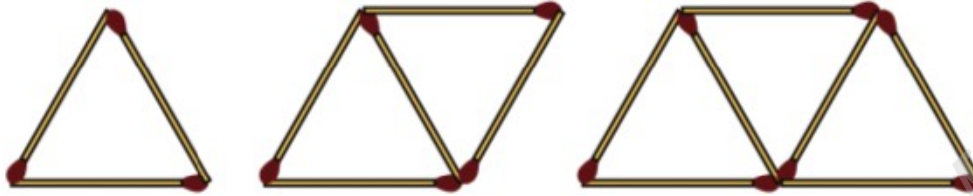


WANDOOR GANITHAM – S.S.L.C STUDY MATERIAL 2022

REVISION – ARITHMETIC SEQUENCES – PART 1 - ANSWERS

1 Let's make the figures shown in the figure using matchsticks .

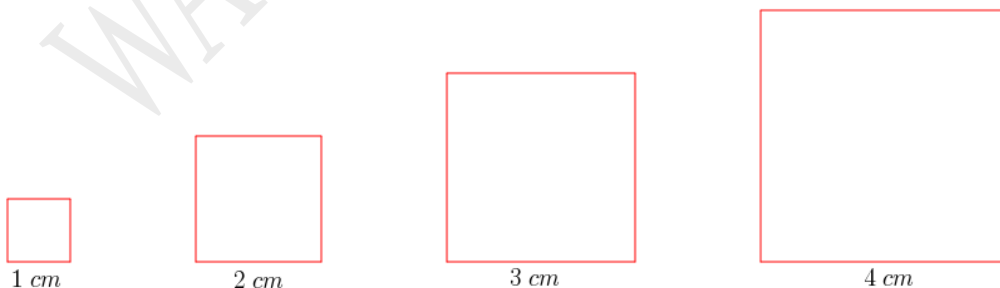


- If we continue this process , how many matchsticks are there in the fourth figure?
- If we continue this process , what is the sequence of numbers of matchsticks used in each figure ?
- Check whether the sequence obtained above is an arithmetic sequence or not .

Answer .

- 9
- 3 , 5 , 7 , . . .
- Here the sequence starts with 3 and adding 2 repeatedly . So it is an arithmetic sequence .

2 In the figure some squares are drawn . Length of the sides of them are also shown in the figure .



- If we continue this process , what will be the perimeter of the fifth square ?
- If we continue this process , what is the sequence of the perimeter of the squares ?
- Check whether the sequence obtained above is an arithmetic sequence or not .

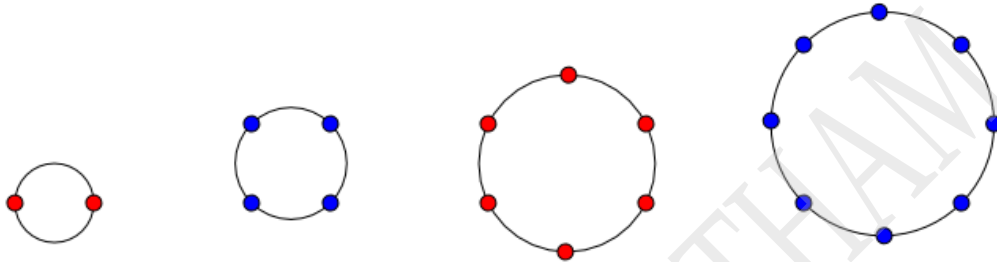
Answer .

a) $4 \times 5 = 20 \text{ cm}$

b) 4, 8, 12, . . .

c) Here the sequence starts with 4 and adding 4 repeatedly . So it is an arithmetic sequence .

3 In the figure some dots are marked on the circles



a) If we continue this process , how many dots are there in the fifth circle ?

b) If we continue this process , what is the sequence of the dots in in each circle ?

c) Check whether the sequence obtained above is an arithmetic sequence or not .

