

Chapter 01

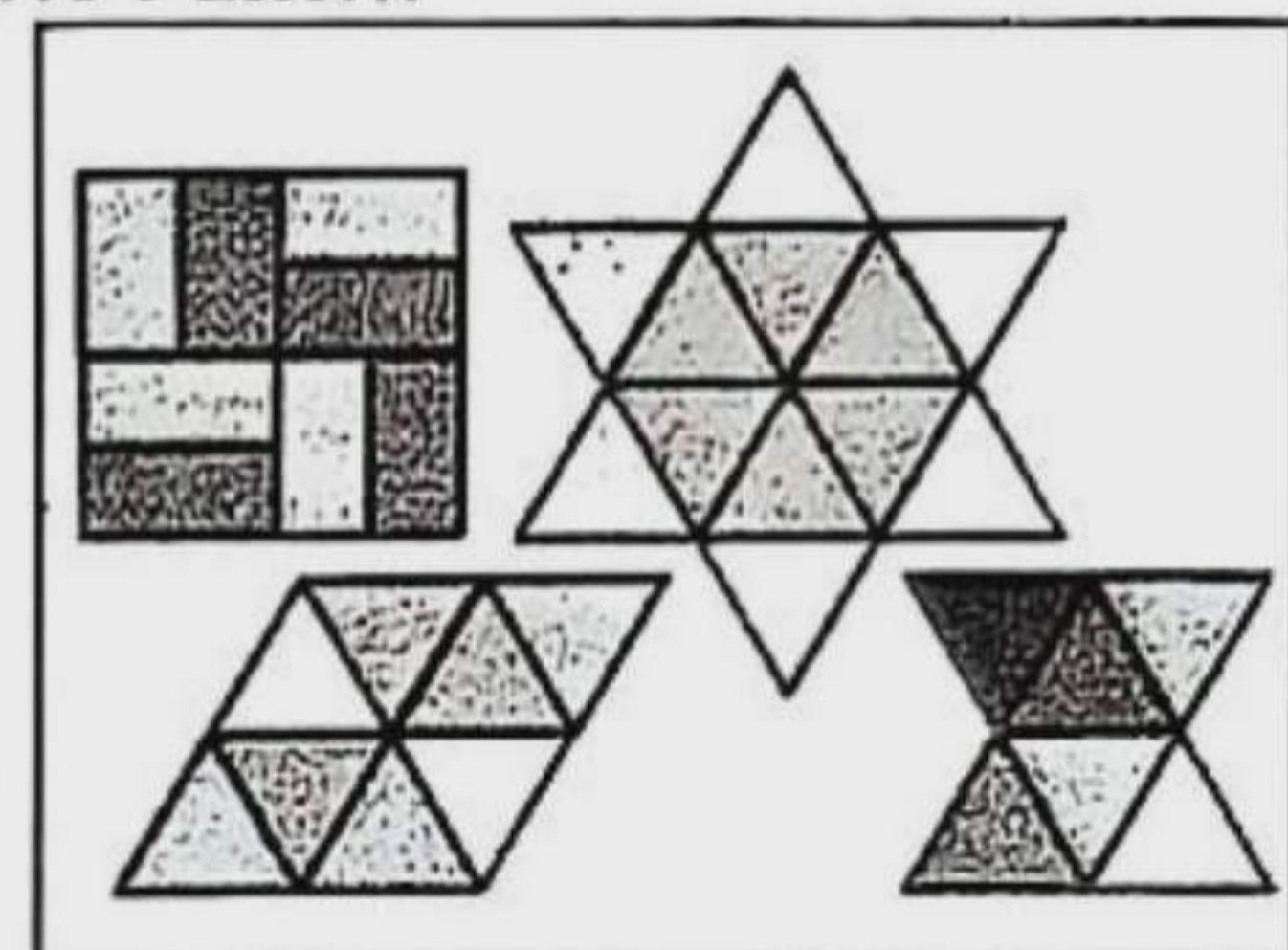
Patterns

Contents for Discussion

- Patterns • Patterns of Natural Numbers • Expression of a number as the sum of squares of two natural numbers • Formation of Magic Square • Playing with numbers • Geometric Pattern

Learning Outcomes : After studying this chapter, I will be able to-

- explain what patterns are
- write and explain linear patterns
- write and explain different geometrical patterns
- write and explain simple linear patterns set by certain conditions
- express the linear patterns as algebraic expressions by using variables
- find the particular term of the linear pattern.



Practice



Solutions to Mathematical Problems following
100% accurate format for best prep.

Dear learners, mathematical problems of this chapter have been divided into exercise, multiple choice, short, creative and exercise-based activities in light of the learning outcomes. Practice the solutions well to ensure the best preparation in the exam.

At a Glance Important Contents of Chapter

- **Pattern:** The term pattern literally means type. This type or pattern is created from the assembly or arrangement of different objects or numbers. In this case, different arrangement or decoration of numbers creates a pattern. That is, a pattern is a structure, sequence or design that follows a certain rule and is repeated several times. For example, a baby's red-blue block separation is a pattern.
- **Prime Numbers:** Numbers greater than 1 that have no factors other than 1 and that number are prime numbers. For example, the prime numbers from 1 to 43 are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43. that is, there are 14 prime numbers from 1 to 43.
- **Magic square:** Magic square consists of equal number of small squares side-by-side and top-bottom, and addition of the numbers of small squares, top-bottom and corners gives the same sum. For example, the magic square of order 5 is formed by:
$$\begin{array}{ccccc} 17 & 24 & 1 & 8 & 15 \\ 23 & 5 & 7 & 14 & 16 \\ 4 & 6 & 13 & 20 & 22 \\ 10 & 12 & 19 & 21 & 3 \\ 11 & 18 & 25 & 2 & 9 \end{array}$$
- **Fibonacci numbers:** A number pattern starting with 0 and 1 and increasing continuously and each number is equal to the sum of the previous two numbers is called Fibonacci number pattern. For example, 0, 1, 1, 2, 3, 5, 8, 13, 21.....numbers are Fibonacci numbers; Where the sum of two consecutive numbers is equal to the next number.
$$\text{Sum of natural consecutive numbers} = \frac{(\text{First Number} + \text{Last Number}) \times \text{Number of terms}}{2}$$
- Sum of 'a' number of consecutive normal odd numbers = a^2 .


Solutions to Exercise Problems


MCQs with Answers

1. In the formation of magic square of order 3—
 i. The magic number will be 15
 ii. At the centre, the number in the small square will be 5
 iii. In the small squares the integers 1 – 15 are set.
 Which one of the following is correct?

- a** @ i & ii @ i & iii © ii & iii @ i, ii & iii
 ► Explanation : Addition of side by side, top, bottom and corner numbers in a magic square of order 3 gives a sum of 15.

That is, its magic number is 15. The number in the small square at center is 5.

2	9	4
7	5	3
6	1	8

Small squares contain consecutive natural numbers from 1 to 9.

Therefore, i and ii are correct.

2. Which one of the following terms will be divisible by 9?

- @ $52 + 25$ @ $527 + 725$
 © $412 + 234$ @ $75 - 57$

► Explanation : Here, $75 - 57 = 18$, which is divisible by 9.

3. In which algebraic expressions 9999 is the 100th term?

- d** @ $99A + 1$ @ $99A - 1$ © $A^2 + 1$ @ $A^2 - 1$
 ► Explanation : 100th term = $(100)^2 - 1 = 10000 - 1 = 9999$

4. What is the sum of 'A' numbered series of normal odd numbers?

- c** @ A @ $2A - 1$ © A^2 @ $2A + 1$
 ► Explanation : Let, 1, 3, 5 are three consecutive natural odd numbers. The sum of three odd numbers is $1+3+5=9=3^2$

Thus, 1, 3, 5, 7, Sum of 'A' number of natural odd numbers = $1+3+5+7+\dots+A=3^2$

5. How many integers from 1 to 100 can be expressed as the sum of squares of two natural numbers?

- c** @ 10 @ 20 © 35 @ 50

► Explanation : From 1 to 100,

$$2 = 1 + 1 = 1^2 + 1^2$$

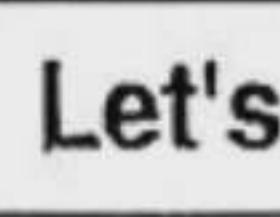
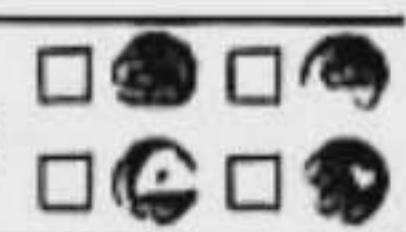
$$5 = 1 + 4 = 1^2 + 2^2$$

$$8 = 4 + 4 = 2^2 + 2^2$$

.....

$$98 = 49 + 49 \quad 7^2 + 7^2$$

In this way, from 1 to 100, 35 integer numbers can be expressed as the sum of squares of two natural numbers.


