SEQUENCE & PROGRESSION

1. If the sum of the first 40 terms of the series, $3+4+8+9+13+14+18+19+\ldots$ is (102)m, then m is equal to :

(1) 20 (2) 5
(3) 10 (4) 25

2. Let $a_1, a_2, a_3, \ldots$ be a G.P. such that $a_1 < 0$, $a_1 + a_2 = 4$ and $a_3 + a_4 = 16$. If $\sum_{i=1}^{9} a_i = 4\lambda$, then λ is equal to :

(1) –171 (2) 171
(3) $\frac{511}{3}$ (4) –513

3. Five numbers are in A.P., whose sum is 25 and product is 2520. If one of these five numbers is $-\frac{1}{2}$, then the greatest number amongst them is :

(1) $\frac{21}{2}$ (2) 27
(3) 16 (4) 7

4. The greatest positive integer k, fr which $49^k + 1$ is a factor of the sum $49^{125} + 49^{124} + \ldots\ 49^2 + 49 + 1$, is :

(1) 32 (2) 60
(3) 63 (4) 65

5. If the 10^{th} term of an A.P. is $\frac{1}{20}$ and its 20^{th} term is $\frac{1}{10}$, then the sum of its first 200 terms is

(1) $50\frac{1}{4}$ (2) $100\frac{1}{2}$
(3) 50 (4) 100

6. The sum, $\sum_{n=1}^{7} \frac{n(n+1)(2n+1)}{4}$ is equal to ________.

7. The sum $\sum_{k=1}^{20}(1+2+3+\ldots+k)$ is ....

8. If $x = \sum_{n=0}^{\infty}(-1)^n \tan^{2n}\theta$ and $y = \sum_{n=0}^{\infty}\cos^{2n}\theta$, for $0 < \theta < \frac{\pi}{4}$, then :

(1) $y(1 + x) = 1$ (2) $x(1 + y) = 1$
(3) $y(1 - x) = 1$ (4) $x(1 - y) = 1$

9. Let a_n be the n^{th} term of a G.P. of positive terms. If $\sum_{n=1}^{100} a_{2n+1} = 200$ and $\sum_{n=1}^{100} a_{2n} = 100$, then $\sum_{n=1}^{200} a_n$ is equal to :

(1) 225 (2) 175
(3) 300 (4) 150

10. The number of terms common to the two A.P.'s 3, 7, 11, ..., 407 and 2, 9, 16, ..., 709 is ______.

11. The product $2^{\frac{1}{4}} \cdot 4^{\frac{1}{16}} \cdot 8^{\frac{1}{48}} \cdot 16^{\frac{1}{128}} \cdot \ldots$ to ∞ is equal to :

(1) $2^{\frac{1}{2}}$ (2) $2^{\frac{1}{4}}$
(3) 2 (4) 1

12. If $|x| < 1$, $|y| < 1$ and $x \neq y$, then the sum to infinity of the following series $(x+y) + (x^2+xy+y^2) + (x^3+x^2y + xy^2+y^3)+\ldots..$

(1) $\frac{x+y-xy}{(1-x)(1-y)}$ (2) $\frac{x+y-xy}{(1+x)(1+y)}$
(3) $\frac{x+y+xy}{(1+x)(1+y)}$ (4) $\frac{x+y+xy}{(1-x)(1-y)}$

13. The sum of the first three terms of a G.P. is S and their product is 27. Then all such S lie in :

(1) $[-3, \infty)$ (2) $(-\infty, 9]$
(3) $(-\infty, -9] \cup [3, \infty)$ (4) $(-\infty, -3] \cup [9, \infty)$

14. If the sum of first 11 terms of an A.P., a_1 a_2, a_3,... is 0 ($a_1 \neq 0$), then the sum of the A.P., a_1, a_3, a_5,...,a_{23} is ka_1, where k is equal to :

(1) $\frac{121}{10}$ (2) $-\frac{72}{5}$

(3) $\frac{72}{5}$ (4) $-\frac{121}{10}$

15. Let S be the sum of the first 9 terms of the series: $\{x + ka\} + \{x^2 + (k + 2)a\} + \{x^3+(k+4)a\} + \{x^4+(k + 6)a\}+.....$ where $a \neq 0$ and $x \neq 1$.

