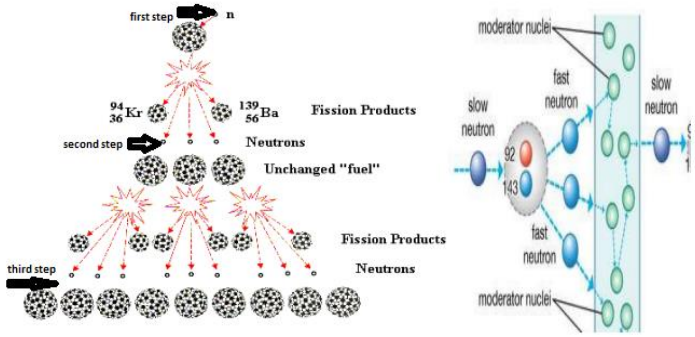
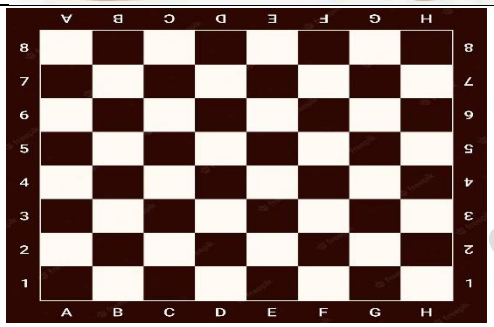
CHAPTER-9

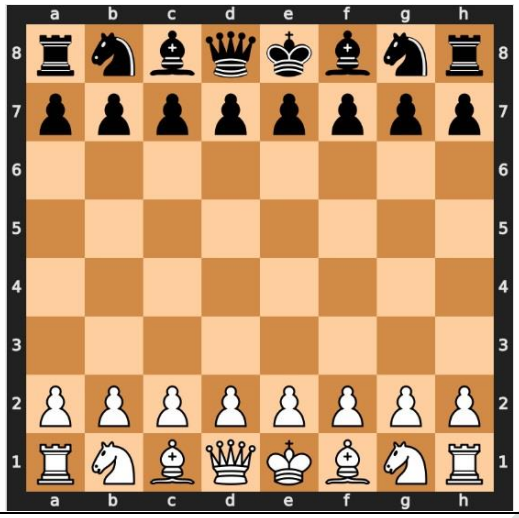
SEQUENCES & SERIES

02 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	If S_n= $5n^2$+2n in an AP, then find ?	2
2.	Find the sum to n terms of the series whose nth term is n(n+3)?	2
3.	If A.M and G.M of two positive numbers a and b are 10 and 8 respectively. Find the numbers?	2
4.	A person has 2 parents, 4 grandparents and so on. Find the number of his ancestors during the ten generations preceding his own?	2
5.	Find the sum to n terms of the series $7^2 + 8^2 + 9^2 + 10^2 + 11^2 +$ ……. …… …… $+50^2$.	2
6.	**Statement I:** $4X\ 4^{\frac{1}{3}}\ X\ 4^{\frac{1}{9}}\ X\ \ldots\ldots\infty = 8$ **Statement II**: $S_\infty = \frac{a}{r-1}, if\ \|r\| > 1$ (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	2
7.	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.	2
8.	A snail starts moving towards a point 3cm away at a pace of 1cm per hour. As it gets tired, it covers only half the distance compared to previous hour in each succeeding hour. In how much time will the snail reach his target?	2
9.	The inventor of the chess board suggested a reward of one gram of wheat for the first square, 2 grains for the second, 4 grains for the third and so on, doubling the number of the grains subsequent squares. How many grains would to be given to the inventor for all the squares? (There are 64 squares in the chess board).	2
10.	What is the minimum value of $3^x + 3^{1-x}, x \in R$?	2
11.	Write the first five terms of the sequence whose n^{th} term is given by $a_n = 2^n$	2
12.	In a G.P the 3rd term is 24 and 6^{th} term is 192. Find the 10th term	2
13.	The sum of first three terms of a G.P. is 39/10 and their product is 1. Find the common ratio and the terms.	2
14.	If $A = 1 + r^n + r^{2n} + \ldots\ldots \infty$, then express r in terms of n and A	2
15.	Find the number of terms in the AP 7, 10, 13, …., 31	2
16.	An old monk blessed the king and said – "Do the desire of the monk. The rule of taking my alms is like this, "Give me one rupee today, then give me the order to keep doubling for twenty days." The king was ready. As per the orders of the king, Raj Bhandari started giving alms to the monk. After giving alms for two weeks, he calculated that he saw a lot of money coming out.	2