Let's solve the textbook problems


- According to the stimuli answer to the question No. 6 and 7 :

12	19	14
17	A	13
16	11	18

← A magic square

6. What would be the right number in the square marked 'A'?

- c** @ 45 @ 20 © 15 @ 3

► Explanation : Adding side by side, top, bottom and corners in the magic square gives 45.

$$\text{That is, } 19 + A + 11 = 45$$

$$\text{or, } A + 30 = 45$$

$$\therefore A = 45 - 30 = 15$$

Therefore, the right number in the place marked 'A' would be 15.

7. In the magic square, what is the magic number?

- d** @ 15 @ 34 © 35 @ 45

► Explanation : Adding side-by-side, top-bottom and corner-to-corner to the magic square gives 45 each time. Therefore, the magic number of the magic square is 45.

8. The sum of the 1st three odd integers is—.

- i. square number ii. odd number
 iii. prime number

Which one of the following is correct?

- a** @ i & ii @ i & iii © ii & iii @ i, ii & iii

► Explanation : Sum of first three odd natural numbers = $1 + 3 + 5 = 9$, which is a perfect square and an odd number but not a prime number. Therefore, i and ii are correct.


Solutions to Mathematical Problems

9. Find the difference between two consecutive numbers and the next two numbers in each of the following numerical patterns.

- (a) 7, 12, 17, 22, 27,....

Solution :

The given numerical pattern is 7, 12, 17, 22, 27,....

Here difference between two consecutive numbers is $12 - 7 = 7 - 2 = 22 - 17 = 27 - 22 = 5$.

Again 1st number, $7 = 5 \cdot 1 + 2$

2nd number, $12 = 5 \cdot 2 + 2$

3rd number, $17 = 5 \cdot 3 + 2$

4th number, $22 = 5 \cdot 4 + 2$

5th number, $27 = 5 \cdot 5 + 2$

$\therefore 6^{\text{th}}$ number = $5 \cdot 6 + 2$ or, 32 and

7th number = $5 \cdot 7 + 2$ or, 37

So, the found difference between two consecutive numbers is 5 and the next two numbers of the given pattern are 32 and 37. (Ans.)

(b) 6, 17, 28, 39, 50,

Solution :

The given pattern is 6, 17, 28, 39, 50,

Here difference between two consecutive numbers is $17 - 6 = 28 - 17 = 39 - 28 = 50 - 39 = 11$.

Again 1st number, 6 = 11 · 1 - 5

2nd number, 17 = 11 · 2 - 5

3rd number, 28 = 11 · 3 - 5

4th number, 39 = 11 · 4 - 5

5th number, 50 = 11 · 5 - 5

∴ 6th number = 11 · 6 - 5 or, 61 and

7th number = 11 · 7 - 5 or, 72

So, the difference between two consecutive numbers is 11 and the next two numbers of the pattern are 61 and 72. (Ans.)

10. Is there any similarity in the following numerical patterns? Find the next number in each of the following numerical patterns.

(a) 1, 1, 2, 3, 5, 8, 13,

Solution :

Given pattern : 1, 1, 2, 3, 5, 8, 13,

Sum of two consecutive numbers 2 3 5 8 13 21

There is similarity in the given number patterns. The sum of any two consecutive numbers is the next number. This is Fibonacci number patterns. So, the next number will be the sum of two consecutive previous numbers.

∴ The next number will be = 8 + 13 = 21

∴ The next number is 21.

(b) 4, 4, 5, 6, 8, 11,

Solution :

Given pattern 4, 4, 5, 6, 8, 11

Sum of two consecutive numbers 0 1 1 2 3

There is similarity in the given number patterns. The sum of any two consecutive numbers is the next number. This is Fibonacci number patterns. So, the next number will be the sum of two consecutive previous numbers.

∴ The next number will be = 11 + (2 + 3)
= 11 + 5 = 16

∴ The next number is 16.



Creative Questions with Solutions □

Ques. 11 The following geometrical figures are constructed with sticks :



- Make a list of the numbers of sticks.
- Explain how you can find the next number in the list.
- Construct the next figure with sticks and verify your result.

Solution to Question No. 11 :

a. The list of the number of sticks is 4, 7, 10

b. Here, $4 = 3 + 1 = 3 \cdot 1 + 1$

$$7 = 6 + 1 = 3 \cdot 2 + 1$$

$$10 = 9 + 1 = 3 \cdot 3 + 1$$

∴ We have a formula $3n + 1$, where, $n = 1, 2, 3, \dots$ etc.
So, using the above formula, $3n + 1$, we can find out the next number putting $n = 4$ as under :

$$3n + 1 = 3 \cdot 4 + 1 = 13$$

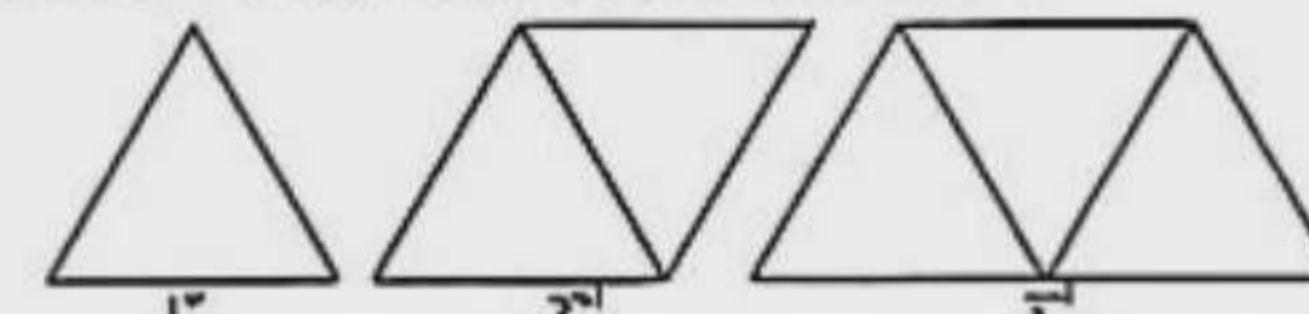
∴ The next number is 13.

c. The forth picture will be of $3n + 1$ sticks where $n = 4$

∴ The total number of sticks in 4th picture = $3 \cdot 4 + 1$ or, 13 sticks

∴ The 4th picture will be : 

Ques. 12 The pattern of the triangles is constructed with match sticks :



a. Find the number of match sticks in the fourth pattern.

b. Explain how you can find the next number in the patterns.

c. How many match sticks are required to construct the hundredth pattern?

Solution to Question No. 12 :

a. According to the given information, the 4th pattern will be as under :

4th pattern

From the above pattern, we have 9 sticks (Ans.)

b. In pattern 1, numbers of sticks is $3 = 2 + 1 = 2 \cdot 1 + 1$

$$\text{“ “ } 2, \text{ “ “ “ “ is } 5 = 4 + 1 = 2 \cdot 2 + 1$$

$$\text{“ “ } 3, \text{ “ “ “ “ is } 7 = 6 + 1 = 2 \cdot 3 + 1$$

∴ In pattern n, numbers of sticks is $2n + 1$

So, to find out the next number that is 4th number of the list, we can use $2n + 1$ where $n = 4$.

∴ The number of sticks in the 4th pattern
 $= 2 \times 4 + 1 = 9$

c. The formula for finding out the number of sticks the required pattern is $2n + 1$, where n is any natural number.

∴ Match sticks required to construct the hundredth pattern = $2 \cdot 100 + 1$ (putting n = 100)
 $= 2 \times 100 + 1 = 201$

∴ Number of sticks is 201

Ques. 13 5, 13, 21, 29, 37,

a. Express 29 and 37 as the sum of squares of two natural numbers.

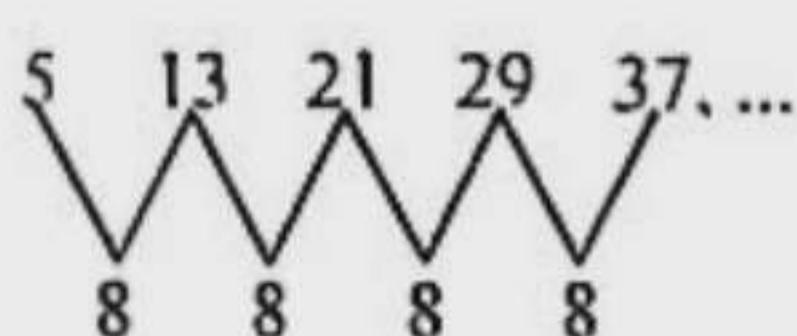
b. Find the next four number in the list.

c. Find the sum of the first 50 numbers in the list.

Solution to Question No. 13 :

- a $29 = 25 + 4 = 5^2 + 2^2$
 Again $37 = 36 + 1 = 6^2 + 1^2$

b Given numbers :



Difference of two consecutive numbers

∴ It is seen, the difference each time is 8.