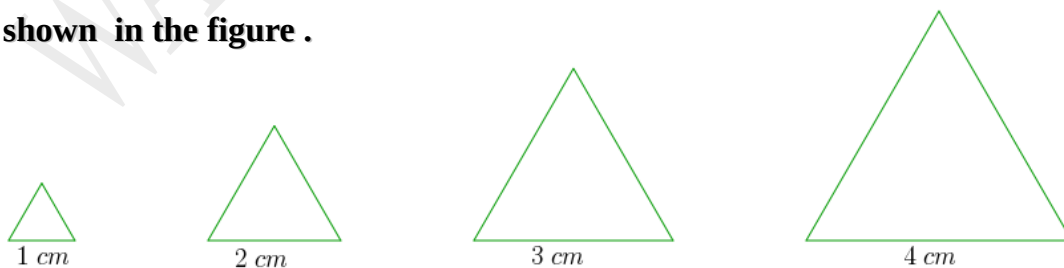
Answer .

a) 10

b) 2, 4, 6, . . .

c) Here the sequence starts with 2 and adding 2 repeatedly . So it is an arithmetic sequence .

4 In the figure some equilateral triangles are drawn . Length of the sides of them are also shown in the figure .



a) If we continue this process , what will be the perimeter of the fifth triangle ?

b) If we continue this process , what is the sequence of the perimeter of the triangles ?

c) Check whether the sequence obtained above is an arithmetic sequence or not .

Answer .

a) $3 \times 5 = 15 \text{ cm}$

b) 3, 6, 9, . . .

c) Here the sequence starts with 3 and adding 3 repeatedly . So it is an arithmetic sequence .

- 5 a) Write the sequence of natural numbers which are multiplied by 4 .
b) Write the sequence of natural numbers which are multiplied by 4 and added to 1
c) Check whether the sequence obtained above is an arithmetic sequence or not .

Answer .

a) 4, 8, 12, . . .

b) 5, 9, 13, . . .

c) Here the sequence starts with 5 and adding 4 repeatedly . So it is an arithmetic sequence .

- 6 a) Write the sequence of natural numbers which are multiplied by 5 .
b) Write the sequence of natural numbers which are multiplied by 5 and subtract 2 from them ?
c) Check whether the sequence obtained above is an arithmetic sequence or not .

Answer .

a) 5, 10, 15, . . .

b) 3, 8, 13, . . .

c) Here the sequence starts with 3 and adding 5 repeatedly . So it is an arithmetic sequence .

- 7 a) Write down the sequence of natural numbers ending in 1 ?
b) Check whether the sequence obtained above is an arithmetic sequence or not .

Answer .

a) 1 , 11 , 21 , . . .

b) Here the sequence starts with 1 and adding 10 repeatedly . So it is an arithmetic sequence .

8 a) Write down the sequence of natural numbers ending in 2 or 7 ?

b) Check whether the sequence obtained above is an arithmetic sequence or not .

Answer .

a) 2 , 7 , 12 , . . .

c) Here the sequence starts with 2 and adding 5 repeatedly . So it is an arithmetic sequence .

9 a) Write an arithmetic sequence of first term 7 and common difference 4 ?

b) What is its 5th term ?

c) Can the difference between any two terms of this sequence be 100 ? Why ?

Answer .

a) 7 , 11 , 15 , . . .

$$b) x_5 = f + 4d = 7 + (4 \times 4) = 7 + 16 = 23$$

c) Yes . 100 is the multiple of the common difference (4) . (The difference between any two terms of an arithmetic sequence is the product of the difference of the positions and the common difference)

10 a) Write an arithmetic sequence of first term 10 and common difference 6 ?

b) What is its 8th term ?

c) Can the difference between any two terms of this sequence be 54 ? Why ?

Answer .

a) 10 , 16 , 22 , . . .

b) $x_8 = f + 7d = 10 + (7 \times 6) = 10 + 42 = 52$

c) Yes . 54 is the multiple of the common difference (6) . (The difference between any two terms of an arithmetic sequence is the product of the difference of the positions and the common difference)

11 a) Write an arithmetic sequence of common difference 5 .

b) What is its 9th term ?

c) Can the difference between any two terms of this sequence be 72 ? Why ?

Answer .

a) 5 , 10 , 15 , . . . (or any arithmetic sequence of common difference 5)

b) $x_9 = f + 8d = 5 + (8 \times 5) = 5 + 40 = 45$

c) No . 72 is not a multiple of the common difference (5) . (The difference between any two terms of an arithmetic sequence is the product of the difference of the positions and the common difference)

12 a) Write an arithmetic sequence of common difference 10 .

b) What is its 10th term ?

c) Can the difference between any two terms of this sequence be 63 ? Why ?

