



# MATHS

# NCERT - FULL MARKS MATHEMATICS(TAMIL)

# **SEQUENCES AND SERIES**

### Example

**1.** Write the first three terms in each of the following sequences defined by the following:

(i) 
$$a_n=2n+5,$$
 (ii)  $a_n=rac{n-3}{4}$ 

**2.** What is the  $20^{
m th}$  term of the sequence defined by

$$a_n = (n-1)(2-n)(3+n)$$
 ?



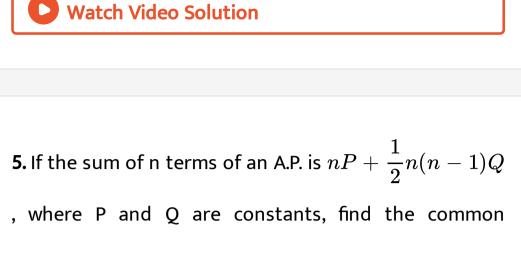
**3.** Let the sequence  $a_n$  be defined as follows:

$$a_1=1, a_n=a_{n-1}+2$$
 for  $n\geq 2$  .

Find first five terms and write corresponding series

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



difference.

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

**7.** The income of a person is Rs. 3,00,000 in the first year and he receives an increases of Rs. 10,000 to his income per year for the next 19 years. Find the total amount he received in 20 years.

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8. Example 8 Insert 6 numbers between 3 and 24 such

that the resulting sequence is an A.P.

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**9.** Find the  $10^{th}$  and  $n^{th}$  terms of the G.P . 5, 25,125

•••••



10. Which term of the G.P., 2,8,32, ... up to n terms is

131072 ?

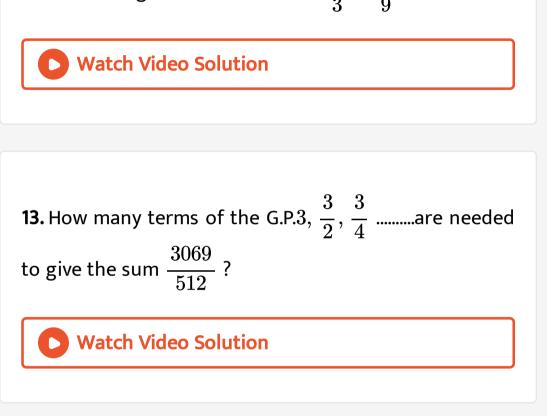
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11. In a GP the 3rd term is 24 and 6th term is 192. Find

the 10th term.



12. Find the sum of first n terms and the sum of first 5 terms of the geometric series  $1 + \frac{2}{3} + \frac{4}{9} + \dots$ 



**14.** The sum of first three terms of a G.P. is  $\frac{13}{12}$  and their product is – 1. Find the common ratio and the terms.

15. Find the sum of the sequence 7, 77, 777, 7777, ... to n

terms.

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**16.** 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.

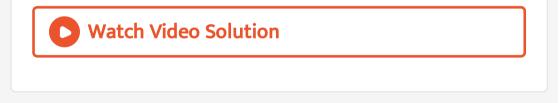
17. Insert three numbers between 1 and 256 so that the

resulting sequence is a G.P.



18. If A.M. and G.M. of two positive numbers a and b are

10 and 8, respectively, find the numbers.



**19.** Find the sum to n terms of the series : 5 + 11 + 19 + 29 + 41.....



**20.** Find the sum to n terms of the series whose  $n^{\text{th}}$  term is n (n+3).

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Miscellaneous Examples

**1.** If  $p^{th}, q^{th}, r^{th}$  and  $s^{th}$  terms of an A.P. are in G.P, then

show that (p - q), (q - r), (r - s) are also in G.P.

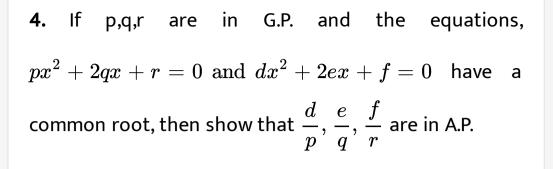
**2.** If a, b, c are in geometric progression, and if  $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$ , then prove that x, y, z are in arithmetic progression.



