MATHS

BOOKS - ZEN MATHS (KANNADA ENGLISH)

ARITHMETIC PROGRESSIONS

Illustrative Examples

1. Which of the following forms an A.P.?

a] $5\frac{1}{2}, 9\frac{1}{2}, 13\frac{1}{2}, 17\frac{1}{2}, \ldots$

b] $\sqrt{3}, \sqrt{12}, , \sqrt{27}, \sqrt{48}, \ldots$

c] $13, 10, 7, 5 \ldots$.

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2. Write the first 4 terms of an A.P. Where $a_n = 4n + 3$.

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3. Write the next three terms of the A.P. $(a + b), (a + 1) + b, (a + 1) + (b + 1)$.

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4. For the A.P $\frac{3}{2}, \frac{1}{2}, \frac{-1}{2}, \frac{-3}{2}, . .$ write the first term and common difference.

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5. The first three terms of an A.P. are $3y-1, 3y+5,$ and $5y+1$. Find y.

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6. Is $\sqrt{3}, \sqrt{6}, \sqrt{9}, \sqrt{12}$ an A.P.? Give reason.

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7. What is the next term of the A.P.?

$\sqrt{7}, \sqrt{28}, \sqrt{63}, \ldots.$

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To Find The Nth Term Of An A P Illustrative Examples

1. How many two digit numbers are divisible by 3?

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2. If the nth term of the A.P. $-1, 4, 914, \ldots$ is 129,find the value of 'n'.

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3. Write the nth term of the A.P. $\frac{1}{m}, \frac{1+m}{m}, \frac{1+2m}{m}, \ldots$

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4. What is the common difference of an A.P. in which $a_{12} - a_8 = 24$?

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5. The fourth and eight terms of an A.P. are in the ratio of $1:2$ and tenth term is 30. Find the common difference.

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6. Find the three numbers of A.P. whose sum is 12 and product is 48.

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7. The 10th term of an A.P. is (-4) and the 22nd term is (-16). Find the 38th term.

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8. The angles of a triangle are in A.P. The greatest angle is twice the least. Find all the angles of the triangle.

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9. Find the sum of all 3 digit naturals which are divisible by 9.

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10. Find the common difference of an A.P. whose first term is $\frac{1}{2}$ and the 8th term is $\frac{17}{6}$. Also write its 4th term.

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11. In an A.P., 7 times the 7th term is equal to 11 times 11th term. Find the 18th term of the A.P.

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Arithmetic Series Illustrative Examples

1. Find the sum of all two digit natural numbers which when divided by 3 yield 1 as remainder.

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2. Find the number of terms of the A.P. 54, 51, 48, ... So that their sum is 513.

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3. How many three digit numbers are divisible by 7?

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4. The sums of $n, 2n, 3n$ terms of an $A.P.$ are S_1, S_2, S_3 respectively.

Prove that : $S_3 = 3(S_2 - S_1)$

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5. If the p^{th} term of an A.P. is $\frac{1}{q}$ and q^{th} term is $\frac{1}{p}$, show that the sum of pq terms is $\frac{(pq+1)}{2}$

.

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6. The sum of the first 8 terms of an A.P. is 100 and the sum of its first 19 terms is 551. Find the first term and the common difference of the AP.

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Textual Exercise Exercise 1 1

1. In which of the following situations, does the list of numbers involved make arithmetic progression, and why ?

The taxi fare after each km when fare is Rs. 15 for the first km and Rs.8 for each additional km.

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2. Write first four terms of the AP, when the first term a and the common difference d are given as follows:

(i) a=10, d=10

(ii) a=-2, d=0

(iii) a=4, d $= -3$

(iv) $a = -1, d = \frac{1}{2}$

(v) $a = -1.25, d = -0.25$

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3. For the following A.P.s, write the first term and the common difference.

i] $3, 1, -1, -3, \ldots$

ii] $-5, -1, 3, 7, \ldots$

iii] $\frac{1}{3}, \frac{5}{3}, \frac{9}{3}, \frac{13}{3}, \ldots.$

iv] $0.6, 1.7, 2.8, 3.9, \ldots$

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4. Which of the following are APs ? If they form an AP, find the common difference d and write

three more terms.

2,4,8,16,...