If $S = \frac{x^{10} - x + 45a(x-1)}{x-1}$, then k is equal to :

(1) –5 (2) 1

(3) –3 (4) 3

16. If the first term of an A.P. is 3 and the sum of its first 25 terms is equal to the sum of its next 15 terms, then the common difference of this A.P. is :

(1) $\frac{1}{4}$ (2) $\frac{1}{5}$

(3) $\frac{1}{7}$ (4) $\frac{1}{6}$

17. If the sum of the series $20 + 19\frac{3}{5} + 19\frac{1}{5} + 18\frac{4}{5} + ...$ upto n^{th} term is 488 and the n^{th} term is negative, then :

(1) n^{th} term is $-4\frac{2}{5}$ (2) n = 41

(3) n^{th} term is –4 (4) n = 60

18. If m arithmetic means (A.Ms) and three geometric means (G.Ms) are inserted between 3 and 243 such that 4^{th} A.M. is equal to 2^{nd} G.M., then m is equal to _______.

19. If $1+(1-2^2.1)+(1-4^2.3)+(1-6^2.5)+.....+(1-20^2.19) = \alpha - 220\beta$, then an ordered pair (α, β) is equal to:

(1) (10, 97) (2) (11, 103)

(3) (10, 103) (4) (11, 97)

20. Let $a_1, a_2..., a_n$ be a given A.P. whose common difference is an integer and $S_n = a_1 + a_2 + ..+ a_n$. If $a_1 = 1$, $a_n = 300$ and $15 \leq n \leq 50$, then the ordered pair (S_{n-4}, a_{n-4}) is equal to :

(1) (2480, 249) (2) (2490, 249)

(3) (2490, 248) (4) (2480, 248)

21. The minimum value of $2^{\sin x} + 2^{\cos x}$ is :-

(1) $2^{1-\frac{1}{\sqrt{2}}}$ (2) $2^{-1+\sqrt{2}}$

(3) $2^{1-\sqrt{2}}$ (4) $2^{-1+\frac{1}{\sqrt{2}}}$

22. If $3^{2 \sin 2\alpha - 1}$, 14 and $3^{4 - 2 \sin 2\alpha}$ are the first three terms of an A.P. for some α, then the sixth term of this A.P. is :

(1) 66 (2) 65

(3) 81 (4) 78

23. If $2^{10} + 2^9 \cdot 3^1 + 2^8 \cdot 3^2 + ... + 2 \cdot 3^9 + 3^{10} = S - 2^{11}$, then S is equal to :

(1) $\frac{3^{11}}{2} + 2^{10}$ (2) $3^{11} - 2^{12}$

(3) 3^{11} (4) $2 \cdot 3^{11}$

24. If the sum of the first 20 terms of the series $\log_{(7^{1/2})} x + \log_{(7^{1/3})} x + \log_{(7^{1/4})} x + ...$ is 460, then x is equal to:

(1) $7^{46/21}$ (2) $7^{1/2}$

(3) e^2 (4) 7^2

25. If the sum of the second, third and fourth terms of a positive term G.P. is 3 and the sum of its sixth, seventh and eighth terms is 243, then the sum of the first 50 terms of this G.P. is :

(1) $\frac{2}{13}(3^{50} - 1)$ (2) $\frac{1}{26}(3^{50} - 1)$

(3) $\frac{1}{13}(3^{50} - 1)$ (4) $\frac{1}{26}(3^{49} - 1)$

26. If $f(x+y)=f(x)f(y)$ and $\sum_{x=1}^{\infty} f(x)=2, x, y \in N$, where N is the set of all natural numbers, then the value of $\frac{f(4)}{f(2)}$ is

(1) $\frac{1}{9}$ (2) $\frac{4}{9}$

(3) $\frac{1}{3}$ (4) $\frac{2}{3}$

27. Let a,b,c,d and p be any non zero distinct real numbers such that

$(a^2 + b^2 + c^2)p^2 - 2(ab + bc + cd)p + (b^2 + c^2 + d^2) = 0$. Then :

(1) a,c,p are in G.P.

(2) a,c,p are in A.P.

(3) a,b,c,d are in G.P.

(4) a,b,c,d are in A.P.