∴ The next 4 numbers in the list are : $37 + 8 = 45$,
 $45 + 8 = 53$,
 $53 + 8 = 61$
 and $61 + 8 = 69$

∴ The next 4 numbers in the list are 45, 53, 61, 69.

- c** The sum of 1st 50 numbers of the pattern, $S = 5 + 13 + 21 + \dots + \text{up to } 50^{\text{th}} \text{ term.}$

We know,

We know,

$S = \frac{n}{2} \{2a + (n - 1)d\}$, where n = number of terms
a = 1st term,
d = common difference

Here, $a = 5$, $d = 8$, $n = 50$

$$\begin{aligned}\therefore S &= \frac{50}{2} \{2 \times 5 + (50 - 1) \times 8\} \\&= 25 \{10 + 49 \times 8\} = 25 \{10 + 392\} \\&= 25 \{402\} = 10,050\end{aligned}$$

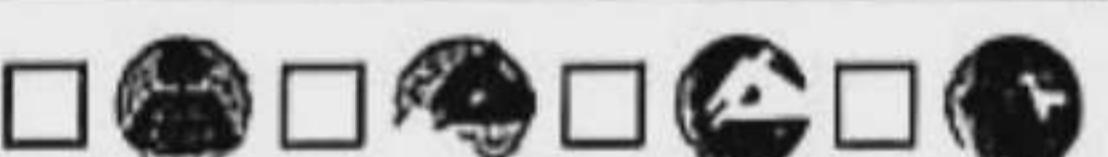
\therefore The required sum is 10,050.



Multiple Choice Q/A



Designed as per topic



1.1 Patterns

► Textbook Page 1

1. What is pattern? (Hard)

 - Ⓐ A pattern refers to a design of something
 - Ⓑ The combination of something in any way
 - Ⓒ The union of two or more things
 - Ⓓ None of the above

2. What is called different designs in our dress? (Easy)

 - Ⓐ Natural pattern ⓷ Geometric pattern
 - Ⓒ Number pattern ⓸ None of the above

3. The diverse nature is full of various —. (Medium)

 - Ⓐ patterns ⓷ animals ⓸ insects ⓹ birds

4. Which one is the prime factor of 20? (Medium) [DB '19]

 - Ⓐ 1 ⓷ 5 ⓸ 10 ⓹ 20

1.2 Patterns of Natural Numbers

► Textbook Page 2

5. What is the next number in the pattern of 25, 22, 19, 16, · ? (Easy)

C @ 10 B 12 C 13 D 9

6. What are the next two numbers in the pattern of 0, 5, 5, 10, 15, 25, ? (Easy)

a @ 40, 65 B 35, 60 C 45, 75 D 42, 66

7. 1, 2, 2, 4, 6, 10, is a list of — numbers. (Easy)

a Irrational B Rational
C Fibonacci D None of the above

8. What is the next number in the pattern of 1, 3, 4, 7, 11, ? (Medium)

b @ 15 B 18 C 16 D 21

9. What is the sum of 1^{st} 7 natural numbers? (Medium)

c @ 21 B 24 C 28 D 26

10. Which algebraic expression does the pattern 1, 3, 5, 7, express? (Hard) [DB '19]

a A + 1 B 2A + 1 C 2A - 1 D 3A - 2

11. Which numbers are Fibonacci numbers in the following? (Medium) [DB '19]

a 0, 1, 1, 2, 3, B 0, 0, 1, 2, 3,
a C 0, 1, 2, 3, 4, D 0, 2, 4, 6, 8,

12. What is the 9th term of the pattern 0, 1, 1, 2, 3,? (Hard) [RB '19]

c @ 8 B 13 C 21 D 34

- 13.** What is the sum of consecutive even numbers from 1 to 15? (Hard) [RB '19]
a ⓐ 56 ⓑ 64 ⓒ 112 ⓓ 120

14. Which one is the algebraic expression of the pattern of odd natural numbers? (Hard)
[Ideal School & College, Dhaka: Dhaka; JB '19]
c ⓐ $2a$ ⓑ $3a + 1$ ⓒ $2a - 1$ ⓓ $3a$

15. What type of number pattern $0, 1, 1, 2, 3, 5, 8, 13, \dots$ are? (Medium) [JB '19]
a ⓐ Consecutive ⓑ Fibonacci
b ⓒ Odd ⓓ Prime

16. What is the number of prime-numbers between 30 to 75? (Medium) [CB '19]
a ⓐ 9 ⓑ 10 ⓒ 11 ⓓ 12

17. What is the next number of $1, 3, 7, 13, 21, \dots$? (Medium) [CigB '19]
b ⓐ 29 ⓑ 31 ⓒ 34 ⓓ 35

18. How many prime numbers are there in between 1 to 25? (Medium) [CigB '19]
d ⓐ 6 ⓑ 7 ⓒ 8 ⓓ 9

19. What is the next number of the list $9, 16, 25, 36, \dots$? (Medium) [SB '19]
d ⓐ 41 ⓑ 45 ⓒ 47 ⓓ 49

20. What is the sum of the first six odd numbers? (Hard) [BB '19]
b ⓐ 42 ⓑ 36 ⓒ 30 ⓓ 25

21. Which one of the following is a pattern of Fibonacci number? (Medium) [BB '19]
a ⓐ $0, 2, 2, 4, 6$ ⓑ $0, 1, 1, 3, 5$
a ⓒ $0, 1, 1, 2, 4$ ⓓ $0, 1, 2, 3, 4$

22. What is the 6th term of the pattern $0, 1, 4, 9, 16, \dots$? (Medium) [DjB '19]
d ⓐ 17 ⓑ 20 ⓒ 21 ⓓ 25

23. 779 is the 111th term of which algebraic expression? (Hard) [DjB '19]
a ⓐ $7A - 2$ ⓑ $7A + 2$
b ⓒ $555A + 224$ ⓓ $777A + 2$

