CHAPTER 13

Progressions

SYNOPSIS

- **Sequence:** A systematic arrangement of numbers according to a given rule is called a sequence.
- **Series:** The sum of the terms of a sequence is called the series of the corresponding sequence.

  Note: $1 + 2 + 3 + \ldots + n$ is a finite series of first n natural numbers.

  The sum of first n terms of series is denoted by S_n.

  Here, $S_n = T_1 + T_2 + \ldots\ldots + T_{n-1} + T_n$

  $S_{n-1} = T_1 + T_2 + T_3 + \ldots\ldots + T_{n-1}$

  $\Rightarrow \boxed{S_n - S_{n-1} = T_n}$

  Arithmetic Progression: Numbers (or terms) are said to be in arithmetic progression when each term except the first term is obtained by adding a constant to the previous number (or term).

  Let the first term of the progression be a and the common difference be d.

  (i) The n^{th} term (general term) is $T_n = a + (n - 1)d$

  (ii) The sum to n terms, $S_n = \frac{n}{2}[2a + (n - 1)d]$

  The sum to n terms can also be written in a different manner. That is, the sum of n terms

  $= \frac{n}{2}[2a + (n - 1)d]$

  $= \frac{n}{2}[a + \{a + (n - 1)d\}]$

  But, when there are n terms in an AP a is the first term and $\{a + (n - 1)d\}$ is the last term.

  Hence, $S_n = \left(\frac{n}{2}\right)$ [first term + last term]

- **Arithmetic Mean (AM):** The average of all the terms in an AP is called the arithmetic mean of the AP.

  The average of a certain numbers = $\frac{\text{The sum of all the numbers}}{\text{The number of numbers}}$

  $\therefore$ A.M. of n terms in an

  $\text{AP} = \frac{S_n}{n} = \frac{1}{n} \times \frac{n}{2}\left[\text{first term} + \text{last term}\right]$

  Note:

  1. In general, the average of the k^{th} term from the beginning and the k^{th} term from the end is equal to the AM of the AP. If the AM of an AP is known, the sum to n terms of the series (S_n) can be expressed as $S_n = n$ (AM)
  2. If a and b are any two numbers, then their $\text{AM} = \frac{a+b}{2}$.

- **Inserting arithmetic mean between two numbers:** When n arithmetic means $a_1, a_2, \ldots\ldots$ are inserted between a and b, then $a, a_1, a_2, \ldots\ldots a_n, b$ are in AP

$\therefore$ $a = t_1$ and $b = t_{n+2}$. Let d be the common difference.

$\Rightarrow$ $b = t_1 + (n + 1)\,d \Rightarrow b = a + (n + 1)d$

$$\Rightarrow d = \frac{(b-a)}{(n+1)}$$

Note:

(i) If three numbers are in AP we can take the three terms to be (a – d), a and (a + d).

(ii) If four numbers are in AP we can take the four terms to be (a – 3d), (a – d), (a + d) and (a + 3d). The common difference in this case is 2d and not d.

(iii) If five numbers are in AP we can take the five terms to be (a – 2d), (a – d), a, (a + d) and (a + 2d).

Some Important Results

(i) The sum of first n natural numbers =

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

(ii) The sum of the squares of first n natural numbers

$$= \sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

(iii) The sum of the cubes of first n natural numbers

$$= \sum_{i=1}^{n} i^3 = \left[\frac{n(n+1)}{2}\right]^2 = \frac{n^2(n+1)^2}{4} = \left[\sum_{1}^{n} i\right]^2$$

❍ **Geometric Progression:** Numbers are said to be in geometric progression when the ratio of any quantity to the number that follows it is the same. In other words, any term of a GP (except the first one) can be obtained by multiplying the previous term by the same constant. The constant is called the common ratio and is normally represented by r. The first term of a GP is generally denoted by a.

(i) A geometric progression can be represented by a, ar, ar^2, ... where a is the first term and r is the common ratio of the GP. n^{th} term of the GP is ar^{n-1} i.e., $t_n = ar^{n-1}$

(ii) The sum to n terms, $S_n = \dfrac{a\left(r^n - 1\right)}{r-1} = \dfrac{r\left(ar^{n-1}\right) - a}{r-1}$

$\therefore$ The sum to n terms of a geometric progression can also be written as

$$S_n = \frac{r\left(\text{Last term}\right) - \text{First term}}{r-1}$$

(iii) If n terms viz., a_1, a_2, a_3, ... a_n are in GP then the geometric mean (GM) of these n terms is given by = $\sqrt[n]{a_1 a_2 a_3 \ldots\ldots\ldots a_n}$.