28. The common difference of the A.P. $b_1, b_2, ..., b_m$ is 2 more than the common difference of A.P. $a_1, a_2, ..., a_n$. If $a_{40} = -159$, $a_{100} = -399$ and $b_{100} = a_{70}$, then b_1 is equal to :

(1) –127 (2) –81

(3) 81 (4) 127

SOLUTION

1. NTA Ans. (1)

Sol. Sum of the 40 terms of

$3 + 4 + 8 + 9 + 13 + 14 + 18 + 19\ldots$

$= (3 + 8 + 13 + \ldots \text{upto 20 term})$

$+ [4 + 9 + 15 + \ldots \text{ upto 20 terms}]$

$= 10\,[\{6 + 19 \times 5\} + \{8 + 19 \times 5\}]$

$= 10 \times 204 = 20 \times 102$

2. NTA Ans. (1)

Sol. $a_1 + a_2 = 4$

$r^2a_1 + r^2a_2 = 16$

$\Rightarrow r^2 = 4 \Rightarrow r = -2$ as $a_1 < 0$

and $a_1 + a_2 = 4$

$a_1 + a_1(-2) = 4 \Rightarrow a_1 = -4$

$$4\lambda = (-4)\left(\frac{(-2)^9 - 1}{-2-1}\right) = (-4) \times \frac{513}{3}$$

$\Rightarrow \lambda = -171$

3. NTA Ans. (3)

Sol. Let the A.P is

$a - 2d,\ a - d,\ a,\ a + d,\ a + 2d$

$\because$ sum $= 25 \Rightarrow a = 5$

Product = 2520

$(25 - 4d^2)(25 - d^2) = 504$

$4d^4 - 125d^2 + 121 = 0$

$$\Rightarrow d^2 = 1, \frac{121}{4}$$

$$\Rightarrow d = \pm 1, \pm\frac{11}{2}$$

$d = \pm 1$ is rejected because none of the term can be $\frac{-1}{2}$.

$$\Rightarrow d = \pm\frac{11}{2}$$

$$\Rightarrow \text{AP will be } -6, -\frac{1}{2}, 5, \frac{21}{2}, 16$$

Largest term is 16.

4. NTA Ans. (3)

Sol. $1 + 49 + 49^2 + \ldots + 49^{12}$

$$= (49)^{126} - 1 = (49^{63} + 1)\frac{(49^{63} - 1)}{(48)}$$

So greatest value of k = 63

5. NTA Ans. (2)

Sol. $T_{10} = \frac{1}{20} = a + 9d$ ...(i)

$T_{20} = \frac{1}{10} = a + 19d$ ...(ii)

$$a = \frac{1}{200} = d$$

$$\text{Hence, } S_{200} = \frac{200}{2}\left[\frac{2}{200} + \frac{199}{200}\right] = \frac{201}{2}$$

(2) Option

6. NTA Ans. (504)

Sol.
$$\frac{1}{4}\left(\sum_{n=1}^{7} 2n^3 + \sum_{n=1}^{7} 3n^2 + \sum_{n=1}^{7} n\right)$$

$$= \frac{1}{4}\left(2\left(\frac{7 \times 8}{2}\right)^2 + 3\left(\frac{7 \times 8 \times 15}{6}\right) + \frac{7 \times 8}{2}\right)$$

= 504

Ans. 504.00

7. NTA Ans. (1540.00)

Sol.
$$\sum_{k=1}^{20} \frac{k(k+1)}{2} = \frac{1}{2}\sum_{k=1}^{20} \frac{k(k+1)(k+2) - (k-1)k(k+1)}{3}$$

$$= \frac{1}{6} \times 20 \times 21 \times 22 = 1540.00$$

8. NTA Ans. (3)

Sol.
$$x = \sum_{n=0}^{\infty} (-1)^n \tan^{2n}\theta = 1 - \tan^2\theta + \tan^4\theta + \ldots$$