Answer .

a) 10 , 20 , 30 , . . . (or any arithmetic sequence of common difference 10)

b) $x_{10} = f + 9d = 10 + (9 \times 10) = 10 + 90 = 100$

c) No . 63 is not a multiple of the common difference (10) . (The difference between any two terms of an arithmetic sequence is the product of the difference of the positions and the common difference)

13 Consider the arithmetic sequence 5 , 9 , 13 , ...

a) What is its common difference ?

b) Find the position of 101 in this sequence ?

Answer .

a) $d = 9 - 5 = 4$

b) $Position\ difference = \frac{Term\ difference}{common\ difference} = \frac{101-5}{3} = \frac{96}{3} = 32$

$$n = 32 + 1 = 33$$

14 Consider the arithmetic sequence 8 , 13 , 18 , ...

a) What is its common difference ?

b) Find the position of 203 in this sequence ?

Answer .

a) $d = 13 - 8 = 5$

b) $Position\ difference = \frac{Term\ difference}{common\ difference} = \frac{203-8}{5} = \frac{195}{5} = 39$

$$n = 39 + 1 = 40$$

15 Consider the arithmetic sequence 4 , 10 , 16 , ...

a) What is its common difference ?

b) Find the position of 58 in this sequence ?

Answer .

a) $d = 10 - 4 = 6$

b) $Position\ difference = \frac{Term\ difference}{common\ difference} = \frac{58-4}{6} = \frac{54}{6} = 9$

$$n = 9 + 1 = 10$$

16 4th term of an arithmetic sequence is 14 and its 9th term is 29

- a) What is its common difference ?
- b) What is its first term ?
- c) Find the position of 62 in this sequence ?

Answer .

$$a) \text{ common difference} = \frac{\text{Term difference}}{\text{Position difference}} = \frac{29-14}{9-4} = \frac{15}{5} = 3$$

$$b) f = x_4 - 3d = 14 - (3 \times 3) = 14 - 9 = 5$$

$$c) \text{ Position difference} = \frac{\text{Term difference}}{\text{common difference}} = \frac{62-5}{3} = \frac{57}{3} = 19$$

$$n = 19 + 1 = 20$$

17 5th term of an arithmetic sequence is 31 and its 11th term is 67

- a) What is its common difference ?
- b) What is its first term ?
- c) Find the position of 601 in this sequence ?

Answer .

$$a) \text{ common difference} = \frac{\text{Term difference}}{\text{Position difference}} = \frac{67-31}{11-5} = \frac{36}{6} = 6$$

$$b) f = x_5 - 4d = 31 - (4 \times 6) = 31 - 24 = 7$$

$$c) \text{ Position difference} = \frac{\text{Term difference}}{\text{common difference}} = \frac{601-7}{6} = \frac{594}{6} = 99$$

$$n = 99 + 1 = 100$$

18 10th term of an arithmetic sequence is 74 and its 20th term is 154

- a) What is its common difference ?
- b) What is its first term ?
- c) Find the position of 474 in this sequence ?

Answer .

a) $common\ difference = \frac{Term\ difference}{Position\ difference} = \frac{154 - 74}{20 - 10} = \frac{80}{10} = 8$

b) $f = x_{10} - 9d = 74 - (9 \times 8) = 74 - 72 = 2$

c) $Position\ difference = \frac{Term\ difference}{common\ difference} = \frac{474 - 2}{8} = \frac{472}{8} = 59$

$n = 59 + 1 = 60$

19 8th term of an arithmetic sequence is 29 and its 15th term is 57

- a) What is its common difference ?
- b) What is its first term ?
- c) Find the position of 97 in this sequence ?

Answer .

a) $common\ difference = \frac{Term\ difference}{Position\ difference} = \frac{57 - 29}{15 - 8} = \frac{28}{7} = 4$

b) $f = x_8 - 7d = 29 - (7 \times 4) = 29 - 28 = 1$

c) $Position\ difference = \frac{Term\ difference}{common\ difference} = \frac{97 - 1}{4} = \frac{96}{4} = 24$

$n = 24 + 1 = 25$

20 Consider the arithmetic sequence 6, 10, 14, ...

- a) What is its common difference ?
- b) Find the position of the term obtained by adding 40 to its 20th term ?