24. $1 + 2 + 3 + \dots + 25 = ?$ (Medium) [MB '19]
b ⓐ 300 ⓑ 325 ⓒ 625 ⓓ 650

25. In which numbers are Fibonacci? (Medium) [DB '18]
 ⓐ 0, 1, 2, 3, 4, ⓑ 0, 1, 1, 2, 3,
ⓑ ⓒ 3, 3, 6, 9, 12, ⓓ -1, 1, 0, 1, 2,
26. Which one is the sum of the first twenty consecutive odd numbers? (Medium) [DB '18]
ⓐ ⓑ 81 ⓒ 100 ⓓ 210 ⓔ 400
27. Which one is the algebraic expression of
 $-1, 2, 7, 14, \dots$ (Medium) [RB '18]
ⓐ ⓑ $A - 2$ ⓒ $3A - 4$ ⓓ $A^2 - 2$ ⓔ $2A^2 - 3$
28. What is the 5th number of the list? [RB '18]
 $5, 12, 20, 29, \dots$ (Medium)
ⓐ ⓑ 39 ⓒ 38 ⓓ 37 ⓔ 36
29. 10001 is the 100th term of which algebraic expressions? (Hard) [JB '18]
ⓐ ⓑ $1 + A^2$ ⓒ $1 + 99A$ ⓓ $A^2 - 1$ ⓔ $99A - 1$
30. 0, 1, 1, 2, 3, 5 is a pattern. What is the 8th term of this pattern? (Hard) [JB '18]
ⓓ ⓑ 7 ⓒ 8 ⓓ 12 ⓔ 13
31. Which one of the following is the Fibonacci number's pattern? (Medium) [CB '18]
 ⓑ 0, 1, 2, 3, 5, ⓒ 0, 2, 4, 6, 8,
ⓓ ⓒ 0, 4, 5, 9, 13, ⓓ 0, 1, 1, 2, 3,
32. Which one is the next number of the pattern 1, 5, 6, 11, 17, 28,? (Medium) [CB '18]
ⓐ ⓑ 32 ⓒ 39 ⓓ 45 ⓔ 56
33. What is the next number of the list 3, 5, 8, 12,? (Medium) [CtgB '18]
ⓐ ⓑ 17 ⓒ 16 ⓓ 15 ⓔ 14
34. Which one of the following is a pattern of Fibonacci number? (Medium) [CtgB '18]
 ⓑ 0, 0, 1, 2, 3 ⓒ 0, 1, 2, 3, 4
ⓓ ⓒ 0, 1, 2, 4, 6 ⓓ 0, 1, 1, 2, 3
35. If 2, 3, 5, 7, is a pattern of prime number, what is the 7th term? (Medium) [SB '18]
ⓑ ⓑ 13 ⓒ 17 ⓓ 19 ⓔ 23
36. Which term is 101 of an algebraic expression $(a^2 + 1)$? (Medium) [SB '18]
ⓐ ⓑ 10th ⓒ 23rd ⓓ 50th ⓔ 100th
37. 2, 3, 5, 8, what is the next number of the list? (Medium) [BB '18]
ⓓ ⓑ 18 ⓒ 17 ⓓ 16 ⓔ 12
38. How many prime factors are there of 21? (Medium) [BB '18]
ⓑ ⓑ 1 ⓒ 2 ⓓ 3 ⓔ 4
39. $1 + 2 + 3 + 4 + \dots + 40 =$ What? (Hard) [DjB '18]
ⓑ ⓑ 800 ⓒ 820 ⓓ 1600 ⓔ 1640
40. What is the sum of first A consecutive odd numbers? (Medium) [DB '17]
ⓑ ⓑ A ⓒ A^2 ⓓ $2A - 1$ ⓔ $2A + 1$
41. What is the 7th term of the list 1, 4, 8, 13, (Medium) [DB '17]
ⓒ ⓑ 22 ⓒ 28 ⓓ 34 ⓔ 40
42. 0, 1, 1, 2, 3, 5, 8, what is the next number of the pattern? (Medium) [RB '17]
ⓓ ⓑ 9 ⓒ 10 ⓓ 11 ⓔ 13
43. $1 + 2 + 3 + 4 + 5 + \dots + 20 = ?$ (Medium) [RB '17]
ⓐ ⓑ 210 ⓒ 200 ⓓ 63 ⓔ 21
44. How many prime number are here from 1 to 20? (Easy) [JB '17]
ⓑ ⓑ 7 ⓒ 8 ⓓ 9 ⓔ 10
45. Which one of the following pattern is Fibonacci? (Medium) [JB '17]
 ⓑ 1, 2, 3, 4, 5, 7 ⓒ 4, 6, 8, 9, 12, 15.....
ⓒ ⓒ 0, 1, 1, 2, 3, 5, 8 ⓓ 1, 5, 9, 13, 19.....
46. Which one of the following is the Fibonacci number's pattern? (Medium) [CB '17]
 ⓑ 3, 6, 9, 12, 15, ⓒ 2, 4, 8, 16, 32,
ⓒ ⓒ 2, 3, 5, 8, ⓓ 2, 4, 6, 8, 10,
47. How many prime numbers are there from 25 to 50? (Easy) [SB '17]
ⓒ ⓑ 4 ⓒ 5 ⓓ 6 ⓔ 7
48. What is the value of A if 31 is expressed in the form $(3A + 1)$? (Medium) [SB '17]
ⓒ ⓑ 8 ⓒ 9 ⓓ 10 ⓔ 11
49. What is the next number of the series 9, 4, -1, -6,? (Medium) [BB '17]
ⓒ ⓑ -16 ⓒ -15 ⓓ -11 ⓔ -7
50. Find the next number of the following list? —4, —1, 4, 11, 20, (Medium) [DjB '17]
ⓐ ⓑ 31 ⓒ 35 ⓓ 39 ⓔ 41
51. What will be the number of the empty box? (Medium) [Viqarunnisa Noon School & College, Dhaka; DjB '17]
 1, 3, 27, 81,
ⓒ ⓑ 5 ⓒ 6 ⓓ 9 ⓔ 12
52. How many prime numbers from 1 to 50? (Easy) [DB '16]
ⓒ ⓑ 10 ⓒ 12 ⓓ 15 ⓔ 20
53. What type of number pattern
 $0, 1, 1, 2, 3, 5, 8, 13, \dots$ are? (Medium) [DB '16]
 ⓑ Consecutive ⓒ Fibonacci
ⓑ ⓒ Odd ⓓ Geometric
54. What is the next number of the pattern 1, 4, 10, 19, 31? (Medium) [RB '16]
ⓒ ⓑ 34 ⓒ 43 ⓓ 46 ⓔ 49
55. Which expression is used for 7, 11, 15, 19 pattern? (Medium) [RB '16]
 ⓑ $(5x + 2)$ ⓒ $(4x + 3)$
ⓑ ⓒ $(8x - 1)$ ⓓ $(4x - 3)$
56. How many prime numbers from 1 to 10? (Medium) [JB, SB '16]
ⓑ ⓑ 3 ⓒ 4 ⓓ 5 ⓔ 10
57. 0, 1, 1, 2, 3, 5, What is the pattern of the above numbers? (Medium) [JB '16]
 ⓑ Prime ⓒ Composite
ⓒ ⓒ Fibonacci ⓓ Co-prime
58. What is the next number of the list 2, 3, 5, 8, 12,? (Medium) [CB '16]
ⓒ ⓑ 15 ⓒ 16 ⓓ 17 ⓔ 18
59. What is the sum of the first 20 odd natural numbers? (Hard) [CB '16]
ⓐ ⓑ 100 ⓒ 210 ⓓ 361 ⓔ 400
60. What is the number of prime numbers between 1 to 20? (Easy) [CtgB '16]
ⓓ ⓑ 5 ⓒ 6 ⓓ 7 ⓔ 8



61. What is 10th term of the pattern 2, 5, 8, 11, 14 ? (Medium) [CtgB '16]
C @ 31 @ 30 @ 29 @ 28
62. Which one is the smallest prime number? (Medium) [SB, DjB '16]
b @ 3 @ 2 @ 1 @ -1
63. If 100th term of $4n + 3$ is 403, then which one is 50th term? (Hard) [SB '16]
b @ 201.5 @ 203 @ 303 @ 806
64. What is the next number of the pattern 3, 9, 19, 33, ? (Medium) [DjB '16]
C @ 43 @ 47 @ 51 @ 52
65. $1 + 2 + 3 + 4 + 5 + \dots + 20 = ?$ (Hard)
C @ 21 @ 35 @ 163 @ 210
66. For the natural numbers— [BB '19]
i. 37 is the 7th term of the pattern $(5a + 2)$
ii. 28 is the 5th term of 8, 13, 18,
iii. 80 is the 10th term of $a^2 - 1$
Which one is correct? (Medium)
a @ i & ii @ i & iii @ ii & iii @ i, ii & iii
67. i. Artistic designs on different constructions is called geometric pattern
ii. 1, 2, 3, 4, 5, 6, is a number pattern
iii. The sum of any two or more natural odd numbers beginning from 1 is a square number
Which one of the following is correct? (Medium)
d @ i & ii @ ii & iii @ i & iii @ i, ii & iii
68. i. 1, 4, 9, 16, 25, represents a pattern of square of natural numbers
ii. The sum of odd natural numbers upto 15 is a square number
iii. The next number of the list of numbers of 0, 3, 3, 6, 9, is 12
Which one of the following is correct? (Medium)
d @ i & iii @ ii & iii @ i & ii @ i, ii & iii
69. The pattern 2, 3, 5, 7, 11, is—. [DjB '19]
i. the pattern of positive integers
ii. the pattern of odd numbers
iii. the pattern of prime numbers
Which one is correct? (Medium)
b @ i & ii @ ii & iii @ i & iii @ i, ii & iii
70. 0, 1, 1, 2, 3, 5, [MB '19]
i. These are Fibonacci numbers
ii. 7th term is 8
iii. The summation of the first eighth term is 33
Which one is correct? (Medium)
d @ i & ii @ i & iii @ ii & iii @ i, ii & iii
71. 1, 3, 5, 7, 31 numbers are—. [BB '18]
i. fundamental numbers
ii. odd numbers
iii. having the sum 256
Which one of the following is correct? (Medium)
C @ i & ii @ i & iii @ ii & iii @ i, ii & iii
72. From 1 to 10—. [CtgB '17]
i. Number of Prime numbers is 4
ii. The sum of the odd numbers is 25
iii. The odd square number is 1
Which one is correct? (Medium)
b @ i & iii @ i & ii @ ii & iii @ i, ii & iii