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Textual Exercise Exercise 1 2

1. Fill in the blanks in the following table, given that a is the first term, d the common

difference and a_n n^{th} term of the AP :

	a	d	n	a_n
(i)	7	3	8	...
(ii)	–18	...	10	0
(iii)	...	–3	18	–5
(iv)	–18.9	2.5	...	3.6
(v)	3.5	0	105	...

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2. Find the

(i) 30th term of the AP 10,7,4,....

(ii) 11th term fo the AP: $-3, \ -\frac{1}{2}, 2$.....

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3. In the following AP's find the missing terms in the boxes.

(i) 2._____,26

Let the missing term bex.

(ii) _____13, _____,3.

(iii) 5,_____,_____,$9\frac{1}{2}$

(iv) -4,_____,_____,_____,_____,6.`

(v) _____,38,_____,_____,_____-22.

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4. Which term of the AP : 3,8,13,18,... is 78 ?

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5. Find the number of terms in each of the following A.Ps.

(i) $7, 13, 19, \ldots, 205$

(ii) $18, 15\frac{1}{2}, 13, \ldots, -47$

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6. Check whether -150 is a term of the AP : 11, 8, 5, 2

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7. Find the 31^{th} term of an AP whose 11^{th} term is 38 and the 16th term is 73.

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8. An A.P. consists of 50 terms of which the 3rd term is 12 and the last term is 106. Find the 29th term.

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9. If the 3rd and 9th term of an A.P. are 4 and -8 respectively, which term is zero?

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10. The 17^{th} term of an AP exceeds its 10^{th} term by 7. Find the common difference.

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11. Which term of the AP : 3, 15, 27, 39, ... Will be 132 more than its 54^{th} term ?

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12. Two APs have the same common difference. The difference between their 100^{th} terms is 100, what is the difference between their 1000^{th} terms ?

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13. How many 3-digit numbers are divisible by 7?

14. How many multiples of 4 lie between 10 and 250 ?

15. For what values of 'n' are the nth terms of A.Ps. $63, 65, 67, \ldots$ and $3, 10, 17, \ldots$ are equal?

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16. Determine the AP whose third term is 16 and the 7th term exceeds the 5th term by 12.

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17. Find the 20^{th} term from end of the sequence 3,8,13 ..... 253.

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18. The sum of the 4^{th} and 8^{th} terms of an AP is 24 and the sum of the 6^{th} and 10^{th} terms is 44. Find the first three terms of the AP.

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19. Subba Rao started work in 1995 at an annual salary of Rs.5000 and received an increment of Rs. 200 cash year. In which year did this income reach Rs. 7000 ?

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20. Ramkali saved Rs.5 in the first week of a year and then increased her weekly savings by Rs. 1.75. If in the n^{th} week, her weekly savings become Rs. 20.75, find n.

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Textual Exercise Exercise 1 3

1. Find the sum of the following Aps:

(i) 2, 7, 12, ..., to 10 terms.

(ii) $-37,\ -33,\ -29,$ ....., to 12 terms.

(iii) 0.6, 1.7, 2.8,....., to 100 terms

(iv) $\frac{1}{15}, \frac{1}{12}, \frac{1}{10}$,.....,to 11 terms

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2. Find the sums given below :

$7 + 10\frac{1}{2} + 14 + \ldots + 84.$

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3. In an A.P:

(i) Given $a = 5, d = 3, a_n = 50$, find n and S_n.

(ii) Given $a = 7, a_{13} = 35$, find 'd' and S_{13}.

(iii) Given $a_{12} = 37, d = 3$, find a and S_{12}.

(iv) Given $a_3 = 15, S_{10} = 125$, find 'd' and a_{10}.

(v) Given $d = 5, S_9 = 75$, find 'a' and a_9.

(vi) Given $a = 2, d = 8, S_n = 90$, find 'n' and a_n.

(vii) Given $a = 8, I = a_n = 62, S_n = 210$, find 'n' and 'd'.

(viii) Given $a_n = 4 = I, d = 2, S_n = -14$, find 'n' and 'a'.

(ix) Given $a = 3, n = 8, S_n = 192$, find 'd'.

(x) Given $I = 28, S_n = 144$, and there are a total 9 terms find 'a' .

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4. How many terms of the A.P : 9, 17 25,... must be taken to give sum of 636 ?

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5. The first of an A.P is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.

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6. The first and the last terms of an A.P are 17 and 350 respectively. If the common difference is 9, how many terms are there and what is their sum ?