(iv) If three terms are in geometric progression, then the middle term is the geometric mean of the GP, i.e., if a, b and c are in GP then b is the geometric mean of the three terms.

(v) If there are two terms say a and b, then their geometric mean is given by GM = $\sqrt{ab}$.

(vi) When n geometric means are there between a and b, the common ratio of the GP can be derived as follows.

Given that, n geometric means are there between a and b. $\therefore$ $a = t_1$ and $b = t_{n+2}$

Let 'r' be the common ratio $\Rightarrow b = (t_1)\,(r^{n+1})$

$$\Rightarrow b = a\,r^{n+1} \Rightarrow r^{n+1} = \frac{b}{a} \Rightarrow r = \sqrt[(n+1)]{\frac{b}{a}}$$

Infinite Geometric Progression

If $-1 < r < 1$ (or ∩ r ∩ < 1). The sum of an infinite geometric progression is represented by S_∞ and is given by the formula, $S_\infty = \dfrac{a}{1-r}$, if $|r| < 1$.

❍ **Harmonic Progression (HP):** A series is said to be a harmonic progression if the reciprocals of the terms in the progression form an arithmetic progression.

n^{th} term of an HP: We know that if a, a + d, a + 2d,…. are in AP, then the nth term of this AP is a + (n – 1) d.

So, n^{th} term of an HP is $\dfrac{1}{a+\left(n-1\right)d}$.

Note: There is no concise general formula for the sum to n terms of an HP.

Harmonic Mean (HM): If three terms are in HP then the middle term is the HM of other two terms. The harmonic mean of two terms a and b is given by

$$HM = \frac{2ab}{a+b}$$

Inserting n Harmonic Means between Two Numbers

To insert n harmonic means between two numbers, we first take the corresponding arithmetic series and insert n arithmetic means, and next, we find the corresponding harmonic series.

Relation between AM, HM and GM of Two Numbers

Let x and y be two numbers

$$\therefore \quad AM = \frac{x+y}{2},\; GM = \sqrt{xy} \;\text{ and }\; HM = \frac{2xy}{x+y}$$

$\Rightarrow$ (AM) (HM) = $(GM)^2$

Solved Examples

1. In a series, $T_n = 2n + 5$, find S_4.

Solution: $T_n = 2n + 5$

$T_1 = 2(1) + 5 = 7; T_2 = 2(2) + 5 = 9$

$T_3 = 2(3) + 5 = 11; T_4 = 2(4) + 5 = 13$

$S_4 = T_1 + T_2 + T_3 + T_4 = 7 + 9 + 11 + 13 = 40.$

2. Find the first term and the common difference of an AP if the 3rd term is 6 and the 17th term is 34.

Solution: If a is the first term and d is the common difference, then we have $a + 2d = 6$ ... (1)

$a + 16d = 34$ ... (2)

On subtracting equation (1) from equation (2), we get $14d = 28 \Rightarrow d = 2$

Substituting the value of d in equation (1), we get $a = 2$. $\therefore$ $a = 2$ and $d = 2$

3. Find the sum of the first 22 terms of an AP whose first term is 4 and the common difference is 4/3.

Solution: Given that, a = 4 and d = 4/3.

We have $S_n = \frac{n}{2}[2a + (n - 1)d]$

$$S_{22} = \left(\frac{22}{2}\right)\left[(2)(4)+(22-1)\left(\frac{4}{3}\right)\right]$$

$= (11)(8 + 28) = 396$

4. Find the three terms in AP whose sum is 36 and product is 960.

Solution: Let the three terms of an A.P. be (a – d), a and (a + d). Sum of these terms is 3a. 3a = 36 $\Rightarrow$ a = 12

Product of these three terms is

$(a + d)\, a\, (a - d) = 960$

$\Rightarrow (12 + d)(12 - d) = 80 \Rightarrow 144 - d^2 = 80 \Rightarrow d = \pm 8$

Taking d = 8, we get the terms as 4, 12 and 20.

Note: If d is taken as –8, then the same numbers are obtained, but in decreasing order.