73. $a^2 - 1$ is an algebraic expression, whose [BB '17]
i. 1st term is 0
ii. the sum of the first three terms is 11
iii. every term is odd number
Which one is correct? (Hard)
a @ i & ii @ i & iii @ ii & iii @ i, ii & iii
■ 2, 4, 6, 8, 10, are some numbers.
Answer to the questions No. 74 and 75 based on the following information : [RAJUK Uttara Model College, Dhaka]
74. What type of numbers are these? (Easy)
@ Even numbers @ Odd numbers
a @ Negative numbers @ Irrational number
75. What is the next number of the pattern? (Medium)
b @ 2 @ 12 @ 18 @ 20
■ Answer to the questions No. 76 and 77 based on the following information : Dola wrote consecutive natural numbers from 1 to 20.
76. How many odd numbers are there in written number of Dola. (Hard)
b @ 9 @ 10 @ 11 @ 20
77. What is the sum of odd numbers written by her? (Hard)
C @ 10 @ 20 @ 100 @ 210
- 1.3 Expression of a number as the sum of squares of two natural numbers ► Textbook Page 5
78. $3^2 + 4^2 = ?$ (Easy)
C @ 7 @ 14 @ 25 @ 49
► Explanation : $3^2 + 4^2 = 9 + 16 = 25$
79. $5^2 + 7^2 = ?$ (Medium)
d @ 17 @ 24 @ 39 @ 74
► Explanation : $5^2 + 7^2 = 25 + 49 = 74$
80. Between 1 to 20, how many numbers can be expressed as the sum of two squares? (Hard) [CtgB '19]
d @ 3 @ 4 @ 5 @ 6
81. If the algebraic expression of a pattern is $a^2 - 1$, which one of the following is 4th term? (Hard) [SB '19]
b @ 7 @ 15 @ 17 @ 24
82. How many ways the number 26 can be expressed as a sum of two distinct prime numbers? (Medium) [DjB '19]
d @ 0 @ 1 @ 2 @ 3
83. Which one of the following number cannot be expressed as the sum of two numbers square? (Hard) [DjB '18]
C @ 10 @ 13 @ 16 @ 50
84. Which one of the following algebraic expression represents a pattern of 0, 3, 8, 15, 24 (Medium) [JB '17]
b @ $2a + 1$ @ $a^2 - 1$ @ $a^2 + 1$ @ $2a^2 - 1$
85. How many numbers can be expressed as a sum of two squares between 1 and 100? (Medium) [BB '17]
d @ 30 @ 31 @ 32 @ 35
86. Which one is the expression of the following pattern? (Hard) [DjB '17]
@ 0, 3, 8, 15, 24,?
C @ $2n^2 - 1$ @ $2n^2 + 1$ @ $n^2 - 1$ @ $n^2 + 1$

87. $n^2 - 1 = 24$, then what is the value of n ? (Hard) [SB '16]

C @ 3 B @ 4 C @ 5 D @ 6

88. For algebraic expression $(A^2 - 1)$ — [CB '19]

- i. 1st term is zero
ii. The sum of first 4 numbers is 26
iii. The difference of consecutive two terms is 5

Which one is correct? (Medium)

- A @ i & ii B @ i & iii C ii & iii D i, ii & iii

89. For the natural numbers— [JB '16]

- i. 15 is the magic square of order 3
ii. $6^2 + 8^2 = 14^2$
iii. The sum of natural numbers from 1 to 10 is 55

Which one is correct? (Hard) [Milestone College, Dhaka]

- B @ i & ii B @ i & iii C ii & iii D i, ii & iii

90. Answer to the questions No. 90 and 91 based on the following information :

4	9	8
11	A	3
6	5	10

← is a magic square of order 3 [JB '18]

90. Which one is the appropriate number for marked 'A' in the square? (Easy)

C @ 21 B @ 12 C @ 7 D @ 2

91. What is the magic number of the given magic square? (Medium)

D @ 2 B @ 7 C @ 12 D @ 21

1.4 Formation of Magic Square → Textbook Page 6

92. What is the magic number of order 7? (Hard) [RAJUK Uttara Model College, Dhaka]

A @ 175 B @ 135 C @ 145 D @ 185

► Explanation : Magic number of order 'A' = $\frac{A(A^2 + 1)}{2}$

$$\text{Magic number of order } 7 = \frac{7(7^2 + 1)}{2} = \frac{7(49 + 1)}{2} \\ = \frac{7 \times 50}{2} = 175$$

93. What is the magic number of order 6? (Medium) [Cantonment Public School & College, Rangpur]

A @ 111 B @ 65 C @ 34 D @ 15

► Explanation : Magic number of order 'A' = $\frac{A(A^2 + 1)}{2}$

$$\text{Magic number of order } 6 = \frac{6(6^2 + 1)}{2} \\ = \frac{6 \times 37}{2} = 111$$

94. What is magic number of magic square of order 5? (Medium) [RB '19]

C @ 25 B @ 26 C @ 65 D @ 130

4	11	6	11
A	7	5	11
8	3	10	11

← A magic square

What would be the right number in the square marked 'A'? (Hard) [JB '19]

C @ 1 B @ 2 C @ 9 D @ 11 E @ 6

96. What is the sum of diagonal of magic square of order 4? (Medium) [CB '19]

C @ 15 B @ 16 C @ 34 D @ 65

97. Which one is the magic number of magic square of order 4? (Medium) [DB '18]

C @ 16 B @ 17 C @ 34 D @ 68

98. Which one of the following is the magic number of magic square of order 4? (Medium) [CB '18]

C @ 15 B @ 17 C @ 34 D @ 40

99. Which one of the following is the magic number of magic square of order 3? (Hard) [CB '17]

B @ 12 B @ 15 C @ 16 D @ 34

100. To form a 3-order magic square, which number will be set in the small square in the centre. (Hard) [CtgB '17]

C @ 1 B @ 3 C @ 5 D @ 7

101. Which is the magic number of a magic square of order 5? (Medium) [SB '17]

B @ 81 B @ 65 C @ 55 D @ 34

102. What is the magic number for the magic square of order 5? (Medium) [DB '16]

D @ 34 B @ 35 C @ 60 D @ 65

103. Which one is the magic number for the magic square of order 4? (Medium) [RB '16]

B @ 32 B @ 34 C @ 36 D @ 40

104. What is the value in the blank cell? [CB '16]

12	5	10
7	9	11
8	13	

D @ 2 B @ 3 C @ 4 D @ 6

105. For the natural numbers— [CtgB '18]

i. 31 is the 10th term of the pattern $(3a + 1)$

ii. 15 is the magic number of magic square of order 3

iii. there are 5 prime numbers from 1 to 10

Which one of the following is correct? (Medium)

A @ i & ii B @ i & iii C ii & iii D i, ii & iii

1.5 Playing with numbers → Textbook Page 7

106. Take any two-digit number. Interchange the digits of the number and add to the original number. By what number will it be divisible? (Hard) [Ideal School & College, Dhaka]

C @ 9 B @ 10 C @ 11 D @ 12

107. If the sum of 23 and number obtained by interchanging digits is divided by 11, then what will be the remainder? (Medium)

A @ 0 B @ 1 C @ 2 D @ 3

108. What is the sum of a two digit number 45 and number obtained by interchanging the digits? (Medium)

B @ 100 B @ 99 C @ 90 D @ 89

109. The sum of the original number and the number obtained by interchanging the digits of 45 digits is always divisible by which of the following? (Hard)

B @ 19 B @ 11 C @ 71 D @ 13

110. If 43 and the subtraction of the number obtained by exchanging its two digits is divided by 9, what will be the quotient? (Hard)

- a) @ 0 b) 1 c) 3 d) 5

111. What is the difference of the number obtained by exchanging the places of 72 and its two digits? (Medium)

- a) @ 45 b) 50 c) 60 d) 40

112. What will be the result of subtracting 321 from the larger number obtained by writing it inversely? (Easy)

- a) @ 198 b) 220 c) 189 d) 178

113. What is the quotient of the three-digit number 754 and its opposite number after subtracting the smaller one from the larger one and dividing the subtraction by 99? (Hard)

- c) @ 2 b) 3 c) 0 d) 1

1.6 Geometric pattern ➔ Textbook Page 7

114. 3, 5, 7, 9 what is the general term? (Medium) [Dhaka Residential Model College, Dhaka]

- a) @ $2A$ b) $2A$ c) $A + 1$ d) $3A - 2$

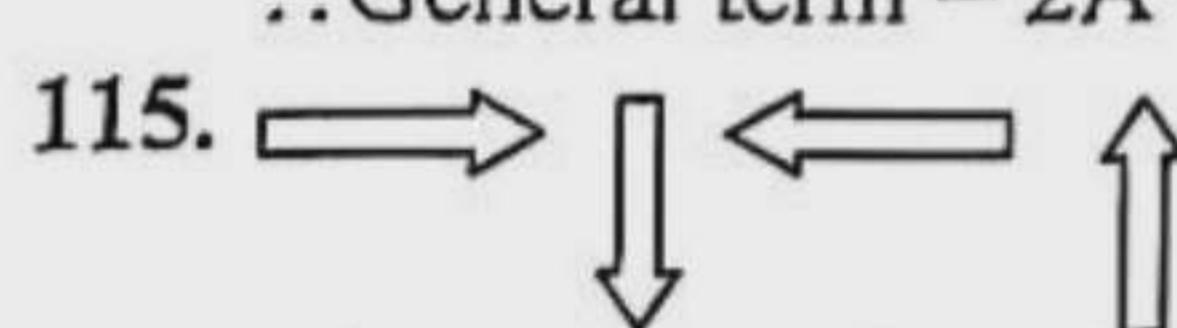
► Explanation : Here, $3 = 2 \times 1 + 1$

$$5 = 2 \times 2 + 1$$

$$7 = 2 \times 3 + 1$$

$$9 = 2 \times 4 + 1$$

∴ General term = $2A + 1$



What is the 11th shape of the pattern? (Hard)