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7. Find the sum of first 22 terms of an A.P in which d = 7 and 22nd term is 149.

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8. Find the sum of first terms of an A.P whose second and third terms are 14 and 18 respectively.

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9. If the sum of first 7 terms of an A.P is 49 and that of 17 terms is 289, find the sum of first n terms.

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10. Show that $a_1, a_2, \ldots, a_n, \ldots$ form an A.P where an is defined as below : (i) $a_n = 3 + 4n$ (ii) $a_n = 9 - 5n$.

Also find the sum of the first 15 terms in each case.

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11. If the sum of the first n terms of an A.P. is $4n - n^2$ what is the first term? What is the sum of the first two terms? What is the second term? Find the 3rd, 10th, and the nth terms.

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12. Find the sum of the first 40 positive integers divisible by 6.

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13. Find the sum of the first 15 multiples of 8.

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14. Find the sum of the odd numbers between 0 and 50.

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15. A contract on construction job specific a penalty for delay of completion beyond a certain date as follows : Rs. 200 for the first day, Rs.250 for the second day, Rs. 300 for the third day, etc., the penalty for each succeeding day being Rs. 50 more than for the preceding

day. How much money the contractor has to pay as penalty, if he has delayed the work by 30 days ?

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16. A sum of Rs. 700 to be used to give seven cash prizes to students of a school for thir overall academic performance. If each prize is Rs. 20 less than its preceding prize, find the value of each of the prizes.

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17. In a school, students thought of planting trees in an around the school to reduce air pollution. It was decided that the number of trees, that each section of each class will plant, will be the same as the class. In which they are studying e.g., a section of Class I will plant 1 tree, a section of Class II will plant 2 trees and so on till Class XII. There are three sections of each class. How many trees will be planted by the students?

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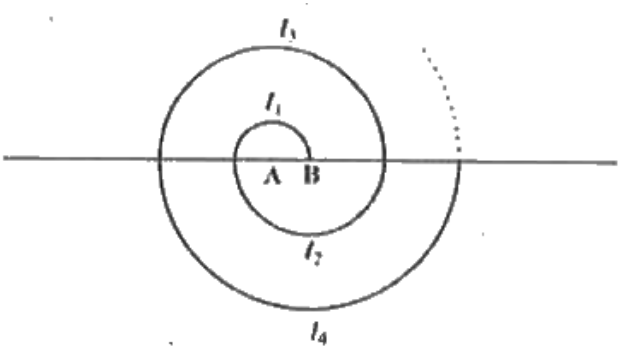
18. A spiral is made up of successive semicircles, with centres alternately at A and B, starting with centre at A, of radii 0.5 cm , 1.0 cm, 1.5 cm, 2.0 cm,... as shown in Fig. 54. What is the total length of such a spiral made up to thirteen consecutive semicircles ? (Take $\pi = \frac{22}{7}$)



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19. 200 logs are stacked in the following manner : 20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on. In how many rows are the 200 logs placed and how many logs are in the top row ?

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20. In a potato race, a bucket is placed at the starting point, which is 5m from the first

potato, and the other potatoes are placed 3m apart in a straight line. There are ten potatoes in the line (fig.).

A competitor starts from the bucket, picks up the nearest potato, runs back with it, drops it in the bucket, runs back to pick up the nest potato, runs to the bucket to drop it in, and she continues in the same way until all the potatoes are in the bucket. What is the total distance the competitor has to run ? [Hint : To pick up the first potato and the second potato,

the total distance (in metres) run by a competitor is $2 \times 5 + 2 \times (5 + 3)$]

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Textual Exercise Exercise 1 4

1. Which term of the A.P.: $121, 117, 113, \ldots$. is its first negative term?

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2. The sum of the third and the seventh terms of an A.P. is 6 and the product is 8. Find the sum of first sixteen terms of the A.P.

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3. A tadcler has rungs 25 cm apart . The rungs decrease uniformly in length from 45cm at the bottom to 25 cm at the top . If the top and the bottom runs are $2\frac{1}{2}$ m apart , what is length of the wood required for the rungs ?

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4. The houses of a row are numbered consectively from 1 to 49. show that there is a value of x such that the sum of the houses preceding the house numbered x is equal to the sum of the numbers of the houses following it. Find this value of x.

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5. A small terrace at a football ground comprises of 15 steps each of which is 50m long and built of solid concrete.