Answer .

a) $d = 10 - 6 = 4$

b) 30th term

$(x_{20} + 40 = x_{20} + 10 \times 4 = x_{20} + 10d = x_{30})$

21 Consider the arithmetic sequence 7, 10, 13, ...

a) What is its common difference ?

b) Find the position of the term obtained by adding 27 to its 15th term ?

Answer .

a) $d = 10 - 7 = 3$

b) 24th term

$$(x_{15} + 27 = x_{15} + 9 \times 3 = x_{15} + 9d = x_{24})$$

22 Consider the arithmetic sequence 8, 14, 20, ...

a) What is its common difference ?

b) Find the position of the term obtained by subtracting 48 from its 40th term ?

Answer .

a) $d = 14 - 8 = 6$

b) 32nd term

$$(x_{40} - 48 = x_{40} - 8 \times 6 = x_{40} - 8d = x_{32})$$

23 Consider the arithmetic sequence 3, 8, 13, ...

a) What is its common difference ?

b) Find the position of the term obtained by subtracting 100 from its 30th term ?

Answer .

a) $d = 8 - 3 = 5$

b) 10th term

$$(x_{30} - 100 = x_{30} - 20 \times 5 = x_{30} - 20d = x_{10})$$

24 Consider the sequence of two digit numbers which leave a remainder 1 on divisible by 3 .

a) What is its common difference ?

b) Which is the smallest number in this sequence ?

c) How many two digit numbers are there , which leave a remainder 1 on divisible by 3 ?

Answer .

a) 3

b) Smallest number = 10

c) Largest number = 97

$$\text{Position difference} = \frac{\text{Term difference}}{\text{common difference}} = \frac{97-10}{3} = \frac{87}{3} = 29$$

$$\text{Number} = 29 + 1 = 30$$

25 Consider the sequence of three digit numbers which leave a remainder 1 on divisible by 5 .

a) What is its common difference ?

b) Which is the smallest number in this sequence ?

c) How many three digit numbers are there , which leave a remainder 1 on divisible by 5 ?

Answer .

a) 5

b) Smallest number = 102

c) Largest number = 997

$$\text{Position difference} = \frac{\text{Term difference}}{\text{common difference}} = \frac{997-102}{5} = \frac{895}{5} = 179$$

$$\text{Number} = 179 + 1 = 180$$

26 Consider the arithmetic sequence 3 , 13 , 23 , ...

a) What is its common difference ?

b) Write down the next three terms of this sequence ?

c) Is there any perfect square term in this sequence ? Justify your answer .

Answer .

a) $d = 13 - 3 = 10$

b) 33, 43, 53

c) No. The unit place digit of all the terms of this sequence is 3 . The unit place digit of any perfect square never be 3 .

27 Consider the arithmetic sequence 7 , 12 , 17 , ...

a) What is its common difference ?

b) Write down the next three terms of this sequence ?

c) Is there any perfect square term in this sequence ? Justify your answer .

Answer .

a) $d = 12 - 7 = 5$

b) 22, 27, 32

c) No. The unit place digit of all the terms of this sequence is either 2 or 7 .
The unit place digit of any perfect square never be 2 or 7 .

28 Consider the arithmetic sequence 70 , 67 , 64 , ...

a) What is its common difference ?

b) What is the remainder when each positive term of this sequence is divided by 3 ?

c) Which is the smallest positive number in this sequence ?

d) Which is the largest negative number in this sequence ?

Answer .

a) $d = 67 - 70 = -3$

b) 1

c) 1

d) $1 - 3 = -2$

- 29 Consider the arithmetic sequence 92 , 88 , 84 , ...
- What is its common difference ?
 - What is the remainder when each positive term of this sequence is divided by 4 ?
 - Which is the smallest positive number in this sequence ?
 - Which is the largest negative number in this sequence ?