	 How much alms did the old monk get on 14th day?	
17.	The following diagram shows first few steps of nuclear fission chain reaction. In this reaction single nucleus of Uranium is bombarded with a neutron of low speed to form Barium and Krypton with 3 neutrons as shown in the figure. Observe the figure carefully to solve the given questions:  Name of the progression formed by neutrons.	2
18.	Rahul being a plant lover decides to open a nursery and he bought few plants with pots. . He wants to place pots in such a way that number of pots in first row is 2, in second row is 4 and in third row is 8 and so on.  Find the number of pots in the 8th row.	2
19.	What is the 20th term of the sequence defined by: $a_n = (n-1)(2-n)(3+n)$?	2
20.	150 workers were engaged to finish a job in a certain no. of days. 4 workers dropped out on a second day, 4 more workers dropped out on the third day	2

	and so on. It took 8 more days to finish the work and find the no. of days in which the work was completed? 	
21.	 The inventor of the chess board suggested a reward of one grain of wheat for thefirst square, 2 grains for the second, 4grains for the third and so on, doubling the number of the grains for subsequent squares. How many grains would have to be given to inventor? (Thereare 64 squares in the chess board)	2
22.	 Two cars start together in the same direction from the same place. The first goeswith uniform speed of 10 km/h. The second goes at a speed of 8 km/h in the first hour and increases the sped by 1/2 km each succeeding hour. After how many hours will the second car overtake thefirst car if both cars go non-stop?	2
23.	If arithmetic mean and geometric mean of roots of a quadratic equation are 16 and 10 respectively, then obtain the quadratic equation.	2
24.	Find out the value of k such that k+9, k-6 and 4 form three consecutive terms of a G.P.	2
25.	Vibhanshi asks her friend to insert two numbers between $\sqrt{6}$ and 36 so that the resulting sequence is G.P. Solve and find out the required numbers.	2
26.	There is a geometric progression of real numbers, the third term of that G.P. is 4. Find the product of its first five terms	2
27.	If n^{th} term of a sequence is given by $a_n = \frac{(-1)^{n-1}}{n^2+4}$ then obtain the sum of 3^{rd} and 4^{th} term of the sequence.	2
28.	The inventor of the chess board suggested a reward of one grain of wheat for the first square, 2 grains for the second , 4 grains for the third and so on doubling the number of the grains	2

	for subsequent squares. How many grains would have given to inventors ? There are 64 square in the chess board. 	
29.	Evaluate : $\sum_{k=1}^{11}(2+3^k$	2
30.	There are two numbers whose difference is 12 and AM exceed GM by 2. What are the numbers ?	2
31.	The first term of a GP is 1. The sum of the third term and fifth term is 90. What will be common ratio ?	2
32.	Meetali and her group are organizing an environmental awareness program for which they decide to cover a distance of 192 km by cycling. While cycling It is decided , 5 points to be setup in between to give the cycler a drink if required. The setup points should be such that the cover distance will be doubling the previous covered. First they set up a point at a distance of 6 km from the starting point. What will be distance of the remaining setup points from the starting point ? 	2

ANSWERS:

Q. NO	ANSWER	MARKS
1.	$S_1=7$, $S_2=24$, $S_3=51$ $T_1=7$, $T_2=S_2-S_1=17$ $T_3=S_3-S_2=17$ Hence the terms forms an AP. $a_n=a+(n-1)d= 10n-3$	2
2.	$\sum n(n+3)$ $\sum n^2+3n$ $\sum n^2+3\sum n$ $\{n(n+1)(2n+1)\}/6+3n(n+1)/2$ $\{n(n+1)/2\}[(2n+1)/3+3]$	2
3.	A.M=(a+b)/2=10 ⇒a+b=20 (1) G.M= (ab)1/2 =8 ⇒ab=64 (2) From (1) we have b=20−a Substituting b=20−a in (2) we get a(20−a)=64 ⇒20a−a2−64=0 ⇒a2−20a+64=0 ⇒a2−16a−4a+64=0 ⇒a(a−16)−4(a−16)=0 ⇒(a−16)(a−4)=0 ∴a=16,4 ⇒b=20−16,20−4 using b=20−a ∴b=4,16 Hence the numbers are (a,b)=(16,4) or (4,16)	2
4.	Sum of 10 terms of the G.P. 2,4,8,... $=2(12^{10}-1)/(2-1)=2046$.	2
5.	72 + 82 + 92 + 102 + 112 + … . . . +502 =12+22+…+502-(12+22+…+72) =[50(50+1)(100+1)/6] -[7(7+1)(14+1)/6]	2