5. Find the difference between the 25th term and the 15th term of the progression –13, –17, –21....

Solution: Given progression –13, –17, –21 ...... is in A.P.

d = –4

The required difference = $|t_{25} - t_{15}|$=

$\therefore$ $|(a + 24d) - (a + 14d)| = |10d| = |10(-4)| = 40$

6. Find the 7th term of the GP whose first term is 6 and common ratio is 2/3.

Solution: Given that, $t_1 = 6$ and $r = 2/3$

We have $t_n = a.r^{n-1}$

$$\Rightarrow t_7 = (6)\left(\frac{2}{3}\right)^6 = \frac{(6)(64)}{729} = \frac{128}{243}.$$

7. Find the geometric mean of first twenty five powers of twenty five.

Solution: The GM of the first 25 powers of $25 = [25^1 \times 25^2 \times 25^3 \ldots\ldots 25^{25}]^{1/25}$

$$= [25^{1+2+\ldots\ldots+25}]^{1/25} = \left[25^{\frac{25 \times 26}{2}}\right]^{\frac{1}{25}} = 25^{13} = 5^{26}$$

8. In a geometric progression, the sum of first n terms is 65535. If the last term is 49152 and the common ratio is 4, then find the value of n.

Solution: Let the common ratio and the first term of the GP be r and a respectively.

Given, r = 4 and $ar^{n-1} = 49152 \Rightarrow ar^n = 49152r$

$\Rightarrow ar^n = 49152 \times 4$ ..... (1)

Also, $\frac{a(r^n - 1)}{r - 1} = 65535 \Rightarrow \frac{a(r^n - 1)}{3} = 65535$

$\Rightarrow ar^n - a = 3 \times 65535 \Rightarrow 49152 \times 4 - 3 \times 65535$

$= a \Rightarrow a = 3$. Substituting a = 3 in ar^{n-1} $= 49152$. We get n = 8.

9. Insert three harmonic means between $\frac{1}{12}$ and $\frac{1}{20}$.

Solution: After inserting the harmonic means let the harmonic progression be

$$\frac{1}{a}, \frac{1}{a+d}, \frac{1}{a+2d}, \frac{1}{a+3d}, \frac{1}{a+4d}$$

Given $\frac{1}{a} = \frac{1}{12}$ and $\frac{1}{a+4d} = \frac{1}{20} \Rightarrow a = 12$ and $d = 2$

$\therefore$ The required harmonic means are

$\frac{1}{14}, \frac{1}{16}$ and $\frac{1}{18}$.

10. Find the 10th term of harmonic progression $\frac{1}{5}, \frac{4}{19}, \frac{2}{9}, \frac{4}{17}$........... .

Solution: Given, HP is $\frac{1}{5}, \frac{4}{19}, \frac{2}{9}, \frac{4}{17}$...........

$\Rightarrow 5, \frac{19}{4}, \frac{9}{2}$,..........are in AP

$\Rightarrow d = t_2 - t_1 = \frac{19}{4} - 5 = -\frac{1}{4}$

$a = 5,\ d = -\frac{1}{4}$ and $t_n = a + (n-1)d \Rightarrow t_{10} = a + 9d$

$= 5 + 9 \times -\frac{1}{4} = \frac{11}{4}$. $\therefore$ In HP, $t_{10} = \frac{4}{11}$

PRACTICE EXERCISE 13 (A)

Directions for questions 1 to 35: Select the correct alternative from the given choices.

1. Third term of the sequence whose n^{th} term is 2n + 5, is _____.

(1) 1 (2) 11
(3) 2 (4) 12

2. In a series, if $T_n = 3 - n$, then S_5 = _____.

(1) 15 (2) 5
(3) 0 (4) −2

3. If $t_n = 6n + 5$, then t_{n+1} = _____.

(1) 6 n − 1 (2) 6n + 11
(3) 6n + 6 (4) 6n − 5

4. If $t_n = 3^{n-1}$, then $S_6 - S_5$ = _____.

(1) 243 (2) 81
(3) 77 (4) 27

5. Write the sum of the first three terms of the following sequence whose n^{th} term is 3n + 1.

(1) 20 (2) 10
(3) 21 (4) 12

6. Find the sum of the last three terms of the following sequence whose n^{th} term is 5^{n+1}.

(1) $30(5)^n$ (2) $31(5)^n$
(3) $30(5)^{n-1}$ (4) $31(5)^{n-1}$

7. In a sequence, if $t_n = \frac{n^2-1}{n+1}$, then find the value of $S_6 - S_3$.

(1) 3 (2) 6
(3) 12 (4) 10

8. The tenth term of the series 9, 8, 7, 6 …… is _____.

(1) −1 (2) 1
(3) 0 (4) −2

9. $\sum_{x=1}^{100} x$ = _____.