Answer .

a) $d = 88 - 92 = -4$

b) 0

c) 4

d) $0 - 4 = -4$

- 30 Consider the arithmetic sequence 63 , 58 , 53 , ...
- What is its common difference ?
 - What is the remainder when each positive term of this sequence is divided by 5 ?
 - Which is the smallest positive number in this sequence ?
 - How many positive numbers are there in this sequence ?

Answer .

a) $d = 58 - 63 = -5$

b) 3

c) 3

d) $\text{Position difference} = \frac{\text{Term difference}}{\text{common difference}} = \frac{3-63}{-5} = \frac{-60}{-5} = 12$

$$n = 12 + 1 = 13$$

- 31 Consider the arithmetic sequence 82 , 78 , 74 , ...
- What is its common difference ?
 - What is the remainder when each positive term of this sequence is divided by 10 ?
 - Which is the smallest positive number in this sequence ?
 - How many positive numbers are there in this sequence ?

Answer .

a) $d = 78 - 82 = -4$

b) 2

c) 2

d) $\text{Position difference} = \frac{\text{Term difference}}{\text{common difference}} = \frac{2-82}{-4} = \frac{-80}{-4} = 20$

$$n = 20 + 1 = 21$$

32 Consider the arithmetic sequence 5, 8, 11, ...

a) What is its common difference ?

b) What is its 11th term ?

c) What is the remainder when each term of this sequence is divided by the common difference ?

d) What is its algebraic form ?

Answer .

a) $d = 8 - 5 = 3$

b) $x_{11} = f + 10d = 5 + (10 \times 3) = 5 + 30 = 35$

c) 2

d) $x_n = d n + f - d = 3n + 5 - 3 = 3n + 2$

33 Consider the arithmetic sequence 6, 10, 14, ...

a) What is its common difference ?

b) What is its 15th term ?

c) What is the remainder when each term of this sequence is divided by the common difference ?

d) What is its algebraic form ?

Answer .

a) $d = 10 - 6 = 4$

b) $x_{15} = f + 14d = 6 + (14 \times 4) = 6 + 56 = 62$

c) 2

d) $x_n = d n + f - d = 4n + 6 - 4 = 4n + 2$

34 Consider the arithmetic sequence 3 , 10 , 17 ,

a) What is its common difference ?

b) What is its 20th term ?

c) What is its algebraic form ?

Answer .

a) $d = 10 - 3 = 7$

b) $x_{20} = f + 19d = 3 + (19 \times 7) = 3 + 133 = 136$

c) $x_n = d n + f - d = 7n + 3 - 7 = 7n - 4$

35 Consider the arithmetic sequence 1 , 6 , 11 ,

a) What is its common difference ?

b) What is its 18th term ?

c) What is its algebraic form ?

Answer .

a) $d = 6 - 1 = 5$

b) $x_{18} = f + 17d = 1 + (17 \times 5) = 1 + 85 = 86$

c) $x_n = d n + f - d = 5n + 1 - 5 = 5n - 4$

36 The algebraic form of an arithmetic sequence is $3n + 2$

a) What is its first term ?

b) What is its common difference ?

c) What is the remainder when each term of this sequence is divided by 3 ?

Answer .

a) $f = 3 + 2 = 5$

b) $d = 3$

c) 2

37 The algebraic form of an arithmetic sequence is $5n + 3$

a) What is its first term ?

b) What is its common difference ?

c) What is the remainder when each term of this sequence is divided by 5 ?

Answer .

a) $f = 5 + 3 = 8$

b) $d = 5$

c) 3

38 The algebraic form of an arithmetic sequence is $4n - 1$

a) What is its first term ?

b) What is its common difference ?

c) What is the remainder when each term of this sequence is divided by 4 ?

Answer .

a) $f = 4 - 1 = 3$

b) $d = 4$

c) 3

39 The algebraic form of an arithmetic sequence is $2n - 1$

a) What is its first term ?

b) What is its common difference ?

c) What is the remainder when each term of this sequence is divided by 2 ?

Answer .

a) $f = 2 - 1 = 1$

b) $d = 2$

c) 1

40 Consider the arithmetic sequence 11 , 20 , 29 , ...

a) What is its common difference ?

b) What is its algebraic form ?

c) Find the position of 263 in this sequence ?