**3.** If a, b, c, d and p are different real numbers such that  $ig(a^2+b^2+c^2ig)p^2\!-2(ab+bc+cd)p+ig(b^2+c^2+d^2ig)\leq 0$ 

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





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Exercise 91

**1.** Write the first five terms of each of the sequences whose  $n^{th}$  terms are:

$$a_n = n(n+2)$$

2. Write the first five terms of each of the sequences

whose  $n^{th}$  terms are:

$$a_n = rac{n}{n+1}$$

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**3.** Write the first five terms of each of the sequences whose  $n^{th}$  terms are:

$$a_n = 2^n$$



**4.** Write the first five terms of each of the sequences

whose  $n^{th}$  terms are:

$$a_n = rac{2n-3}{6}$$
  
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5. Write the first five terms of each of the sequences whose  $n^{th}$  terms are:

$$a_n = (\,-\,1)^{n\,-\,1} 5^{n\,+\,1}$$

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**6.** Write the first five terms of each of the sequences whose  $n^{th}$  terms are:

$$a_n=nrac{n^2+5}{4}$$

7. Find the indicated terms in each of the sequences whose  $n^{\rm th}$  terms are:

 $a_n=4n-3,a_{17},a_{24}$ 

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**8.** Find the indicated terms in each of the sequences whose  $n^{\text{th}}$  terms are:

$$a_n=rac{n^2}{2^n},a_7$$

**9.** Find the indicated terms in each of the sequences whose  $n^{\mathrm{th}}$  terms are:

$$a_n = (\,-1)^{n\,-\,1} n^3, a_9$$

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10. Find the indicated terms in each of the sequences

whose  $n^{ ext{th}}$  terms are:

$$a_n=rac{n(n-2)}{n+3},a_{20}$$

11. Write the first five terms of each of the sequences

and obtain the corresponding series:

$$a_1=3, a_n=3a_{n-1}+2$$
 for all  $n>1$ 

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**12.** Write the first five terms of each of the sequences

and obtain the corresponding series:

$$a_1 = -1, a_n = rac{a_{n-1}}{n}, n \geq 2$$

13. Write the first five terms of each of the sequences

and obtain the corresponding series:

$$a_1=a_2=2, a_n=a_{n-1}-1, n>2$$

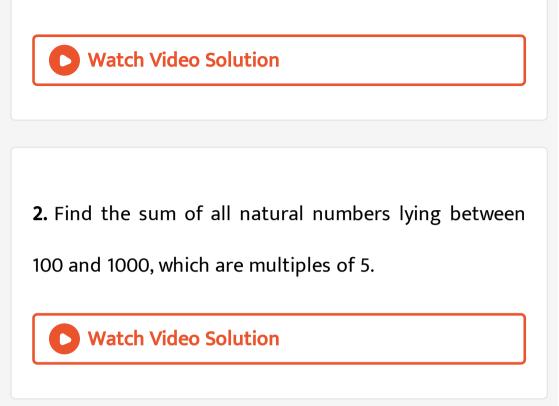
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14. The Fibonacci sequence is defined by  $1=a_1=a_2$ and  $a_n=a_{n-1}+a_{n-2}, n>2$ . Find  $\frac{a_{n+1}}{a_n}$ , for  $n=1,\,2,\,3,\,4,\,5,$ 





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



**3.** 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  $20^{
m th}$  term is –112.

4. How many terms of the A.P. -6,  $-\frac{11}{2}$ , -5,... are

needed to give the sum -25?