- b) @ ↓ b) ← c) → d) ↑

■ Follow the attached figure :



116. What are called the above figures? (Easy)

- a) Geometric pattern b) Natural pattern

- a) c) Algebraic pattern d) Arithmetic pattern

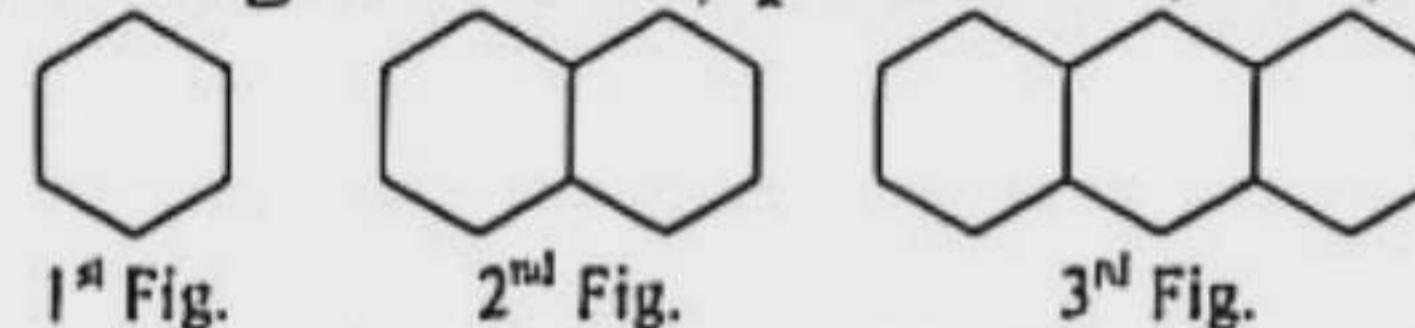
117. What is the algebraic expression of geometric pattern shown in figure (iii)? (Medium)

- a) @ $3n + 1$ b) $5n + 1$ c) $5n + 2$ d) $3n + 3$

118. How many sticks are required to construct the figure 2? (Hard)

- b) @ 8 b) 7 c) 6 d) 10

119. How many number of sticks are there in the 4th figure of the pattern? (Hard) [RB '18]



- b) @ 20 b) 21 c) 23 d) 24



Find the number of sticks in the fourth pattern. (Hard) [SB '16; DjB '15]

- d) @ 5 b) 7 c) 8 d) 9

121. In the algebraic expression ($A^2 - 1$)

i. 1st term is zero

ii. Sum of 1st 4 terms is 26.

iii. Difference of two consecutive number is 5.

Which one of the following is correct? (Easy)

[CB '19]

- a) @ i & ii b) i & iii c) ii & iii d) i, ii & iii

122. In case of natural numbers –

i. 7th term of $5A + 2$ expression is 37.

ii. 8, 13, 18..... 5th term is 28.

iii. 10th term of $A^2 - 1$ is 80.

Which one of the following is correct? (Medium)

[BB '19]

- a) @ i & ii b) i & iii c) ii & iii d) i, ii & iii

■ The following figure is prepared by some sticks.



Answer question 123 and 124 on the basis of above information :

123. Numbers of sticks in the figure (Easy)

- @ 5, 9 & 13 b) 5, 10, 15

- a) c) 13, 9 & 5 d) 6, 10, 16

124. Number of next sticks — (Medium)

- c) @ 7 b) 14 c) 17 d) 22

■ Answer to the questions no. 125 and 126 based on the following information :

$(2A + 1)$ is an algebraic expression.

125. What is the 1st term of the expression? (Easy)

- d) @ 0 b) 1 c) 2 d) 3

126. What is the 10th term of the expression? (Medium)

- c) @ 1 b) 10 c) 21 d) 13



Short Q/A



Designed as per topic

► 1.1 Patterns

➔ Textbook Page 1

Question 1. What do you mean by pattern?

Ans. A pattern refers to a structure, sequence or design that follows a certain rule and is repeated several times. For example, a child's red-blue block separation is a pattern.

► Patterns of Natural Numbers

➔ Textbook Page 2

Question 2. Find the next two numbers from the following list of numbers: 7, 10, 13, 16, 19,

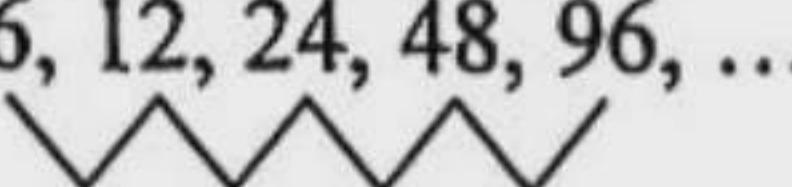
Ans. Given numbers in the list 7, 10, 13, 16, 19, ...



Difference between two consecutive numbers 3 3 3 3

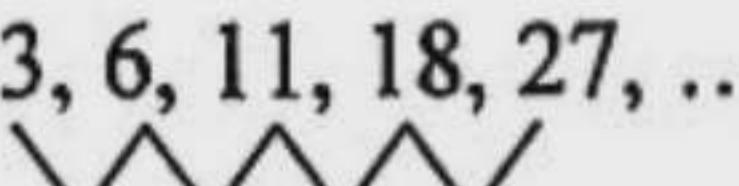
Note that each time the difference is 3.
Hence the next two numbers are $(19 + 3) = 22$ and $(22 + 3) = 25$.
The next required number are 22 and 25.

Question 3. Find the next two numbers from the following list of numbers: 6, 12, 24, 48, 96, ...

Ans. Given numbers are 

Difference between two consecutive numbers 6 12 24 48
Note that each time the difference increases by doubling.
Hence the next two numbers will be respectively
 $96 \times 2 = 192$ and $192 \times 2 = 384$

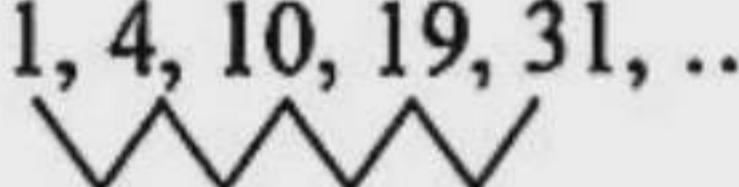
Question 4. Find the next number in the list 3, 6, 11, 18, 27, ...

Ans. Given numbers are 

Difference between two consecutive numbers 3 5 7 9
Note that each time the difference increases by 2.
The next number will be $= 27 + (9 + 2) = 27 + 11 = 38$

The next required number is 38.

Question 5. Find the next two terms in the list 1, 4, 10, 19, 31, ...

Ans. Numbers in the list are 

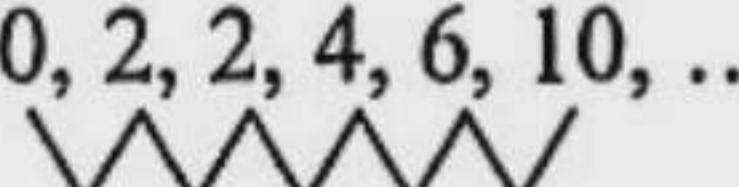
Difference between two consecutive numbers 3 6 9 12
Note that each time the difference increases by 3.
 \therefore The next two numbers in the list are respectively,

$$31 + (12 + 3) = 31 + 15 = 46$$

$$\text{And } 46 + (15 + 3) = 46 + 18 = 64$$

The next required two numbers are 46 and 64.

Question 6. Find the next two terms in the list 0, 2, 2, 4, 6, 10, ...

Ans. Numbers in the list are 

Sum of two consecutive numbers 2 4 6 10 16
Note that the sum of two consecutive numbers is equal to the next number.

The next two numbers in the list are respectively $6 + 10 = 16$

$$\text{And } 10 + 16 = 26$$

The next two required numbers are 16 and 26.

Question 7. Find the next two numbers in the list -4, -1, 4, 11, 20, ...

Ans. Given numbers are 

Difference between two consecutive numbers 3 5 7 9
Note that each time the difference increases by 2.

\therefore The next two numbers are respectively,

$$20 + (9 + 2) = 20 + 11 = 31$$

$$\text{And } 31 + (11 + 2) = 31 + 13 = 44$$

The two required numbers are 31 and 44.

Question 8. What are prime numbers? What are the prime numbers from 21 to 43?

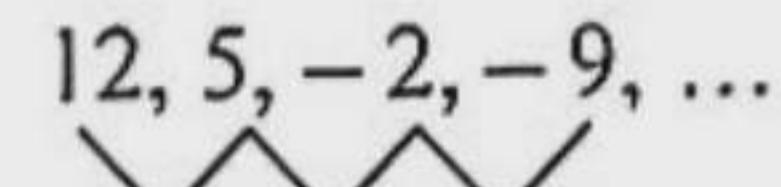
Ans. The numbers those are greater than 1 and having no factor other than 1 and itself are prime number.