Answer .

a) $d = 20 - 11 = 9$

b) $x_n = d n + f - d = 9n + 11 - 9 = 9n + 2$

c) $9n + 2 = 263$

$$9n = 263 - 2 = 261$$

$$n = \frac{261}{9} = 29$$

41 Consider the arithmetic sequence 10 , 17 , 24 , ...

a) What is its common difference ?

b) What is its algebraic form ?

c) Find the position of 136 in this sequence ?

Answer .

a) $d = 17 - 10 = 7$

b) $x_n = d n + f - d = 7n + 10 - 7 = 7n + 3$

c) $7n + 3 = 136$

$$7n = 136 - 3 = 133$$

$$n = \frac{133}{7} = 19$$

42 Consider the arithmetic sequence 3 , 7 , 11 , ...

- a) What is its common difference ?
- b) What is its algebraic form ?
- c) Find the position of 123 in this sequence ?
- d) Is 130 a term of this sequence ? Why ?

Answer .

a) $d = 7 - 3 = 4$

b) $x_n = d n + f - d = 4n + 3 - 4 = 4n - 1$

c) $4n - 1 = 123$

$$4n = 123 + 1 = 124$$

$$n = \frac{124}{4} = 31$$

d) No .

$$130 - 3 = 127 \text{ , } 127 \text{ is not a multiple of the common difference (4)}$$

So 130 is not a term of this sequence . (The difference between any two terms of an arithmetic sequence is the product of the difference of the positions and the common difference)

43 Consider the arithmetic sequence 4 , 9 , 14 , ...

- a) What is its common difference ?
- b) What is its algebraic form ?
- c) Find the position of 154 in this sequence ?
- d) Is 170 a term of this sequence ? Why ?

Answer .

a) $d = 9 - 4 = 5$

b) $x_n = d n + f - d = 5n + 4 - 5 = 5n - 1$

c) $5n - 1 = 154$

$$5n = 154 + 1 = 155$$

$$n = \frac{155}{5} = 31$$

d) No .

$$170 - 4 = 166 \text{ , } 166 \text{ is not a multiple of the common difference (5)}$$

So 170 is not a term of this sequence . (The difference between any two terms of an arithmetic sequence is the product of the difference of the positions and the common difference)

44 Consider the arithmetic sequence 4 , 7 , 10 , ...

a) What is its common difference ?

b) What is its algebraic form ?

c) Find the position of 16 in this sequence ?

d) Check whether the square of any term is a term of this sequence or not ?

Answer .

a) $d = 7 - 4 = 3$

b) $x_n = dn + f - d = 3n + 4 - 3 = 3n + 1$

c) $3n + 1 = 16$

$$3n = 16 - 1 = 15$$

$$n = \frac{15}{3} = 5$$

d) $x_n^2 = (3n + 1)^2 = (3n)^2 + 2 \times 3n \times 1 + 1^2 = 9n^2 + 6n + 1$

$$= 3 \times 3n^2 + 3 \times 2n + 1 = 3(3n^2 + 2n) + 1$$

The square of any term of this sequence is got by adding 1 to the multiple of 3 . Also the terms of this sequence are also got by adding 1 to the multiple of 3 .

(Algebraic form of the sequence is $3n + 1$) . So the squares of all terms of this sequence belong to it .

45 Consider the arithmetic sequence 7, 13, 19, . . .

- a) What is its common difference ?
- b) What is its algebraic form ?
- c) Find the position of 49 in this sequence ?
- d) Check whether the square of any term is a term of this sequence or not

Answer .

a) $d = 13 - 7 = 6$

b) $x_n = dn + f - d = 6n + 7 - 6 = 6n + 1$

c) $6n + 1 = 49$

$$6n = 49 - 1 = 48$$

$$n = \frac{48}{6} = 8$$

d) $x_n^2 = (6n + 1)^2 = (6n)^2 + 2 \times 6n \times 1 + 1^2 = 36n^2 + 12n + 1$
 $= 6 \times 6n^2 + 6 \times 2n + 1 = 6(6n^2 + 2n) + 1$

The square of any term of this sequence is got by adding 1 to the multiple of 6 . The terms of this sequence are also got by adding 1 to the multiple of 6 .