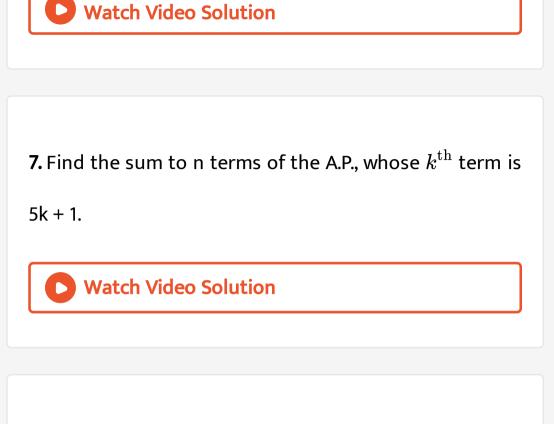
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5. In an A.P. if 
$$p^{th}$$
 term is  $\frac{1}{q}$  and  $q^{th}$  term is  $\frac{1}{p}$ , prove that the sum of first pq terms is  $\frac{1}{2}(pq+1)$ , where  $p \neq q$ .

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6. If the sum of a certain number of terms of the A.P. 25,

22, 19, ... is 116. Find the last term.



**8.** If the sum of n terms of an A.P. is  $\left(pn+qn^2
ight)$  , where

p and q are constants, find the common difference.



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

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**10.** If the sum of first p terms of an A.P. is equal to the sum of the first q terms, then find the sum of the first (p + q) terms.



11. Sum of the first p, q and r terms of an A.P. are a, b

and c, respectively. Prove that 
$$\frac{a}{p}(q-r) + \frac{b}{q}(r-p) + \frac{c}{r}(p-q) = 0$$

12. The ratio of the sum of m and n terms of an A.P. is  $m^2: n^2$ . Show that the ratio of  $m^{th}$  and  $n^{th}$  term is 2m - 1: 2n - 1.

13. If the sum of n terms of an A.P. is  $3n^2 + 5n$  and its

 $m^{th}$  term is 164, find the value of m.



14. Insert five numbers between 8 and 26 such that the

resulting sequence is an A.P.

15. If 
$$\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$$
 is the A.M. between a and b, then

find the value of n.

16. 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.

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17. A man starts repaying a loan as first installment of Rs. 100. If he increases the installment by Rs 5 every month, what amount he will pay in the  $30^{th}$  installment?

18. The difference between any two consecutive interior

angles of a polygon is  $5^\circ$  .If the smallest angle is  $120^\circ$  ,

find the number of the sides of the polygon.

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Exercise 9 3
<b>1.</b> Find the 20th and nth term of the GP. $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}$
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2. Find the 12th term of a G.P. whose 8th term is 192,

and the common ratio is 2.

**3.** The  $5^{th}, 8^{th}$  and  $11^{th}$  terms of a G.P are p,q and s , respectively . Show that  $q^2 = ps$ .

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**4.** 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.

**5.** Which term of the following sequences:

(a) 2,  $2\sqrt{4}$ , 4..... is 128 ? (b)  $\sqrt{3}$ , 3,  $3\sqrt{3}$ , ....

(c)  $\frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \dots$  is  $\frac{1}{19683}$ ?

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**6.** For what values of x, the numbers  $-\frac{2}{7}$ , x,  $-\frac{7}{2}$  are

#### in G.P?



7. Find the sum to indicated number of terms in each of

the geometric progressions in

0.15, 0.015, 0.0015 ,......20 terms .

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8. Find the sum to indicated number of terms in each of

the geometric progressions in

 $\sqrt{7},\sqrt{21}3\sqrt{7}$  , .....n terms

9. Find the sum to indicated number of terms in each of

the geometric progressions in Exercises

$$1,\ -a,a^2,\ -a^3,\,...n$$
 terms (if  $a
eq-1$ )

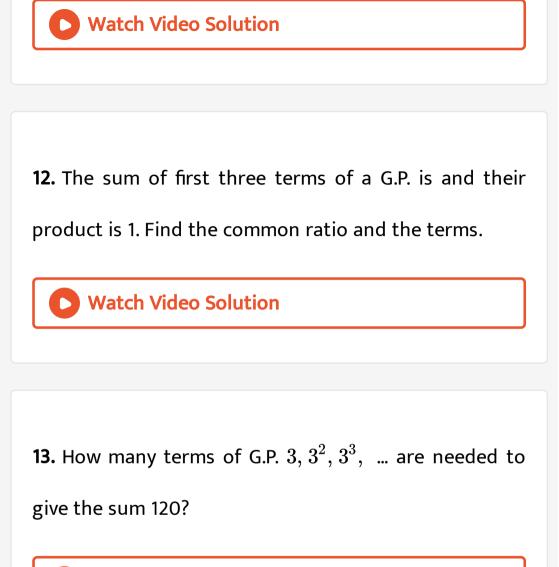
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**10.** Find the sum to indicated number of terms in each

of the geometric progressions in

$$x^3, x^5, x^7, ....n$$
 terms (if  $x 
eq \pm 1$ )