	=42925-140 =42785	
6.	$\frac{a(r^{2n}-1)}{r-1} = 5.\frac{a(r^{2n}-1)}{r^2-1}$ r= 4	2
7.	The snail movement can be thought of that of a G.P. 1,0.5,0.25,.... 1+0.5+0.25+...=3 $\frac{1-0.5^n}{1-0.5} = 3$ $0.5^n = -0.5$ which is not possible.Hence,it never reaches its target.	2
8.	No. of grains for the first square = 1 ,the second square = 2 ,the third square = 4 and so on. These no. of grains form a G.P. as $2^0, 2^1, 2^2, 2^3, \ldots, 2^{63}$ So the first term of G.P. is a=1 and common ratio is r=2 no. of terms in this G.P. is 64. Since sum of n terms of G.P. = $2^{64} - 1$	2
9.	As, AM ≥ GM $\frac{3^x + 3^{1-x}}{2} \geq \sqrt{3^x . 3^{1-x}}$ $3^x + 3^{1-x} \geq 2\sqrt{3}$	2
10.	If A and G respectively are A.M. and G. M. between two positive numbers, then the numbers are $A \pm \sqrt{A^2 - G^2}$ Given A:G = 5:3, Let A = 5x , G = 3x So the numbers are $5x \pm \sqrt{(5x)^2 - (3x)^2}$ i.e. 9x, x ratio 9:1	2
11.	2 , 4 , 8 , 16 , 32	2
12.	Let a is the first term and r be the common ratio of given G.P. So, $ar^2 = 24$ ….(1) and $ar^5 = 192$ ….(2) dividing (2) by (1) we get $r^3 = 192/24$ => $r^3 = 8$ => r = 2 So, from (1) we get , a = 6 Therefore, $a_{10} = ar^9 = 6 \times 2^9 = 6 \times 512 = 3072$	2
13.	Let the terms are $\frac{a}{r}, a, ar$. So, $\frac{a}{r} + a + ar = \frac{39}{10}$ and $\frac{a}{r}.a.ar = 1$ => a = 1 and $\frac{1}{r} + 1 + r = \frac{39}{10}$ => $10[r^2 + r + 1] = 39r$ => $10r^2 - 29r + 10 = 0$ which on solving gives r = 5/2 or 2/5. So, the terms are 5/2, 1, 2/5 or 2/5, 1, 5/2	2
14.	Given series is a GP with first term 1 and common ratio r^n. So, A = $\frac{1}{1-r^n}$ => $A(1 - r^n) = 1$ => $A - Ar^n = 1$ => $r^n = A/(A-1)$	2

	=> r = $\left(\frac{A}{A-1}\right)^{1/n}$	
15.	The given AP is 7, 10, 13, …., 31. So, a=7, d=3, *l*=31 Now *l* = a + (n – 1) d So, 31 = 7 + (n – 1)x3 => 3n – 3 = 31 – 7 = 24 => 3n = 27 => n = 9	2
16.	Sequence of money collected daily is: 1, 2, 4, 8, 16…… Clearly the given sequence is G.P. as the common ratio is same i.e. 2. Now first term a= 1 ; r= 2 ; no. of days are (n) = 14 Therefore money collected at 14^{th} day is $a_n = ar^{n-1}$ $= 1(2)^{14-1}$ =8192 Ans: 8192 Rs.	2
17.	Given initial no. of neutron =1 No. of neutrons produced in first step is = 3 No. of neutrons produced in second step is = 9 Therefore sequence is: 1, 3, 9……. $r_1 = \frac{3}{1} = 3$ $r_2 = \frac{9}{3} = 3$ Since common ratio is same, therefore the given sequence is in G.P. Ans : G.P.	2
18.	Given sequence of the pots row wise are: 2, 4, 8 …….. First term a= 2 ; common ratio r= 2 ; n = 8 Therefore no. of pots in 8^{th} row are: $a_n = a(r)^{n-1}$ $= 2(2)^{8-1}$ = 256 Ans : 256	2
19.	Put n =20, we get A_{20} = (20-1)(2-20)(3+20)= 19 .(-18).23 = -7866	2
20.	A = 150, d = -4 $S_n = \frac{n}{2}[2\times150+(n-1)(-4)]$ If total workers who would have worked for all n days, 150(n - 8) $\therefore \frac{n}{2}[300 + (n - 1)(- 4)] = 150(n - 8)$ $\Rightarrow$n = 25 Ans : 25 days	2
21.	Total number of grains would have to give to inventor is	