The prime numbers from 21 to 43 are 23, 29, 31, 37, 41, 43.

So, there are 6 prime numbers from 21 to 43.

Question 9. Find the difference of two consecutive numbers and the next number from the list 12, 5, -2, -9, ...

Ans. Given list



Difference between two consecutive numbers -7 -7 -7

Note that each time the difference decreases by 7.

\therefore The next number in the list $= -9 - 7 = -16$

Required difference of two consecutive numbers is -7 and the next number is -16.

Question 10. What is Fibonacci Pattern? Give example.

Ans. A pattern that starts with 0 and 1 and increases continuously and each of the number is equal to the sum of the two preceding numbers is called a Fibonacci pattern.

0, 1, 1, 2, 3, 5, 8, 13, the pattern is a Fibonacci pattern.

Question 11. 0, 1, 1, 2, 3, 5, What is the pattern known as and why?

Ans. 0, 1, 1, 2, 3, 5, the pattern is known as Fibonacci number pattern. Because the sum of two consecutive numbers is equal to the next number.

Question 12. Find the next two digits of the numbers : 1, 4, 5, 9, 14, 23, ...

Ans. Given numbers are 

Sum of two consecutive numbers 5 9 14 23 37

Note that each time the sum of two consecutive numbers is equal to the next number.

Therefore, the next two numbers are respectively

$$23 + 14 = 37 \mid 37 + 23 = 60$$

Required next two numbers are 37 and 60.

Question 13. Write the formula for determining the sum of consecutive natural numbers.

Ans. Sum of consecutive natural numbers
$$= \frac{(\text{first number} + \text{last number}) \times \text{number of terms}}{2}$$

Question 14. Find the sum of consecutive natural numbers from 1 to 25.

Ans. Sum of consecutive natural numbers from 1 to 25 :

$$1 + 2 + 3 + 4 + 5 + \dots + 25$$

Here, 1st number = 1; Last number = 25; Number of terms = 25

$$\text{Sum} = \frac{(\text{first number} + \text{last number}) \times \text{number of terms}}{2}$$

$$= \frac{(1 + 25) \times 25}{2} = \frac{26 \times 25}{2} = 325$$

Required sum is 325.



Question 15. Find the sum of the first 25 odd natural numbers.

Ans. We know,

$$\text{Sum of first } n \text{ consecutive odd natural numbers} = n^2.$$

$$\text{Sum of first 25 odd natural numbers} = 25^2 = 625$$

Required sum of first 25 odd natural numbers is 625.

Question 16. Find the sum of first 10 even natural numbers.

Ans. We know,

$$\text{Sum of first } n \text{ consecutive even natural numbers} = n(n+1)$$

$$\begin{aligned}\therefore \text{Sum of first 10 even natural numbers} &= 10(10+1) \\ &= 10 \times 11 \\ &= 110\end{aligned}$$

Required sum is 110.

Question 17. Find the 50th term of $(2n + 1)$.

Ans. Given algebraic equation is $2n + 1$

50th term of the expression $(2n + 1)$

$$\begin{aligned}&= 2 \times 50 + 1 \\ &= 100 + 1 = 101\end{aligned}$$

The 50th term of $(2n + 1)$ is 101.

Question 18. Find the difference between the 1st and 2nd terms of the pattern expressed by algebraic expression $(5n - 2)$.

Ans. 1st term of the pattern expressed by algebraic expression $(5n - 2)$

$$1\text{st term} = 5 \times 1 - 2 = 5 - 2 = 3$$

$$2\text{nd term} = 5 \times 2 - 2 = 10 - 2 = 8$$

$$\therefore \text{Difference of 1st and 2nd terms} = 8 - 3 = 5$$

Required difference of 1st and 2nd terms is 5.

Question 19. Find the sum of the 4th and 5th terms of the algebraic expression expressed by $n^2 + 3$.

Ans. Given algebraic expression = $n^2 + 3$

$$\therefore 4\text{th term} = 4^2 + 3 = 16 + 3 = 19$$

$$\text{And 5th term} = 5^2 + 3 = 25 + 3 = 28$$

$$\therefore \text{Sum of 4th and 5th term} = 19 + 28 = 47$$

Required sum of 4th and 5th term = 47.

1.3 Expression of a number as the sum of squares of two natural numbers → Textbook Page 5

Question 20. Express 29 and 37 as the sum of two squares.

Ans. 29 and 37 are expressed as the sum of two squares :

$$29 = 4 + 25 = 2^2 + 5^2$$

$$\text{And } 37 = 1 + 36 = 1^2 + 6^2$$

Question 21. Express 25 and 34 as the sum of two squares.

Ans. 25 and 34 are expressed as the sum of two squares :

$$25 = 9 + 16 = 3^2 + 4^2$$

$$\text{And } 34 = 9 + 25 = 3^2 + 5^2$$

Question 22. Express 41 and 58 as the sum of two squares.

Ans. 41 and 58 are expressed as the sum of two squares :

$$41 = 16 + 25 = 4^2 + 5^2$$

$$\text{And } 58 = 9 + 49 = 3^2 + 7^2$$

Question 23. Express 50 and 61 as the sum of the squares of two numbers.

Ans. 50 and 61 are expressed as the sum of the squares of two numbers :

$$50 = 1 + 49 = 1^2 + 7^2$$

$$\text{And } 61 = 25 + 36 = 5^2 + 6^2$$

Question 24. Express 145 in two different ways as the sum of the squares of two numbers.

Ans. 145 is expressed as the sum of the squares of two numbers in two different ways :

$$145 = 1 + 144 = 1^2 + (12)^2$$

$$145 = 64 + 81 = 8^2 + 9^2$$

Question 25. Express 185 in two ways as the sum of two squares.

Ans. 185 is expressed as the sum of the squares of two numbers in two ways :

$$185 = 16 + 169 = 4^2 + 13^2$$

$$185 = 64 + 121 = 8^2 + 11^2$$

Question 26. Express 325 as the sum of two squares in two different ways.

Ans. 325 is expressed as the sum of two squares in two different ways :

$$325 = 1 + 324 = 1^2 + 18^2$$

$$325 = 100 + 225 = 10^2 + 15^2$$

Question 27. Express 40 as the difference of two squares and 100 as the sum of two squares.

Ans. 40 is expressed as the difference of two squares :

$$40 = 49 - 9 = 7^2 - 3^2$$

100 is expressed as the sum of two squares :

$$100 = 36 + 64 = 6^2 + 8^2$$

Question 28. Express 80 as the sum of the squares of two integers and the difference of the squares of two integers.

Ans. 80 is expressed as the sum of the squares of two integers :

$$80 = 16 + 64 = 4^2 + 8^2$$

And 80 is expressed as the difference of the squares of two integers :

$$80 = 81 - 1 = 9^2 - 1^2$$

Question 29. Express 20 as the difference of two squares and 41 as the sum of two squares.

Ans. 20 is expressed as the difference of two squares :

$$20 = 36 - 16 = 6^2 - 4^2$$

41 is expressed as the sum of two squares :

$$41 = 25 + 16 = 5^2 + 4^2$$

Question 30. Express 531 and 420 as the sum of three squares.

Ans. 531 and 420 are expressed as the sum of three squares :

$$531 = 1 + 169 + 361 = 1^2 + 13^2 + 19^2$$

$$\text{And } 420 = 4 + 16 + 400 = 2^2 + 4^2 + 20^2$$

Question 31. Express 265 in two different ways as the sum of the squares of two natural numbers.

Ans. 265 is expressed as the sum of the squares of two natural numbers in two different ways :

$$265 = 144 + 121 = 12^2 + 11^2$$

$$265 = 256 + 9 = 16^2 + 3^2$$

Question 32. Express 130 in two different ways as the sum of the squares of two numbers.

Ans. 130 is expressed as the sum of the squares of two numbers in two different ways :

$$130 = 9 + 121 = 3^2 + 11^2$$

$$130 = 49 + 81 = 7^2 + 9^2$$

Question 33. Express the 6th term as the sum of two squares of the list 9, 14, 19, 24, ...

Ans. The numbers in the list are $\underbrace{9, 14, 19, 24, \dots}$

Difference between two consecutive numbers 5 5 5

Note that each time the difference is 5.

∴ 5th number in the list = $24 + 5 = 29$

$$\text{6th number} = 29 + 5 = 34$$

.....

∴ If 34 is expressed as the sum of two squares,

$$34 = 9 + 25 = 3^2 + 5^2$$

Question 34. Find the 11th term of the algebraic expression $(n^2 - 4)$ and express it as the sum of two squares.

Ans. Given algebraic expression = $(n^2 - 4)$

∴ The 11th term = $11^2 - 4 = 121 - 4 = 117$

Now, 117 is expressed as the sum of two squares :

$$117 = 36 + 81 = 6^2 + 9^2$$

Requires 11th term is 117 and the sum of two squares $6^2 + 9^2$.