$\Rightarrow x = \cos^2\theta$

$$y = \sum_{n=0}^{\infty} \cos^{2n}\theta \Rightarrow y = 1 + \cos^2\theta + \cos^4\theta + \ldots$$

$$\Rightarrow y = \frac{1}{\sin^2\theta} \Rightarrow y = \frac{1}{1-x}$$

$\Rightarrow y(1 - x) = 1$

9. NTA Ans. (4)

Sol. $\sum_{n=1}^{100} a_{2n+1} = 200 \Rightarrow a_3 + a_5 + a_7 + ... + a_{201} = 200$

$$\Rightarrow ar^2\frac{(r^{200}-1)}{(r^2-1)} = 200$$

$\sum_{n=1}^{100} a_{2n} = 100 \Rightarrow a_2 + a_4 + a_6 + ... + a_{200} = 100$

$$\Rightarrow \frac{ar(r^{200}-1)}{(r^2-1)} = 100$$

On dividing r = 2

on adding $a_2 + a_3 + a_4 + a_5 + ... + a_{200} + a_{201} = 300$

$\Rightarrow r(a_1 + a_2 + a_3 + ... + a_{200}) = 300$

$$\Rightarrow \sum_{n=1}^{200} a_n = 150$$

10. NTA Ans. (14)

Sol. Common term are : 23, 51, 79, ... T_n

$T_n \le 407 \Rightarrow 23 + (n - 1)28 \le 407$

$\Rightarrow n \le 14.71$

n = 14

11. NTA Ans. (1)

Sol. $2^{\frac{1}{4}} \cdot 4^{\frac{1}{16}} \cdot 8^{\frac{1}{48}} \cdot 16^{\frac{1}{128}} \cdot ....\infty$

$$= 2^{\frac{1}{4}} \cdot 2^{\frac{2}{16}} \cdot 2^{\frac{3}{48}} \cdot 2^{\frac{4}{128}} \cdot ....\infty$$

$$= 2^{\frac{1}{4}} \cdot 2^{\frac{1}{8}} \cdot 2^{\frac{1}{16}} \cdot 2^{\frac{1}{32}} \cdot ....\infty$$

$$= 2^{\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\frac{1}{32}+.....\infty} = (2)^{\left(\frac{1/4}{1-1/2}\right)} = 2^{1/2}$$

12. Official Ans. by NTA (1)

Sol. $|x| < 1, |y| < 1, x \ne y$

$(x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + ...$

By multiplying and dividing x – y :

$$\frac{(x^2-y^2)+(x^3-y^3)+(x^4-y^4)+......}{x-y}$$

$$= \frac{(x^2+x^3+x^4+......)-(y^2+y^3+y^4+......)}{x-y}$$

$$= \frac{\frac{x^2}{1-x} - \frac{y^2}{1-y}}{x-y}$$

$$= \frac{(x^2-y^2)-xy(x-y)}{(1-x)(1-y)(x-y)}$$

$$= \boxed{\frac{x+y-xy}{(1-x)(1-y)}}$$

13. Official Ans. by NTA (4)

Sol. Let three terms of G.P. are $\frac{a}{r}$, a, ar

product = 27

$\Rightarrow a^3 = 27 \Rightarrow a = 3$

$$S = \frac{3}{r} + 3r + 3$$

For r > 0

$$\frac{\frac{3}{r}+3r}{2} \ge \sqrt{3^2} \quad \text{(By AM} \ge \text{GM)}$$

$$\Rightarrow \frac{3}{r} + 3r \ge 6 \qquad ...(1)$$

For r < 0 $\frac{3}{r} + 3r \le -6$ ...(2)

From (1) & (2)

$S \in (-\infty - 3] \cup [9, \infty]$

14. Official Ans. by NTA (2)

Sol. $a_1 + a_2 + a_3 + ... + a_{11} = 0$

$\Rightarrow (a_1 + a_{11}) \times \frac{11}{2} = 0$

$\Rightarrow a_1 + a_{11} = 0$

$\Rightarrow a_1 + a_1 + 10d = 0$

where d is common difference

$\Rightarrow \boxed{a_1 = -5d}$

$a_1 + a_3 + a_5 + ... + a_{23}$

$= (a_1 + a_{23}) \times \frac{12}{2} = (a_1 + a_1 + 22d) \times 6$

$= \left(2a_1 + 22\left(\frac{-a_1}{5}\right)\right) \times 6$

$= -\frac{72}{5}a_1 \Rightarrow K = \frac{-72}{5}$

15. Official Ans. by NTA (3)

Sol. $S = [x + ka + 0] + [x^2 + ka + 2a] + [x^3 + ka + 4a] + [x^4 + ka + 6a] + ...9$ terms

