a, x, y, z, b are in AP, then $x+y+z=15$ and if a, x, y, z, b are in HP. then $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=\frac{5}{3}$. Numbers a, b are

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40. If $x>0$ prove that $x+\frac{1}{x} \geq 2$

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41. Prove that the product n geometric means between two quantities is equal to the nth power of a geometric mean of those two quantities.

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

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43. If a, b, c, d are in A.P. and x, y, z are in G.P., then show that $x^{b-c} \cdot y^{c-a} \cdot z^{a-b} = 1$.

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

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45. If pth, qth and rth terms of an A.P. and G.P. are both a,b and c respectively, show that $a^{b-c}.\ b^{c-a}.\ c^{a-b}=1$

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46. If a, b, c are in A.P., prove that the following are also in A.P.

$\frac{1}{bc}, \frac{1}{ca}, \frac{1}{ab},$ (ii) $b+c, c+a, a+b$ (iii)

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

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

$\left\{(c+c)^2-a^2\right\}, \left\{(c+a)^2-b^2\right\}, \left\{(a+b)^2-c^2\right\}$ (vi)

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

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47. If $a^x = b^y = c^z$ and a,b,c are in G.P. show that $\frac{1}{x}, \frac{1}{y}, \frac{1}{z}$ are in A.P.

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48. If reciprocals of $\frac{x+y}{2}, y, \frac{y+z}{2}$ are in A.P., show that x,y,z are in G.P.

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49. If distinct numbers x,y,z are in G.P. and $\frac{1}{x+a}, \frac{1}{y+a}, \frac{1}{z+a}$ are in A.P., prove that $a = y$.

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

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

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52. If three positive numbers a, b, c are in $A.P.$ and $\frac{1}{a^2}, \frac{1}{b^2}, \frac{1}{c^2}$ also in $A.P.$ then

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Exercise

1. Find the 10th term of the G.P. 5, 25, 125, ... Also find its nth term.

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2. Find the 8th term of the G.P. 0.3,0.06,0.012,.....

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3. Fidnteh 20th and nth term of the G.P. $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}, \ldots .$

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4. Find the 12^{th} term of a G.P. whose 8th term is 192 and the common ratio is 2.

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5. Which term of the geometric sequence: $2\sqrt{3}, 6, 6\sqrt{3}, \ldots\ldots is 1458?$

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6. Which term of the G.P.: $\sqrt{3}, 3, 3, \sqrt{3}, is\ 729?$

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7. Which term of the G.P., 2, 8, 32, . . . up to n terms in 131072?

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8. Which term of the progression 0.004,0.02,0.1, is 125.?

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9. Which term of the G.P.: $\frac{1}{3}, \frac{1}{9}, \frac{1}{27} is \frac{1}{19683}$?

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10. Which term of the geometric sequence: $\frac{1}{4}, -\frac{1}{2}, 1, \ldots . Is 64?$

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11. How many terms are there in the G.JP. $0.03, 0.06, 0.12, \ldots . , 3.84?$

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12. If 5th nd 8th of a G.P. be 48 and 384 respectively. Find the G.P. if term of G.P. are real numbers.

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13. If the 6th and 10th terms of a G.P. are $\frac{1}{16}$ and $\frac{1}{256}$ respectively. Find the G.P. if its terms are real numbers.

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14. If the pth, qth, rth terms of a $G.P.$ be a, b, c respectively, prove that $a^{q-r}b^{r-p}c^{p-q} = 1$

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15. If 5th, 8th, and 11th terms of a G.P. are p, q and s respectively, prove that $q^2 = ps$.

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16. If the 4^{th} , 10^{th} and 16^{th} terms of a G.P. are x, y and z, respectively. Prove that x, y, z are in G.P.

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17. The 4^{th} term of a G.P. is square of its second term, and the first term is 3 . Determine its 7^{th} term.

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

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19. The product of three consecutive terms of a GP Is -64 and the first term is four times the third. Find the terms.

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20. Find a G.P. for which sum of the first two terms is -4 and the fifth term is 4 times the third term.

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21. Find three numbers in G.P. whose sum is 13 and the sum of whose squares is 91.

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22. The sum of first three terms of a G.P. is 13/12 and their product is -1. Find the G.P.

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23. The sum of first three terms of a G.P. is 16 and the sum of the next three terms is 128. Determine the first term, the common ratio and the sum to n terms of the GP.

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24. The first term of a G.P. is 1. The sum of the third term and fifth term is 90. Find the common ratio of G.P.

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25. Three numbers whose sum is 15 are in A.P. If 1,4,19 be added to them respectively the resulting numbers re in G.P. Find the numbers.

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26. 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.

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27. Find three numbers in G.P. whose sum is 52 and the sum of whose products i pairs is 624.