Each stop has a rise of $1/2$ m and a tread of $1/2$m calculate the total volume of concrete required to build the terrace.

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Zen Additional Questions Multiple Choice Questions Mcqs

1. The first n^{th} term of a AP is given by

A. $a_n = a + nd$

B. $a_n = a + (n-1)d$

C. $a_n = a - (n-1)d$

D. $a_n = 2a + (n-1)d$

Answer: B

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2. The 7^{th} term of the AP 3, 6, 9, ... is given by

A. 21

B. 14

C. 28

D. 30

Answer: A

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3. The sum of to n terms of AP $1 + 3 + 5 \ldots$. is given by

A. $2n^2 + 1$

B. n^2

C. $2n^2 - 1$

D. $3n + 1$

Answer: B

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4. For any arithmetic progression, a_n is equivalent to

A. $S_n - S_{n+1}$

B. $S_{n+1} - S_n$

C. $S_{n+1} - S_{n-1}$

D. $S_n - S_{n-1}$

Answer: D

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5. The next two terms of $\sqrt{2}, \sqrt{8}, \sqrt{18}, \ldots\ldots$ are

A. $\sqrt{32}, \sqrt{50}$

B. $\sqrt{8}, \sqrt{10}$

C. $\sqrt{32}, \sqrt{10}$

D. $\sqrt{32}, \sqrt{12}$

Answer: A

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6. The first term of an AP is a and the n^{th} term is b, the $d =$

A. $\frac{a-b}{n}$

B. $\frac{b-a}{n}$

C. $\frac{b-a}{n-1}$

D. $\frac{b-a}{n+1}$

Answer: C

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7. What is the formula to find the sum of AP to n terms ?

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

B. $S_n = \frac{n}{2}[2a + nd]$

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

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

Answer: D

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8. In an AP, $S_n = 3n + 5$ then, the value of d is:

A. 3

B. 5

C. -5

D. 8

Answer: C

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9. For an AP, the correct statement among the following is:

A. $S_3 = S_2 + d$

B. $S_3 = S_2 \times d$

C. $S_3 = S_2 + a_2$

D. $S_3 = S_2 + a_3$

Answer: D

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10. In an AP, the seventh term is 4 and the common difference is -4. Which is the first term?

A. 18

B. 12

C. 28

D. 20

Answer: C

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11. $2m, m+10$ and $3m+2$ form the terms of an AP, then the value of m is:

A. 6

B. -6

C. 21

D. 15

Answer: A

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12. The angles of quadrilateral are in the ratio $3:5:9:13$. Find all the angles of the quadrilateral.

A. $60^\circ, 20^\circ$

B. $100^\circ, 40^\circ$

C. $120^\circ, 60^\circ$

D. $90^\circ, 30^\circ$

Answer: C

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13. Which term of the AP 3, 8, 13, 18, ... is 258?

A. 36

B. 52

C. 24

D. 50

Answer: B

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14. If the 59^{th} term of an AP is 449 and 449^{th} term is 59, then

A. $a_{501} = 0$

B. $a_{508} = 0$

C. $a_{502} = 0$

D. $a_{509} = 0$

Answer: D

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15. If the $n-th$ term of an arithmetic progression $a_n = 24 - 3n$ then its 2nd term is

A. 18

B. 15

C. 0

D. 2

Answer: A

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16. If the n-th term of an arithmetic progression is $5n + 3$, then 3rd term of the arithmetic progression is

A. 11

B. 18

C. 12

D. 13

Answer: B

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17. In an arithmetic progression, if $a = 2n + 1$, then the common difference of the given progression is

A. 0

B. 1

C. 2

D. 3

Answer: C

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Zen Additional Questions Very Short Answer Vsa Questions

1. Find 'd' in the following arithmetic progressions:

i] 2, 5, 8, 11, 14 .....

ii] -3, -1, 1, 3, ...

iii] 0, -8, -16, ...

iv] $\frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \ldots$

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2.

a] first term is 0 and common difference 3

b] first term is -3 and common difference -1

c] first term is 4 and common difference -2.

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3. Express these terms of an A.P. in terms of $'a'$ and $'d'$.