$\Rightarrow S = (x + x^2 + x^3 + x^4 + ...9 \text{ terms}) + (ka + ka + ka + ka + ...9 \text{ terms}) + (0 + 2a + 4a + 6a + ...9 \text{ terms})$

$\Rightarrow S = x\left[\frac{x^9 - 1}{x - 1}\right] + 9ka + 72a$

$\Rightarrow S = \frac{(x^{10} - x) + (9k + 72)a(x - 1)}{(x - 1)}$

Compare with given sum, then we get, $(9k + 72) = 45$

$\Rightarrow \boxed{k = -3}$

16. Official Ans. by NTA (4)

Sol. Sum of 1st 25 terms = sum of its next 15 terms

$\Rightarrow (T_1 + ... + T_{25}) = (T_{26} + ... + T_{40})$

$\Rightarrow (T_1 + ... + T_{40}) = 2(T_1 + ... + T_{25})$

$\Rightarrow \frac{40}{2}[2 \times 3 + (39d)] = 2 \times \frac{25}{2}[2 \times 2 + 24d]$

$\Rightarrow d = \frac{1}{6}$

17. Official Ans. by NTA (3)

Sol. $S = \frac{100}{5} + \frac{98}{5} + \frac{96}{5} + \frac{94}{5} + ...n$

$S_n = \frac{n}{2}\left(2 \times \frac{100}{5} + (n-1)\left(-\frac{2}{5}\right)\right) = 188$

$n(100 - n + 1) = 488 \times 5$

$n^2 - 101n + 488 \times 5 = 0$

$n = 61, 40$

$T_n = a + (n - 1)d = \frac{100}{5} - \frac{2}{5} \times 60$

$= 20 - 24 = -4$

18. Official Ans. by NTA (39)

Sol. $3, A_1, A_2 .... A_m, 243$

$d = \frac{243 - 3}{m + 1} = \frac{240}{m + 1}$

Now $3, G_1, G_2, G_3, 243$

$r = \left(\frac{243}{3}\right)^{\frac{1}{3+1}} = 3$

$\therefore A_4 = G_2$

$\Rightarrow a + 4d = ar^2$

$3 + 4\left(\frac{240}{m + 1}\right) = 3(3)^2$

$m = 39$

19. Official Ans. by NTA (2)

Sol. $1 + (1 - 2^2.1) + (1 - 4^2.3) + ... + (1 - 20^2.19)$

$= \alpha - 220\beta$

$= 11 - (2^2.1 + 4^2.3 + ... + 20^2.19)$

$= 11 - 2^2.\sum_{r=1}^{10} r^2(2r - 1) = 11 - 4\left(\frac{110^2}{2} - 35 \times 11\right)$

$= 11 - 220(103)$

$\Rightarrow \alpha = 11, \beta = 103$

20. Official Ans. by NTA (3)

Sol. $a_n = a_1 + (n - 1)d$

$\Rightarrow 300 = 1 + (n - 1) d$

$\Rightarrow (n - 1)d = 299 = 13 \times 23$

since, $n \in [15, 50]$

$\therefore$ n = 24 and d = 13

$a_{n-4} = a_{20} = 1 + 19 \times 13 = 248$

$\Rightarrow a_{n-4} = 248$

$S_{n-4} = \frac{20}{2}\{1+248\} = 2490$

21. Official Ans. by NTA (1)

Sol. Usnign AM $\geq$ GM

$\Rightarrow \frac{2^{\sin x} + 2^{\cos x}}{2} \geq \sqrt{2^{\sin x} \cdot 2^{\cos x}}$

$\Rightarrow 2^{\sin x} + 2^{\cos x} \geq 2^{1+\left(\frac{\sin x+\cos x}{2}\right)}$

$\Rightarrow \min\left(2^{\sin x} + 2^{\cos x}\right) = 2^{1-\frac{1}{\sqrt{2}}}$

22. Official Ans. by NTA (1)

Sol. Given that

$3^{4 - \sin 2\alpha} + 3^{2 \sin 2\alpha - 1} = 28$

Let $3^{2 \sin 2\alpha} = t$

$\frac{81}{t} + \frac{t}{3} = 28$

t = 81, 3

$3^{2 \sin 2\alpha} = 3^1, 3^4$

$2\sin 2\alpha = 1, 4$

$\sin 2\alpha = \frac{1}{2}$, 2 (rejected)

First term $a = 3^{2 \sin 2\alpha - 1}$

a = 1

Second term = 14

$\therefore$ common difference d = 13

$T_6 = a + 5d$

$T_6 = 1 + 5 \times 13$

$T_6 = 66$

23. Official Ans. by NTA (3)

Sol. $a = 2^{10}$; $r = \frac{3}{2}$; n = 11 (G.P.)

