



# MATHS

# **BOOKS - KC SINHA ENGLISH**

# **GP - FOR BOARDS**

**Solved Examples** 





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



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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 a and b respectively, and if P is the product of the first n terms.

prove that  $P^2 = (ab)^n$ 

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9. If a, b, andc are respectively, the pth, qth , and rth

terms of a G.P., show that  $(q-r){\log a} + (r-p){\log b} + (p-q){\log c} = 0.$ 

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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.



11. If the product of three numbers in GP be 216 and their

sum is 19, then the numbers are

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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.



**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.



**16.** A number consists of three digits which are in GP the sum of the right hand and left hand digits exceeds twice

the middle digits by 1 and the sum of the left hand and middle digits is two thirds of the sum of the middle and right hand digits. Find the number.



**17.** In a set of four numbers, the first three are in G.P. and the last three are in A.P. with difference 6. If the first number is the same as the fourth, find the four numbers.



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





**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....



22. How many terms of the series

 $1+3+3^2+\ldots$  must be taken to meke 3280?



25. If  $S_1,\,S_2andS_3$  be respectively the sum of n, 2n and 3n terms of a G.P., prove that  $S_1(S_3-S_2)=S_1(S_2-S_1)^2$ 



**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 f(1)+f(2)+...+f(n)=120, find the

value of n



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

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

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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

**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.



**31.** If *a*, *b*, *c*, *d* and *p* are different real numbers such that:

$$ig(a^2+b^2+c^2ig)p^{I2}-2(ab+bc+cd)p+ig(b^2+c^2+d^2ig)\leq 0$$

, 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)  $\frac{7}{5}$ 

**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.



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



**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 to mail one letter. Find the amount spend on the postage when 8th set of letter is mailed.



37. Insert seven geometric means between 2 and 162.



in H.P. the value of a and b are

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



**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.

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

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

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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

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**45.** If  $p^{th}$ ,  $q^{th}$ , and  $r^{th}$  terms of an A.P. and G.P. are both a, b and c respectively show that  $a^{b-c}b^{c-a}c^{a-b} = 1$ .

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

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

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

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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.



in A.P. prove that a, c, e are in G.P.

**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.



### Exercise

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

nth term.







# 8. Which term of the progression 0.004,0.02,0.1,... is 12.5?



**11.** How many terms are there in the G.P. 0.03, 0.06, 0.12, ...., 3.84?



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.



**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.



14. If the pth, th, rth terms of a G.P. are x, y, z respectively, prove that  $x^{q-r}$ .  $y^{r-p}$ .  $z^{p-q} = 1$ .



**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.

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.



19. The product of three consecutive terms of a GP Is -64

and the first term is four times the third. Find the terms.



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 the three numbers in G.P., whose sum is 13 and

the sum of whose squars is 91.



22. The sum of first three terms of a G.P. is 13/12 and their

product is -1. Find the G.P.

**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 they are added by 1,4 and 19 respectively, they are in GP. The numbers are



arthimatic progression. Find the numbers.



27. Find three numbers in G.P. whose sum is 52 and the

sum of whose products i pairs is 624.



**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.



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



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





**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



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

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

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

terms and 5 terms

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 of *n* terms of the sequence  $\left(x + \frac{1}{x}\right)^2$ ,  $\left(x^2 + \frac{1}{x^2}\right)^2$ ,  $\left(x^3 + \frac{1}{x^3}\right)^2$ ,  
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41. Evaluate : 
$$\sum_{k=1}^{n} (2^{k} + 3^{k-1})$$
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42. How many terms of the series  $1 + 2 + 2^{3} + \dots$  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.



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.



46. Sum up to n terms the series

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

9+99+999+ ightarrow n~terms

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**48.** The sum of the following series

 $4 + 44 + 444 + \dots$  to n term is:

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

 $5 + 55 + 555 + \cdots$  (ii) .  $6 + 66 + 666 + \cdots$ 



53. Show that the ratio of the sum of first n terms of a G.P. to the sum of terms from  $(n+1)^{th}$  to  $(2n)^{th}$  term is  $rac{1}{r^n}$  . 9873740001



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



**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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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.

**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  $a(b-c)^2 = c(a-b)^2$ 



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

**62.** If a, b, c are in G.P., then prove that  $\log a^n, \log b^n, \log c^n$  are in A.P.

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





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

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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?



**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?

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



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

73. Insert three numbers between 1 and 256 so that the

resulting sequence is a G.P.

. . . . . . . .



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



**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

$$A\pm\sqrt{(A+G)(A-G)}.$$

**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  $\left(m + \sqrt{m^2 - n^2}\right): \left(m - \sqrt{m^2 - n^2}\right)$ 

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**80.** If one G.M., G and two A.M's p and q be inserted between two given numbers, prove that

$$G^2=(2p-q)(2q-p)$$

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

**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 x, y, and z are pth, qth, and rth terms, respectively, of an A.P. nd also of a G.P., then  $x^{y-z}y^{z-x}z^{x-y}$  is equal to xyz b. 0 c. 1 d. none of these **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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**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.

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

and cr are in G.P., then 
$$rac{p}{r}+rac{r}{p}$$
 is equal to

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

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

are in A.P.