11. Evaluate 
$$\sum_{k=1}^{11} \left(2+3^k
ight)$$





14. the sum of the first six terms of a GP is 9 times the

sum of the first three terms. The common ratio is



**15.** If the first term of a G.P. is 729 and its  $7^{th}$  term is 64,

then the sum of first seven terms is



16. Find a G.P. for which sum of the first two terms is - 4

and the fifth term is 4 times the third term.

17. If the 4th, 10th and 16th terms of a G.P. are x, y and z,

respectively. Prove that x, y, z are in GP.

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

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**19.** Find the sum of the products of the corresponding terms of the sequences 2, 4, 8, 16, 32 and 128, 32, 8, 2



 $\frac{1}{2}$ 

**20.** Show that the products of the corresponding terms of the sequences a, ar,  $ar^2, \ldots ar^{n-1}$  and A, AR,  $AR^{22}, \ldots AR^{n-1}$  form a G.P, and find the common ratio.

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**21.** 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.

22. If the  $p^{\text{th}}$ ,  $q^{\text{th}}$  and  $r^{\text{th}}$  terms of a G.P. are a, b and c, respectively. Prove that  $a^{q-r}b^{r-p}c^{P-q}$  = 1.

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**23.** If the first and the  $n^{\text{th}}$  term of a G.P. are a and b, respectively, and if P is the product of n terms, prove that  $P^2 = (ab)^n$ .

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

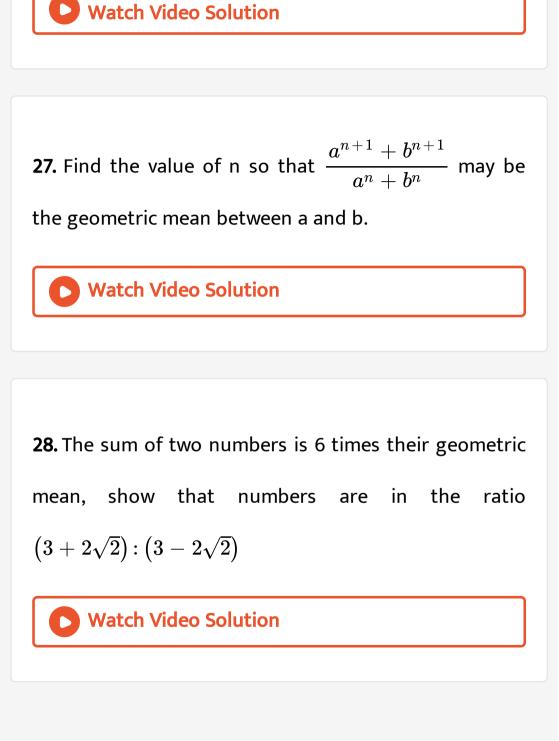
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25. If a, b, c and d are in G.P. show that  $\left(a^2+b^2+c^2
ight)\left(b^2+c^2+d^2
ight)=\left(ab+bc+cd
ight)^2$ 

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26. Insert two numbers between 3 and 81 so that the

resulting sequence is G.P.



29. If A and G be A.M. and G.M., respectively between

two positive numbers, prove that the numbers are

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

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**30.** 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  $2^{nd}$  hour,  $4^{th}$  hour and  $n^{th}$  hour ?