(1) 100 (2) 5050
(3) 1000 (4) 50

10. 1 + 3 + 5 + …… + 99 = ______.

(1) $(99)^2$ (2) $(49)^2$
(3) $(50)^2$ (4) $(100)^2$

11. If the k^{th} term of the arithmetic progression 25, 50, 75, 100, …… is 1000, then find the value of k.

(1) 40 (2) 50
(3) 35 (4) 30

12. If the 5th term and the 14th term of an AP are 35 and 8 respectively, then find the 20th term of the AP.

(1) 10 (2) 20
(3) −12 (4) −10

13. Find the least number of terms of an A.P., 64 + 49 + 34 + …… to be added so that the sum is less than 36.

(1) 12 (2) 9
(3) 10 (4) 8

14. If the sum of 16 terms of an arithmetic progression is 1624 and the first term is 500 times the common difference, then find the common difference.

(1) $1/5$ (2) $2/3$
(3) $3/5$ (4) $2/5$

15. Find the sum of $\frac{0.3}{0.5}+\frac{0.33}{0.55}+\frac{0.333}{0.555}+$ …… to 15 terms.

(1) 10 (2) 9
(3) 3 (4) 5

16. Find the sum of all natural numbers and lying between 100 and 200 which leave a remainder of 2 when divided by 5 in each case.

(1) 2990 (2) 2847
(3) 2936 (4) None of these

17. Find the sum of the series 1 + (1 + 2) + (1 + 2 + 3) + (1 + 2 + 3 + 4) + … + (1 + 2 + 3 + …. + 20).

(1) 1470 (2) 1540
(3) 1610 (4) 1370

18. Geometric mean of 5 and 20 is _____.

(1) 10 (2) −20
(3) 15 (4) 12.5

19. The reciprocals of all the terms of a geometric progression form a _____ progression.

(1) AP (2) HP
(3) GP (4) AGP

20. $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+$..............∞ = _____.

(1) 1 (2) 2
(3) $3^1/_4$ (4) $4^3/_4$

21. If the sum of n terms which are in GP is a(r + 1), then the number of terms is _____. (where 'a' is the first term and 'r' is the common ratio)

(1) 8 (2) 6
(3) 4 (4) 2

22. 6th term of $\frac{1}{4}, \frac{1}{2}, 1$........

(1) 8 (2) 6
(3) 4 (4) 2

23. The common ratio of $3(2)^3, 3(2)^4, 3(2)^5$ is

(1) 1 (2) 2
(3) 3 (4) 4

24. Find the sum of 5 geometric means between 1/3 and 243, by taking common ratio positive.

(1) 121 (2) 126
(3) 81 (4) 111

25. The product of three numbers of a GP is $\frac{64}{27}$. If the sum of their products when taken in pairs is $\frac{148}{27}$, then find the sum of the three numbers.

(1) $\frac{16}{9}$ (2) $\frac{37}{9}$
(3) $\frac{31}{9}$ (4) $\frac{26}{9}$

26. Evaluate $\Sigma\ 2^i$, where i = 2, 3, 4… 10.

(1) 2044 (2) 2048
(3) 1024 (4) 1022

27. A ball is dropped from a height of 64 m and re-bounces 3/4 of the distance every time it touches the ground. Find the total distance it travels before it comes to rest.

(1) 444 (2) 512
(3) 448 (4) 384

28. One side of an equilateral triangle is 36 cm. The mid points of its sides are joined to form another triangle. Again another triangle is formed by joining the mid points of the sides of this triangle and the process is continued indefinitely. Determine the sum of areas of all such triangles including the given triangle (in cm^2).

(1) $432\sqrt{3}$ (2) $324\sqrt{3}$
(3) $648\sqrt{3}$ (4) $430\sqrt{3}$.

29. If | x | < 1, then find the sum of the series $2 + 4x + 6x^2 + 8x^3 + \ldots$..

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

30. If a, b, c and d are in harmonic progression, then $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ and $\frac{1}{d}$ are in_____ progression.

(1) AP (2) GP
(3) HP (4) AGP

31. If the AM of two numbers is 9 and their HM is 4, then their GM is _____.

(1) 6 (2) 36
(3) 16 (4) 6.5

32. $1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}$...... are in _____.