(Algebraic form of the sequence is $6n + 1$). So the squares of all terms of this sequence belong to it .

46 Consider the arithmetic sequence 6, 11, 16, . . .

- a) What is its common difference ?
- b) What is its algebraic form ?
- c) Find the position of 36 in this sequence ?
- d) Check whether the square of any term is a term of this sequence or not .

Answer .

a) $d = 11 - 6 = 5$

$$\text{b) } x_n = dn + f - d = 5n + 6 - 5 = 5n + 1$$

$$\text{c) } 5n + 1 = 36$$

$$5n = 36 - 1 = 35$$

$$n = \frac{35}{5} = 7$$

$$\begin{aligned} \text{d) } x_n^2 &= (5n + 1)^2 = (5n)^2 + 2 \times 5n \times 1 + 1^2 = 25n^2 + 10n + 1 \\ &= 5 \times 5n^2 + 5 \times 2n + 1 = 5(5n^2 + 2n) + 1 \end{aligned}$$

The square of any term of this sequence is got by adding 1 to the multiple of 5 . Also the terms of this sequence are also got by adding 1 to the multiple of 5 .

(Algebraic form of the sequence is $5n + 1$). So the squares of all terms of this sequence belong to it .

47 Calculate the sums of the following following arithmetic sequences .

$$\text{a) } 1 + 2 + 3 + \dots + 20$$

$$\text{b) } 2 + 4 + 6 + \dots + 40$$

$$\text{c) } 5 + 7 + 9 + \dots + 43$$

Answer .

$$\text{a) } 1 + 2 + 3 + \dots + 20 = \frac{20 \times 21}{2} = 210$$

$$\text{b) } 2 + 4 + 6 + \dots + 40 = 2 \times 210 = 420$$

$$\text{c) } 5 + 7 + 9 + \dots + 43 = 420 + (20 \times 3) = 420 + 60 = 480$$

48 Calculate the sums of the following following arithmetic sequences .

$$\text{a) } 1 + 2 + 3 + \dots + 40$$

$$\text{b) } 5 + 10 + 15 + \dots + 200$$

$$\text{c) } 7 + 12 + 17 + \dots + 202$$

Answer .

$$\text{a) } 1 + 2 + 3 + \dots + 40 = \frac{40 \times 41}{2} = 820$$

$$\text{b) } 5 + 10 + 15 + \dots + 200 = 5 \times 820 = 4100$$

$$\text{c) } 7 + 12 + 17 + \dots + 202 = 4100 + (40 \times 2) = 4180$$

49 Calculate the sums of the following following arithmetic sequences .

$$\text{a) } 1 + 2 + 3 + \dots + 60$$

$$\text{b) } 4 + 8 + 12 + \dots + 240$$

$$\text{c) } 5 + 9 + 13 + \dots + 241$$

$$\text{d) } 9 + 17 + 25 + \dots + 481$$

Answer .

$$\text{a) } 1 + 2 + 3 + \dots + 60 = \frac{60 \times 61}{2} = 1830$$

$$\text{b) } 4 + 8 + 12 + \dots + 240 = 4 \times 1830 = 7320$$

$$\text{c) } 5 + 9 + 13 + \dots + 241 = 7320 + (60 \times 1) = 7380$$

$$\text{d) } 9 + 17 + 25 + \dots + 481 = 7320 + 7380 = 14700$$

50 Calculate the sums of the following following arithmetic sequences .

$$\text{a) } 1 + 2 + 3 + \dots + 100$$

$$\text{b) } 3 + 6 + 9 + \dots + 300$$

$$\text{c) } 13 + 16 + 19 + \dots + 310$$

$$\text{d) } 12 + 15 + 18 + \dots + 309$$

Answer .

$$\text{a) } 1 + 2 + 3 + \dots + 100 = \frac{100 \times 101}{2} = 5050$$

$$\text{b) } 3 + 6 + 9 + \dots + 300 = 3 \times 5050 = 15150$$

$$\text{c) } 13 + 16 + 19 + \dots + 310 = 15150 + (100 \times 10) = 16150$$

$$\text{d) } 12 + 15 + 18 + \dots + 309 = 16150 - (100 \times 1) = 16050$$