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4. Write the next three terms of the given arithmetic progression:

i] $3, \ -2, \ -7, \ldots\ldots$

ii] $0, 5, 10, \ldots\ldots$

iii] $119, 136, 157, \ldots$

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5. If $a = 5, d = 2$, find

i] T_5 ii] T_{10} iii] T_{100}

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6. Write the common difference of the arithmetic progression whose nth term is

a] $n^2 + 5$

b] $2n^2 - 6$

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7. Find the 10th term of an arithmetic progression whose first term is 'd' and common difference is 'b'.

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8. What is common difference of an AP in which $a_{21} - a_7 = 84$?

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9. For what value of k will $k + 9, 2k - 1, 2k + 7$ be consecutive terms of a AP.

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10. Find the sum of first twenty terms of Arithmetic series $2 + 7 + 12 + \cdots$ using suitable formula.

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11. Write the formula to find the sum of first n terms of an Arithmetic progression, whose first term is a and the last term is a_n.

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Zen Additional Questions Short Answer Sa Type 1 Questions

1. Write the n^{th} term of the AP:

a] $13, 8, 3, -2, \ldots\ldots$

b] $\sqrt{2}, 3\sqrt{2}, 5\sqrt{2}, \ldots\ldots$

c] $121, 117, 113, \ldots\ldots$

d] $\frac{3}{4}, \frac{5}{4}, \frac{7}{4}, \ldots\ldots$

e] $-15, -10, -5, 0, \ldots\ldots\ldots$

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2. Which term of the AP

a] $2, 5, 8, \ldots\ldots$ is 68?

b] $-3, \ -5, \ -7, \ldots\ldots$ is -101?

c] $21, 42, 63, \ldots\ldots\ldots$ is 420?

d] $80, 76, 72, \ldots\ldots$ is 0?

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3. Check whether

a] -1 is a term of $33, 31, 29, \ldots\ldots\ldots$

b] 54 is a term of $3, 9, 15, \ldots\ldots\ldots$.

c] -10 is a term of $-3, \ -5, \ -7, \ldots\ldots$

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4. The 10th term of AP is 41 and 18th term is 73. Find the 26th term.

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5. The 7th term of an AP is 32 and 13th term is 62. Find the progression.

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6. In an AP, the 6th term is 12 and 8th term is 22. Find the nth term.

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7. Which term of the AP 5, 15, 25 is 150 more than its 12th term?

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8. In an AP, the 18th term is 20 more than the 13th term. If the fourth term is 22, find the AP.

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9. Find the common difference of the AP in which 18th term is 10 less than the 20th term.

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10. The 24th term of an AP is twice its 10th term. Show that 72nd term is 4 times its 15th term.

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11. Find the sum of first:

a] 13 term of AP 2, 6, 10, 14, ...

b] 20 terms of AP -6, 0, 6, 12, ...

c] 15 term of AP 18, 16, 14, ...

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12. Find the sum of

a] first 10 multiples of 8

b] first 25 multiples of 3

c] first 100 multiples of 2.

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13. Find the sum of

i] 41, 36, 31, ... upto 10 terms

ii] -26, -24, -22, ... upto 36 terms.

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14. Find the sum of first n odd natural numbers.

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15. Find the sum of first n even numbers.

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16. For what values of n, the nth terms of the following sequences are equal:

13, 19, 25, ... and 69, 68, 67, ...

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17. Determine k such that $(3k-2), (4k-6)$ and $(k+2)$ are three consecutive terms of AP.

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18. How many two digits numerals are divisible by 6?

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19. The first and last terms of an AP are 7 and 49. How many terms make the sum 420?

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20. Which term of an AP 3, 8, 13, 18, ... will be 55 more than 20th term?

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21. Find the common difference of an AP whose first term is 4, last term is 49 and sum of all terms 265.

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22. Three numbers which are in AP together make a 39 and their product is a 325. Find the AP.

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23. The four sides of a quadrilateral form an AP, taken in order. The difference in lengths between each adjacent pair is 8 cm. If its perimeter is 168 cm, find the sides.

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24. Find the Sum of $5 + 8 + 11 + \ldots$. to 10 terms using formula.

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Zen Additional Questions Short Answer Sa Type 2 Questions

1. Find the 12th term from the end of AP 8, 10, 12, ... , 130

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2. Find the sum:

i] $28 + 31 + \cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot + 100$

ii] $28 + 26 + \cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot\cdot + 10.$

iii] $3 + 11 + 19 + \ldots\ldots + \ + 803.$

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3. Find the sum of first 20 terms of an AP whose nth term is $a_n = 2 - 3n.$

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4. In an AP, the 5th term is 30 and 12th term is 65. What is the sum of first 20 terms?