(1) AP (2) GP
(3) HP (4) None of these

33. HM of 3 and 5 is _____

(1) 15/4 (2) 15/8
(3) 3/4 (4) 5/8

34. Find the sum to 9 terms of the series 0×3 + 0.33 + 0.333 + ……..

(1) $\frac{8.10^{10}+1}{27.10^9}$ (2) $\frac{9.10^{10}+1}{27.10^9}$
(3) $\frac{9.10^9+1}{27.10^8}$ (4) $\frac{8.10^9+1}{27.10^8}$

35. Find the sum of all three-digit numbers which leave a remainder 2, when divided by 6.

(1) 82656 (2) 82658
(3) 82650 (4) 82654

PRACTICE EXERCISE 13 (B)

Directions for questions 1 to 35: Select the correct alternative from the given choices.

1. In a sequence, if S_n is the sum of the first n terms and S_{n-1} is the sum of the first (n – 1) terms, then the n^{th} term is _____.

(1) S_{n-2} (2) $S_n - S_{n-1}$
(3) $S_{n+1} - S_n$ (4) $S_{n+1} - S_{n-1}$

2. If $T_n = 3n + 8$, then T_{n-1} = _____.

(1) 3n + 7 (2) 3n + 6
(3) 3n – 5 (4) 3n + 5

3. If $t_n = 5 - 2n$, then t_{n-1} = _____.

(1) $2n - 1$ (2) $7 + 2n$
(3) $4 - 2n$ (4) $7 - 2n$

4. Find the sum of first three terms of the following sequence whose n^{th} term is $8 - 5n$.

(1) −9 (2) −6
(3) 6 (4) 12

5. Find the sum of the first three terms of the following sequence whose n^{th} term is $5n^2 - 2$.

(1) $15n^2 - 30n + 19$ (2) $15n^2 - 19$
(3) $15n^2 - 25n + 18$ (4) $15n^2 - 20n + 18$

6. Find the general term of a sequence, whose sum of n terms is given by $4n^2 + 3n$.

(1) $8n + 1$ (2) $4n - 2$
(3) $8n - 1$ (4) $4n - 1$

7. The sum of the first 20 terms of the sequence 1, 4, 9, … is _____.

(1) 2870 (2) 2890
(3) 2970 (4) 2780

8. The sum of 100 terms of the progression 5, 5, 5, …… is _____.

(1) 500 (2) 5000
(3) 50 (4) 5

9. Σn^3 = _____.

(1) $(\Sigma n)^3$ (2) $(\Sigma n)^2$
(3) $(\Sigma n)^3 + (\Sigma n)^2$ (4) $\Sigma(n + n^2)$

10. Find the 15th term of the arithmetic progression 10, 4, −2, ...

(1) 75 (2) −75
(3) −74 (4) −90

11. How many terms are needed in the series −15, −12, −9, …… so that their sum is 18?

(1) 15 (2) 10
(3) 12 (4) 18

12. Which of the following does not belong to the series 8, 11, 14, 17, 20 ……?

(1) 120 (2) 131
(3) 144 (4) 150

13. Find the number of terms in an arithmetic progression for which the first term is 4, last term is 22 and the common difference is 1/4.

(1) 70 (2) 71
(3) 72 (4) 73

14. If two AP's have the same first term and the difference between their common difference is 2, then the difference between the sum of their first 10 terms is _____.

(1) 20 (2) 18
(3) 90 (4) 100

15. If 8 times the 8th term of an arithmetic progression is equal to 12 times the 12th, term, then the 20th term is

(1) 12 times to 8th term
(2) 8 times to 12th term
(3) 0
(4) Cannot be determined

16. An arithmetic progression starts with a positive fraction and every alternate term is an integer. If the sum of the first 11 terms is 33, then find the fourth term.