	= 1 + 2+ 2^2+ … up to 64 term = $\frac{1(2^{64}-1)}{2-1}$ = $2^{64}-1$	
22.	Suppose the second car overtakes the first car after t hours, Then the two carstravel the same distance int hours. Distance travelled by the first car in t hours = 10t km. Distance travelled by the second car in t hours = Sum of t terms of an A.P. with first term 8 and common difference 1/2. = $\frac{t}{2}\left[2\times 8+(t-1)\times\frac{1}{2}\right]=\frac{t(t+31)}{4}$ When the second car overtakes the first car, we have 10t = $\frac{t(t+31)}{4}\Rightarrow t(t-9)=0\Rightarrow t=9$ $[\because t\neq 0]$ Thus, the second car will overtake the first car in 9 hours.	
23.	Let the roots of the quadratic equation are a and b, the arithmetic mean will be $\frac{(a+b)}{2}=16$ $\Rightarrow a+b=32$ and geometric mean $\sqrt{ab}=10$ $\Rightarrow ab=100$ So, the quadratic equation will be $x^2-(a+b)x+(ab)=0$ $\Rightarrow x^2-32x+100=0$	2
24.	It is given that k+9, k-6, 4 are in G.P. $\Rightarrow (k-6)^2=(k+9)\times 4$ $\Rightarrow k=0,16$	2
25.	Let the two numbers be α and β then$\sqrt{6}$, α, β, 36 are in G.P. $\because n^{th}$ term $T_n=ar^{n-1}$ $\therefore \quad 36=\sqrt{6}r^{4-1}$ $\Rightarrow \quad r^3=6\sqrt{6}$ $\Rightarrow \quad r=\sqrt{6}$ So,	2

	$\alpha = ar$ $\Rightarrow \alpha = \sqrt{6} \times \sqrt{6} = 6$ & $\beta = ar^2$ $\Rightarrow \beta = \sqrt{6} \times \left(\sqrt{6}\right)^2 = 6\sqrt{6}$	
26.	Let *a* be the first term and *r* be the common ratio. Then, $a^3 = 4$ $\Rightarrow ar^2 = 4$ Therefore, Product of first five terms will be $a_1a_2a_3a_4a_5 = a(ar)\left(ar^2\right)\left(ar^3\right)\left(ar^4\right)$ $= a^5r^{10} = \left(ar^2\right)^5 = 4^5$	2
27.	Given n[th] term of the sequence is $a_n = \frac{(-1)^{n-1}}{n^2+4}$ So, $a_3 = \frac{(-1)^{3-1}}{3^2+4} = \frac{1}{13}$ $a_4 = \frac{(-1)^{4-1}}{4^2+4} = \frac{-1}{20}$ $\therefore a_3 + a_4 = \frac{1}{13} + \frac{-1}{20} = \frac{7}{260}$	2
28.	Here a = 1 , r = 2 Sn = $\frac{a(r^n-1)}{r-1} = 2^{64} - 1$	
29.	$2+3+2+3^2+2+3^3+\ldots\ldots\ldots\ldots+2+3^{11}$ $2+2+2+2+\ldots\ldots\ldots+2+3+3^2+3^3+\ldots\ldots\ldots+3^{11}$ $22+\frac{3(3^{11}-1)}{2}$	
30.	$\frac{a+b}{2} = \sqrt{ab}+2$ $\Rightarrow a+b = 2\sqrt{ab}+4$ $\Rightarrow (a+b)-2\sqrt{ab} = 4$ $\Rightarrow (\sqrt{a}-\sqrt{b})^2 = 4$ $\Rightarrow \sqrt{a}-\sqrt{b} = 2$ Now $a-b = 12$ $\Rightarrow (\sqrt{a}+\sqrt{b})(\sqrt{a}-\sqrt{b}) = 12$ $\Rightarrow (\sqrt{a}+\sqrt{b})(2) = 12$ $\Rightarrow (\sqrt{a}+\sqrt{b}) = 6$	

	Solving we Have a =16 , b= 4	
31.	$a_3 + a_5 = 90$ $\Rightarrow ar^2 + ar^4 = 90$ $\Rightarrow r^2 + r^4 = 90$ $\Rightarrow r = \pm 3, \pm\sqrt{10}$	
32.	GP is 6,12,24,48,96,192	