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28. From thre numbers in G.P., other three numbers in G.P. are subtracted and the remainder are also found to be in G.P. Prove that the three sequences have the same common ratio.

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29. Find the sum of indicated terms of each of the following geometric progression: 1,2,4,8,.....,12 terms

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30. Find the sum of indicated terms of each of the following geometric progression: $1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \ldots, n$ terms

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31. Find the sum to indicated number of terms in each of the geometric progressions : 0.15, 0.015, 0.0015, . . . , 20 terms.

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32. Find the sum of indicated terms of each of the following geometric progression: $1, -\frac{1}{2}, \frac{1}{4}, -\frac{1}{8}, . . , n$ terms

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33. Find the sum of the following geometric progression: 1,3,9,27, to 8 terms.

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34. Find the sum of indicated terms of each of the following geometric progression: 1,-3,9,-27, ...9 terms

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35. Find the sum of indicated terms of each of the following geometric progression: $x^2, x^4, x^6, \ldots, nterms (x \neq \pm 1)$

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36. Find the sum to indicated number of terms in each of the geometric progressions : $1, -a, a^2 - a^3, \ldots n$ terms (if a $\neq$ - 1)

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37. Find the sum of indicated terms of each of the following geometric progression: $1+\frac{2}{3}+\frac{4}{9}+\ldots.$, n terms and 5 terms

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38. A G.P. has first term 729 and 7th term 64. Find the sum of its first 7 terms.

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39. Find the sum of the products of the corresponding terms of the sequences 2,4, 8, 16, 32 and 128, 32, 8, 2, $\frac{1}{2}$.

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40. Find the sum to n terms of the following series: $\left(x+\frac{1}{x}\right)^2+\left(x^2+\frac{1}{x^2}\right)^2+\left(x^3+\frac{1}{x^3}\right)^2+\left(x^4+\frac{1}{x^4}\right)^2+\ldots\ldots$

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41. Evaluate : $\sum_{k=1}^{n}\left(2^k+3^{k-1}\right)$

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42. How many terms of the series $1+2+2^2+\ldots..$ must be taken to make 511?

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43. How many terms of the G.P. $3, 3/2, 3/4,$ be taken together to make $\frac{3069}{512}$?

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44. 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.

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45. 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.

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46. 2. (i) Sum upto n terms the series 6 + 66 + 666 +...

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47. Find the sum of the following series:

$9 + 99 + 999 + \rightarrow n\,terms$

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48. The sum of the following series $4 + 44 + 444 + \ldots\ldots\ldots$. to n term is:

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49. Find the sum of the following series up to n terms: (i)

$5 + 55 + 555 + \cdot\cdot\cdot$ (ii)

$.6 \quad + \cdot 66 \quad + \cdot 666 \quad + \cdot \quad \cdot \cdot$

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50. Evaluate $7 + 77 + 777 + \ldots\ldots$upto n

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51. Find the sum of the following series:

$0.6 + 0.66 + 0.666 \rightarrow \ n\ terms$

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52. Find the sum of the following series:

$0.5 + 0.55 + 0.555 + \ \rightarrow \ n\ terms$

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53. Show that the ratio of the sum of first n terms of a $G.\ P.$ to the sum of terms from $(n+1)$ to $(2n)$ terms is $\frac{1}{r^n}$

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54. if S is the sum , P the product and R the sum of reciprocals of n terms in $G.\ P.$ prove that $P^2R^n = S^n$

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55. If a,b,c,d.....are in G.P., then show that $(a+b)^2, (b+c)^2, (c+d)^2$ are in G.P.

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56. If a,b,c,d.....are in G.P., then show that $(a-b)^2, (b-c)^2, (c-d)^2$ are in G.P.

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57. If a, b, c are in $G.P.$, prove that $a^2+b^2, ab+bc, b^2+c^2$ are also in $G.P$

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58. If a, b, c, d are in G.P. prove that:

$(a^2+b^2), (b^2+c^2), (c^2+d^2)$ are in G.P.

$(a^2-b^2), (b^2-c^2), (c^2-d^2)$ are in G.P.

$\frac{1}{a^2+b^2}, \frac{1}{b^2+c^2}, \frac{1}{c^2+d^2}$ are in G.P.

$(a^2+b^2+c^2), (ab+bc+cd), (b^2+c^2+d^2)$

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

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60. If a,b,c are in G.P., then show that $a(b-c)^2 = c(a-b)^2$

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61. If a,b,c are in G.P., then show that : $(a^2 - b^2)(b^2 + c^2) = (b^2 - c^2)(a^2 + b^2)$

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62. If a,b,c are in G.P., then show that : $\log a, \log b, \log c$ are in A.P.