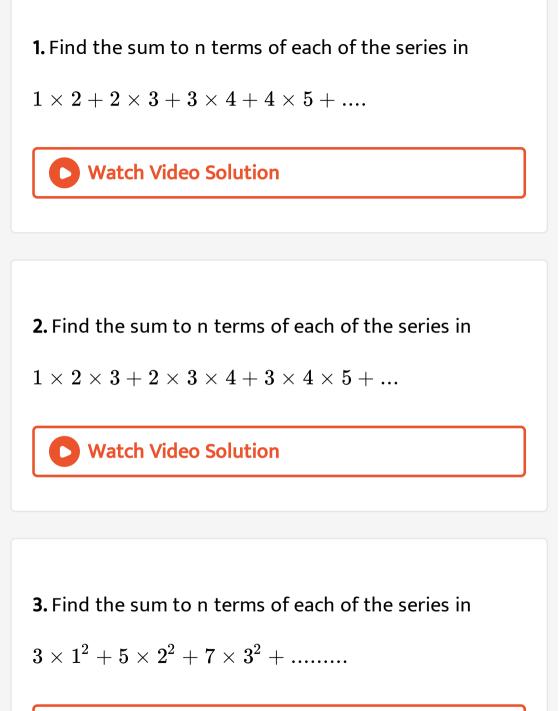


**31.** What will Rs. 500 amounts to in 10 years after its deposit in a bank which pays annual interest rate of 10% compounded annually?

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**32.** If A.M. and G.M. of roots of a quadratic equation are 8 and 5, respectively, then obtain the quadratic equation.





4. Find the sum to n terms of each of the series in  

$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots$$
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5. Find the sum to n terms of each of the series in

$$5^2 + 6^2 + 7^2 + \ldots + 20^2$$

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6. Find the sum to n terms of each of the series in

 $3 \times 8 + 6 \times 11 + 9 \times 14 + \dots$  .



7. Find the sum to n terms of each of the series in

$$1^2 + \left(1^2 + 2^2\right) + \left(1^2 + 2^2 + 3^2\right) + ...$$

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8. Find the sum to n terms of the series in whose  $n^{th}$  terms is given by n(n+1)(n+4)

9. Find the sum to n terms of the series in whose  $n^{th}$  terms is given by  $n^2+2^n$ 

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**10.** Find the sum to n terms of the series in whose  $n^{th}$ 

terms is given by

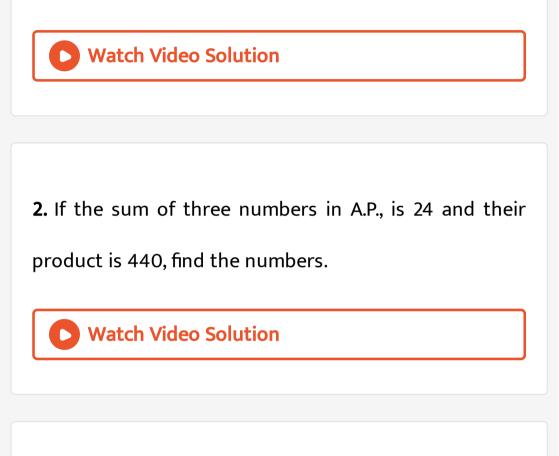
$$\left(2n-1
ight)^2$$

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Miscellaneous Exercise On Chapter 9

1. Show that the sum of  $\left(m+n
ight)^{th}$  and  $\left(m-n
ight)^{th}$ 

term of an A.P is equal to twice the  $m^{th}$  term.



3. The sum of first n, 2n and 3n terms of an A.P. are

 $S_1, S_2, S_3$  respectively. Prove that  $S_3 = 3(S_2 - S_1).$ 

4. Find the sum of all numbers between 200 and 400

which are divisible by 7.



5. Find the sum of integers from 1 to 100 that are

divisible by 2 or 5.

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6. Find the sum of all two digit numbers which when

divided by 4, yields 1 as remainder.

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

find the value of n.



**8.** 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.



9. 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.



**10.** The sum of three numbers in G.P. 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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**11.** 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.