$S' = (2^{10}) \frac{\left(\left(\frac{3}{2}\right)^{11} - 1\right)}{\frac{3}{2} - 1} = 2^{11}\left(\frac{3^{11}}{2^{11}} - 1\right)$

$S' = 3^{11} - 2^{11} = S - 2^{11}$ (Given)

$\therefore S = 3^{11}$

24. Official Ans. by NTA (4)

Sol. $460 = \log_7 x \cdot (2 + 3 + 4 + ... + 20 + 21)$

$\Rightarrow 460 = \log_7 x \cdot \left(\frac{21 \times 22}{2} - 1\right)$

$\Rightarrow 460 = 230 \cdot \log_7 x$

$\Rightarrow \log_7 x = 2 \Rightarrow x = 49$

25. Official Ans. by NTA (2)

Sol. Let first term = a > 0

Common ratio = r > 0

$ar + ar^2 + ar^3 = 3$ ....(i)

$ar^5 + ar^6 + ar^7 = 243$ ....(ii)

$r^4(ar + ar^2 + ar^3) = 243$

$r^4(3) = 243 \Rightarrow r = 3$ as $r > 0$

from (1)

3a + 9a + 27a = 3

$a = \frac{1}{13}$

$S_{50} = \frac{a(r^{50} - 1)}{(r - 1)} = \frac{1}{26}(3^{50} - 1)$

26. Official Ans. by NTA (2)

Sol. $f(x + y) = f(x).\ f(y)$

$\sum_{x=1}^{\infty} f(x) = 2$ where $x, y \in N$

$f(1) + f(2) + f(3) + ... \infty = 2$ ...(1) (Given)

Now for $f(2)$ put x = y = 1

$f(2) = f(1 + 1) = f(1).\ f(1) = (f(1))^2$

$f(3) = f(2 + 1) = f(2).\ f(1) = (f(1))^3$

Now put these values in equation (1)

$f(1) + (f(1))^2 + [f(1)^2 + ...\infty = 2]$

$\frac{f(1)}{1 - f(1)} = 2$

$\Rightarrow f(1) = \frac{2}{3}$

Now $f(2) = \left(\frac{2}{3}\right)^2$

$f(4) = \left(\frac{2}{3}\right)^4$

then the value of $\frac{f(4)}{f(2)} = \frac{\left(\frac{2}{3}\right)^4}{\left(\frac{2}{3}\right)^2} = \frac{4}{9}$

27. Official Ans. by NTA (3)

Sol. $(a^2 + b^2 + c^2)p^2 + 2(ab + bc + cd)p + b^2 + c^2 + d^2 = 0$

$\Rightarrow (a^2p^2 + 2abp + b^2) + (b^2p^2 + 2bcp + c^2) + (c^2p^2 + 2cdp + d^2) = 0$

$\Rightarrow (ab + b)^2 + (bp + c)^2 + (cp + d)^2 = 0$

This is possible only when

$ap + b = 0$ and $bp + c = 0$ and $cp + d = 0$

$p = -\frac{b}{a} = -\frac{c}{b} = -\frac{d}{c}$

or $\frac{b}{a} = \frac{c}{b} = \frac{d}{c}$

$\therefore$ a,b,c,d are in G.P.

28. Official Ans. by NTA (2)

Sol. $a_1, a_2, ..., a_n \rightarrow (CD = d)$

$b_1, b_2, ..., b_m \rightarrow (CD = d + 2)$

$a_{40} = a + 39d = -159$
...(1)

$a_{100} = a + 99d = -399$
...(2)

Subtract : $60d = -240 \Rightarrow d = -4$

using equation (1)

$a + 39(-4) = -159$

$a = 156 - 159 = -3$

$a_{70} = a + 69d = -3 + 69(-4) = -279 = b_{100}$

$b_{100} = -279$

$b_1 + 99(d + 2) = -279$

$b_1 - 198 = -279 \Rightarrow b_1 = -81$