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63. If a,b,c are in G.P., then show that : $a\left(b^2+c^2\right)=c\left(a^2+b^2\right)$

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64. For what values of x, the numbers $-\frac{2}{7}, x, -\frac{7}{2}$ are in G.P

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65. Show that the products of the corresponding terms of the sequences a, $ar, ar^2, \cdots; ar^{n-1}$ and $A, AR, AR^2, \cdots; AR^{n-1}$, form a G.P, and find the common ratio.

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66. A person has 2 parents, 4 grandparents, 8 great grand parents, and so on. Find the number of his ancestors during the ten generations preceding his one.

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67. The number of bacteria in a certain culture doubles every hour. If there were 30 bacteria present in the culture originally, how many bacteria will be present at the end of 2nd hour, 4th hour and nth hour?

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68. A man deposited Rs 10000 in a bank at the rate of 5% simple interest annually. Find the amount in 15^{th} year since he deposited the amount and also calculate the total amount after 20 years.

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69. Shamshad Ali buys a scooter for Rs. 2200. He pays Rs. 4000 cash and agrees to pay the balance in annual instalments of Rs. 1000 plus 10% interest on the unpaid amount. How much the scooter will cost him?

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70. A farmer buys a used tractor for Rs. 12000. He pays Rs. 6000 cash and agrees to pay the balance in annual instalments of Rs. 500 plus 12% interest on the unpaid amount. How match the tractor cost him?

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71. Insert 5 geometric means between 16 and $\frac{1}{4}$.

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72. Insert two number between 3 and 81 so that the resulting sequence is G.P.

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73. Insert three numbers between 1 and 256 so that the resulting sequence is a G.P.

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74. Insert six G.M.\'s between $\frac{8}{27}$ and $-5\left(\frac{1}{16}\right)$

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75. The sum of two numbers is 6 times their geometric means, show that numbers are in the ratio $(3+2\sqrt{2}):(3-2\sqrt{2})$.

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76. If odd number of G.M.\'s are inserted between two given quantities a and b, show that the middle G.M.= $\sqrt{ab}$

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77. If A.M. and GM. of two positive numbers a and b are 10 and 8, respectively find the numbers.

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78. If A and G be A.M. and GM., respectively between two positive numbers, prove that the numbers are $A \pm \sqrt{(A+G)(A-G)}$.

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

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80. If one G.M., G and two A.M.\'s p and q be inserted between two given quantities, show that $G^2=(2p-q)(2q-p)$.

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81. If one A.M. A and two G.M.\'s p and q be inserted between two given numbers, shwo that $p^2q + \frac{q^2}{p} = 2A$

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82. If a is the A.M. between b and c, b the G.M. between a and c, then show that $\frac{1}{a}, \frac{1}{c}, \frac{1}{b}$ are in A.P.

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83. if a, b, c are the pth, qth and rth terms of both an $A.P.$ and also of a $G.P.$ then $a^{b-c} \cdot b^{c-a} \cdot c^{a-b}$

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84. An A.P. and a G.P. of positive terms have the same first term and the sum of their first, second and third terms are respectively, 1, $\frac{1}{2}$ and 2. Show that the sum of their fourth terms is $\frac{19}{2}$

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85. Let $a(a \neq 0)$ is a fixed real number and $\frac{a-x}{px} = \frac{a-y}{qy} = \frac{a-z}{rz}$. If p, q, r are in A.P., show that $\frac{1}{x}, \frac{1}{y}, \frac{1}{z}$ are in A.P.

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86. 29. If a, b, c are in $G.P.$ and $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$ prove that x, y, z are in $A.P.$

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87. If a,b,c,d be in G.P. and $a^x = b^y = c^z = d^w$, prove that $\frac{1}{x}, \frac{1}{y}, \frac{1}{z}, \frac{1}{w}$ are in A.P.

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88. If reciprocals of $(y-x), 2(y-a), (y-z)$ are in A.P., prove that $x-a, y-a, z-a$ are in G.P.

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89. (c) If a series of numbers be in G.P., show that their logarithms are in A.P

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90. If $a, b, andc$ are in A.P. $p, q, andr$ are in H.P., and $ap, bq, andcr$ are in G.P., then $\frac{p}{r}+\frac{r}{p}$ is equal to $\frac{a}{c}-\frac{c}{a}$ b. $\frac{a}{c}+\frac{c}{a}$ c. $\frac{b}{q}+\frac{q}{b}$ d. $\frac{b}{q}-\frac{q}{b}$

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91. a, b, x are in $A. P.$, a, b, y are in $G. P.$ and a, b, z are in $H. P.$ then:

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92. If x,1,z are in A.P. x,2,z are in G.P., show thast $\frac{1}{x}, \frac{1}{4}, \frac{1}{z}$ are in A.P.

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