**12.** 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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13. If 
$$rac{a+bx}{a-bx}=rac{b-cx}{b-cx}=rac{c+dx}{c-dx}(x
eq 0)$$
 then show

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

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

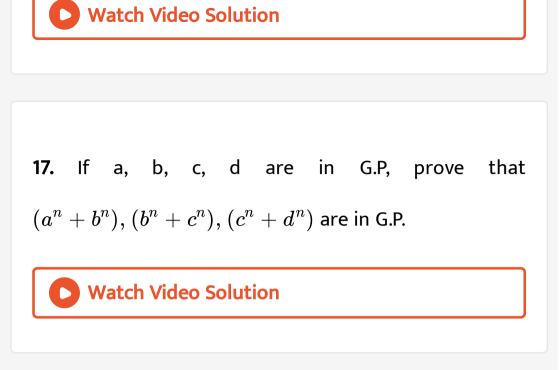
Watch Video Solution15. The
$$p^{th}$$
,  $q^{th}$  and  $r^{th}$  terms of an A.P. are a, b, c,respectively.Showthat

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

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16. If 
$$a\left(rac{1}{b}+rac{1}{c}
ight), b\left(rac{1}{c}+rac{1}{a}
ight), c\left(rac{1}{a}+rac{1}{b}
ight)$$
 are in A.P.,

prove that a, b, c, are in A.P.



18. If a and b are the roots of  $x^2-3x+p=0$  and c, d are roots of  $x^2-12x+q=0$  , where a,b,c,d form a G.P Prove that (q+p):(q-p) = 17 : 15

**19.** The ratio of the A.M. and G.M. of two positive numbers a and b, is m : n. Show that  $a:b = \left(m + \sqrt{m^2 - n^2}\right): \left(m - \sqrt{m^2 - n^2}\right).$  Watch Video Solution

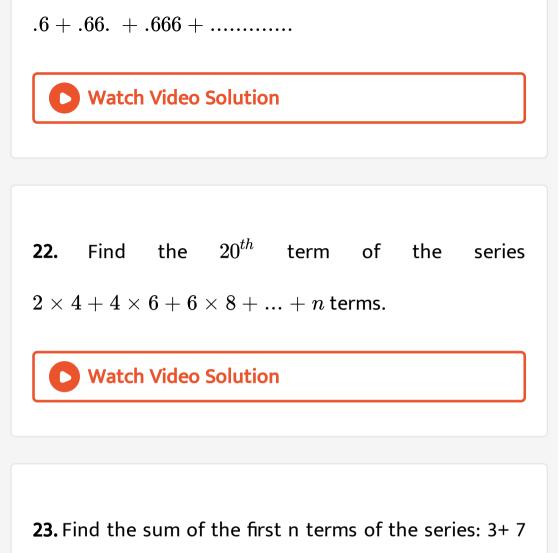
**20.** If a, b, c are in A.P., b, c, d are in G.P. and  $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ 

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



**21.** Find the sum of the following series up to n terms:

(i) 
$$5 + 55 + 555 + \dots$$
 (ii)



+13 +21 +31 +.....

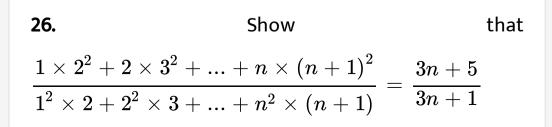


24. If  $S_1,\,S_2,\,S_3$  are the sum of first n natural numbers, their squares and their cubes, respectively , show that  $9S_2^2=S_3(1+8S_1)$ 



**25.** Find the sum of the following series up to n terms:

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1 + 3} + \frac{1^3 + 2^3 + 3^3}{1 + 3 + 5} + \dots \dots$$





**27.** 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 much will the tractor cost him?



**28.** Shamshad Ali buys a scootor for Rs 22000. He pays Rs 4000 cash and agrees to pay the balance in annual instalment of Rs 1000 plus 10% interest on the unpaid amount. How much will the scootor cost him?



**29.** 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 spent on the postage when 8th set of letter is mailed.



**30.** 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.



**31.** 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.



**32.** 150 workers were engaged to finish a piece of work in a certain number of days. Four workers dropped from the work on the second day. Four workers dropped on third day and so on. It took 8 more days to finish the work. Find the number of days in which the work was completed. [Let the no.of days to finish the work is 'r' then

$$150x = rac{x+8}{2} [2 imes 150 + (x+8-1)(-4)]$$