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5. The first of an A.P is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.

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6. The sum of first n terms of an AP is $3n^2 + 4n$. Find:

a] a_{25}

b] a_{10}

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7. Find the sum of all natural numbers between 50 and 500, which are divisible by 6.

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8. Find 'x' if

$1 + 4 + 7 + 10 + \ldots\ldots\ldots + x = 287.$

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9. Find the sum of all natural numbers between 1 and 1000 which are divisible by 3,

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10. The sum of first 14 terms of an AP is 1505 and its first term is 10. Find its tenth term.

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11. The sum of first 7 terms of an AP is 63 and the sum of next 7 terms is 161. Find a_{28}.

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12. Find the middle term of AP : $10, 7, 4, \ldots\ldots, -62.$

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13. The seventh term of an arithmetic progression is four times itss second term and twelth term is 2 more than three times of its fourth term. Find the progression.

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14. A line segment is divided into four parts forming an arithmetic progression . The sum of the lengths of 3 rd and 4 th parts is three times the sum of the lengths of first two part. If the length of fourth part is s14 cm, find the total length of the line segment.

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Zen Additional Questions Long Answer La Type Questions

1. If the sum of n terms of A.P. is $\frac{1}{2}\left(3n^2+7n\right)$, find its n^{th} term and write its 25th term.

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2. The sum of first 6 terms of an A.P. is 42. If its 10th and 30th terms are in the ratio 1 : 3, find a_8 and a_{12}.

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3. In an arithmetic progression, thrice the second term is equivalent to eighth term and the sum of fourth term and the seventh term is 9 greater than the ninth term. Find the AP.

4. In and AP, the sum of the first 10 terms is -150 and sum of the next ten terms is -550. Find the AP.

5. A person saved Rs. 500 in the first month and increased his saving by Rs. 50 every month. What is his savings at the end of 5 years?

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6. In an arithmetic progression of 50 terms, the sum of first ten terms is 210 and the sum of last fifteen terms is 2565. Find the arithmetic progression.

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7. The ratio of 11th term to 18th term of an AP is 2:3. Find the ratio of 5th term to the 21st term, also the ratio of the sum of the first 5 terms to the sum of the first 21 terms.

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8. Along a road lies an odd number of stones placed at intervals of 10 m. These stones have

to be assembled around the middle stone. A person can carry one stone at a time, A man started the job with one of the end of the stones by carrying in them succession. In carrying all the stones, he covered a distance of 3 km. Find the number of stones.

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9. A thief runs away from a police station with a uniform speed of 100 m/minute. After 1 minute a policeman runs behind the thief to

catch him. He goes at a speed of 100 m/ minute in first minute and increases his speed by 10 m/ minute in each succeeding minute. How many minutes will the policeman take to catch the thief?

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10. The digits of a positive number of three digits are in A.P. and their sum is 15. The number obtained by reversing the digit is 594

less than the original number. Find the number.

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11. If the roots of the equation

$$(b-c)x^2+(c-a)x+(a-b)=0$$

are equal show that a, b, c are in A.P.

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12. The sum of the fourth and eighth terms of an arithmetic progression is 24 and the sum of the sixth and tenth terms is 44. Find the first three terms of the Arithmetic progression.

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13. There are five terms in an arrithmetic progression. the Sum of these terms is 55, and the fourth term is five more than the sum of

the first two terms.Find the terms of the Arithmaetic progression.

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14. In an arithmetic progression sixth term is one more than twice the thrid term. Tha sum of the fourth and fifth terms is five times the secon term. Find the tenth term of the arithmatic progression.

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Zen Additional Questions Hots Higher Order Thinking Skills Questions

1. If m times the m^{th} term of an A.P. is equal ton times the n^{th} term and $m \neq n$, show that $(m+n)^{th}$ term is zero.

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2. In a given AP, p^{th} term is q and q^{th} term is p. Show that the n^{th} term is $(p+q-n)$.

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3. If S_n denotes sum of the first n times of an A.P, then prove that $S_{30} = 2[S_{20} - S_{10}$.

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4. Find the sum of the following:

$$\left(1 - \frac{1}{n}\right) + \left(1 - \frac{2}{n}\right) + \left(1 - \frac{3}{n}\right) + \ldots\ldots\ldots$$

upto n terms.

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