(1) 2 (2) 3
(3) 5 (4) 6

17. Find the sum of 100 terms of the series 1(3) + 3(5) + 5(7) + ……

(1) 1353300 (2) 1353400
(3) 1353200 (4) 1353100

18. If the seventh term of an AP is 25 and the common difference is 4, then find the 15th term of AP.

(1) 55 (2) 50
(3) 57 (4) 52

19. If a, b and c are in geometric progression, then a^2, b^2 and c^2 are in _____ progression.

(1) AP (2) GP
(3) HP (4) AGP

20. The n^{th} term of the sequence $\frac{1}{100}, \frac{1}{10000}, \frac{1}{1000000}$, ... is _____.

(1) $(100)^n$ (2) 10^{2n}
(3) 10^{-2n} (4) 10^{-n}

21. Fifth term of $\frac{1}{16}, \frac{1}{8}, \frac{1}{4}$ ……. _____.

(1) 1/2 (2) 1
(3) 0 (4) 2

22. The product of t_5 and t_6 of the progression 1/4, 1/2, 1, …… =

(1) t_8 (2) t_{11}
(3) t_{10} (4) t_7

23. GM of 4 and 64

(1) 32 (2) 8
(3) 16 (4) 24

24. $2+1+\frac{1}{2}+\frac{1}{4}+.........\infty$

(1) 1 (2) 2
(3) 3 (4) 4

25. If in a G.P., 5th term and the 12th term are 9 and $\frac{1}{243}$ respectively, find the 9th term of G.P.

(1) $\frac{1}{7}$ (2) $\frac{1}{8}$
(3) $\frac{1}{9}$ (4) $\frac{1}{81}$

26. Find the geometric mean of the first 36 powers of 36.

(1) $(36)^{36}$ (2) $(36)^{37}$
(3) $(6)^{37}$ (4) $(6)^{36}$

27. Find the sum to 90 terms of the series 5 + 55 + 555 + ……

(1) $\frac{50}{81}\left[10^{90}-82\right]$ (2) $\frac{50}{81}\left[10^{90}-83\right]$
(3) $\frac{50}{81}\left[10^{90}-80\right]$ (4) $\frac{50}{81}\left[10^{90}-90\right]$

28. $\sqrt{x},\sqrt{2x},2\sqrt{x},2\sqrt{2x}......$ are in geometric progression. If the sum of first 10 terms is $31\left(\sqrt{6}+\sqrt{3}\right)$, then find the 10th term.

(1) $8\sqrt{3}$ (2) $8\sqrt{6}$
(3) $16\sqrt{6}$ (4) $16\sqrt{3}$

29. Find the 10th term of a geometric progression in which the product of the first three terms is 1728 and the sum of next three terms is 756. (where common ratio is an integer)

(1) $2^2.3^9$ (2) $2^3.3^{10}$
(3) $2^5.3^{10}$ (4) $2^3.3^9$

30. The harmonic mean of 20 and 30 is _____.

(1) 25 (2) 28
(3) 26 (4) 24

31. 100, 100, 100, …… are in _____.

(1) AP (2) GP
(3) HP (4) All of these

32. 7th term of $\frac{1}{2},\frac{1}{4},\frac{1}{6}$...... is _____.

(1) 1/10 (2) 1/12
(3) 1/14 (4) 1/16

33. The relation among AM, GM and HM is

(1) AM × GM = HM (2) HM = $\sqrt{AM \times GM}$
(3) GM^2 = AM × HM (4) AM^2 = GM × HM

34. If $\frac{1}{q+r},\frac{1}{r+p}$ and $\frac{1}{p+q}$ are in AP, then show that p^2, q^2 and r^2 are in __________.

(1) AP (2) GP
(3) HP (4) AGP

35. A person opens an account with ₹50 and starts depositing every day double the amount he has deposited on the previous day. Then find the amount he has deposited on the 10th day from the beginning.

(1) ₹25000 (2) ₹25600
(3) ₹28500 (4) ₹26500

ANSWER KEYS

PRACTICE EXERCISE 13 (A)

1. 1	**2.** 3	**3.** 2	**4.** 1	**5.** 3	**6.** 4	**7.** 3	**8.** 3	**9.** 2	**10.** 3
11. 1	**12.** 4	**13.** 3	**14.** 1	**15.** 2	**16.** 1	**17.** 2	**18.** 1	**19.** 3	**20.** 1
21. 4	**22.** 1	**23.** 2	**24.** 1	**25.** 2	**26.** 1	**27.** 3	**28.** 1	**29.** 3	**30.** 1
31. 1	**32.** 3	**33.** 1	**34.** 1	**35.** 3					

PRACTICE EXERCISE 13 (B)

1. 2	**2.** 4	**3.** 4	**4.** 2	**5.** 1	**6.** 3	**7.** 1	**8.** 1	**9.** 2	**10.** 3
11. 3	**12.** 1	**13.** 4	**14.** 3	**15.** 3	**16.** 1	**17.** 1	**18.** 3	**19.** 2	**20.** 3
21. 2	**22.** 4	**23.** 3	**24.** 4	**25.** 3	**26.** 3	**27.** 1	**28.** 3	**29.** 1	**30.** 4
31. 4	**32.** 3	**33.** 3	**34.** 1	**35.** 2					