Question 35. Express the fifth term of the algebraic expression $(3n + 2)$ as the sum of two squares.

Ans. Given algebraic expression = $3n + 2$

$$\begin{aligned}\text{The fifth term of the expression} &= 3 \times 5 + 2 \\ &= 15 + 2 = 17\end{aligned}$$

17 is expressed as the sum of two squares :

$$17 = 1 + 16 = 1^2 + 4^2$$

The required form expressed as the sum of two squares : $17 = 1^2 + 4^2$.

Question 36. Express the 5th term of the algebraic expression $(5n + 1)$ as the sum of two squares.

Ans. The 5th term of the algebraic equation $(5n + 1) = 5 \times 5 + 1 = 25 + 1 = 26$

26 is expressed as the sum of two squares :

$$26 = 1 + 25 = 1^2 + 5^2$$

Question 37. Express the 13th term of the algebraic expression $(n^2 - 24)$ as the sum of two numbers.

Ans. The 13th term of the algebraic equation $(n^2 - 24) = 13^2 - 24 = 169 - 24 = 145$

Now, $145 = 81 + 64 = 9^2 + 8^2$

► 1.4 Formation of Magic Square → Textbook Page 6

Question 38. What is magic square?

Ans. If a square is divided into equal number of smaller cells along the length and breadth, and then consecutive natural numbers are placed in the cells in such a way that the sum of the numbers in each row, column, and diagonal is the same, it is called magic square.

Question 39. Form a magic square of order 4, where the least natural number is the first element of the square.

Ans. The least natural number is 1

Then the magic square is :

1	12	8	13
15	6	10	3
14	7	11	2
4	9	5	16

Question 40. Find the magic number of the magic square of order 7.

Ans. We know,

$$\text{Magic number of magic square of order } 'n' = \frac{n(n^2 + 1)}{2}$$

$$\therefore \text{Magic number of magic square of order 7} = \frac{7(7^2 + 1)}{2} = \frac{7 \times 50}{2} = 175$$

Required magic number is 175.

Question 41. What is the value of the cell marked 'n' in the following magic square?

4	11	6
n	7	5
8	3	10

← A magic square

Ans. If the numbers of the magic square of 3 order are added in each row, column or diagonal, then the sum = $4 + 11 + 6 = 21$

$$\therefore 4 + n + 8 = 21$$

$$\text{or, } n + 12 = 21$$

$$\text{or, } n = 21 - 12$$

$$\therefore n = 9$$

The required value of the cell marked 'n' is 9.

► 1.5 Playing with numbers → Textbook Page 7

Question 42. If the number 512 is written in reverse and the smaller number is subtracted from the larger number, what will be the quotient if the difference is divided by 99?

Ans. Given number is 512

Writing the number in reverse, we get, 215

Now, $512 - 215 = 297 = 3 \times 99$, which is divisible by 99 i.e. the quotient is zero.

∴ Dividing the difference by 99 leaves the quotient zero.

Question 43. Show that the sum of 79 and the number, obtained by interchanging its two digits, is a multiple of 11.

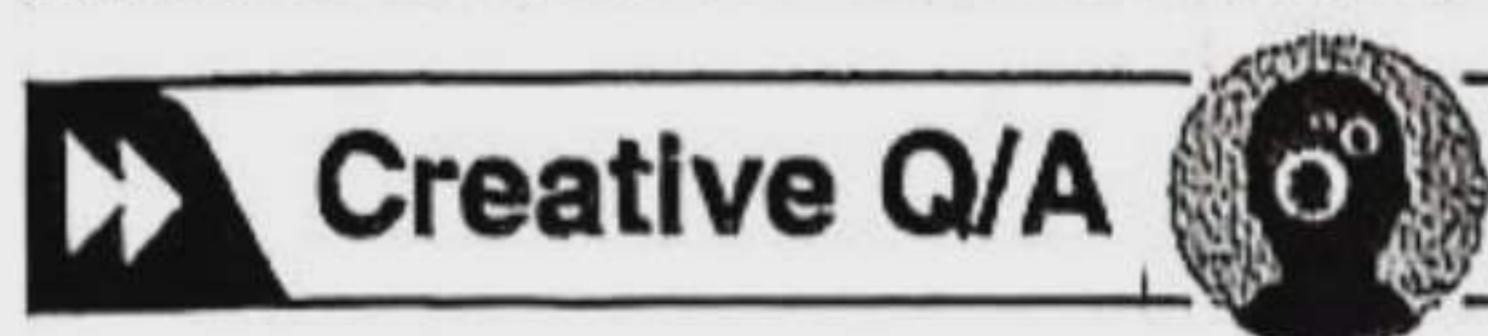
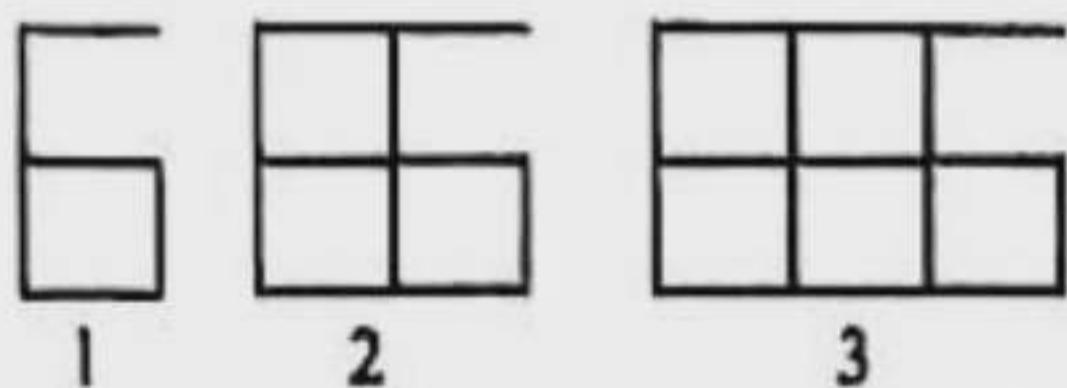
Ans. The number obtained by interchanging the two digits of the number 79 = 97

Sum of 79 and the number, obtained by interchanging its two digits

$$= 79 + 97 = 176$$

$$= 16 \times 11; \text{ which is a multiple of 11}$$

∴ Sum of 79 and the number, obtained by interchanging its two digits, is a multiple of 11. (shown)

**Ques. 01**

- a. Express the figures in terms of digits. 2
 b. Find the line segments required to construct the 4th pattern. 4
 c. Explain how you can find any number in the pattern. 4

Solution to Question No. 01 :

a. From figure 1, we have 6 segments of sticks of equal length.

From figure 2, we have, 11 segments of sticks of equal length.

From figure 3, we have 16 segments of sticks of equal length.

∴ The required pattern of numbers is 6, 11, 16, which expresses the geometric figures.

b. The given figures can be expressed in the pattern of numbers as under (from (a)) : 6, 11, 16.

It is observed from the above pattern that the difference of two consecutive numbers is 5.

So, the 4th number is $(16 + 5)$ i.e. 21.

∴ The number of line segments required to construct the 4th figure is 21.

c. According to (a) and (b), we can take the following pattern of numbers against the given figures : 6, 11, 16.

Here, difference between the two consecutive numbers is 5.

∴ We can write,

$$6 = 5n + 1, \text{ where } n = 1$$

$$11 = 5n + 1, \text{ where } n = 2$$

$$16 = 5n + 1, \text{ where } n = 3.$$

That is, the algebraic expression of the numbers in the pattern can be written in the form $5n + 1$ where $n = 1, 2, 3, \dots$

So, any number of the pattern can be by using the algebraic expression $5n + 1$.

Ques. 02 $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10$

is a series of first ten natural numbers.

- a. Find the sum of the first 5 odd natural numbers. 2
 b. Show that the sum of 1st 10 odd natural numbers is a perfect square number. 4
 c. Express the algebraic expression $3n + 2$ in a pattern of numbers. 4

Solution to Question No. 02 :

a. The first 5 odd natural numbers are 1, 3, 5, 7 and 9.

∴ The sum of the first 5 odd natural numbers

$$= (n)^2 = (5)^2 = 25 [n = 5].$$

∴ The required sum of the first 5 odd natural numbers is 25.

- b. The sum of the first 10 odd natural numbers is $= (n)^2 = (10)^2 = 100 [n = 10]$

Here $100 = (10)^2$ is a perfect square number.

So, it is showed that the sum of 1st ten odd natural numbers is a perfect square number.

- c. We have, $3n + 2$ is an algebraic expression where $n = 1, 2, 3, \dots$

Now, we can have a pattern of numbers putting $n = 1, 2, 3, 4, \dots$ as under :

$$\text{For } n = 1, 3n + 2 = 3.1 + 2 = 5$$

$$n = 2, 3n + 2 = 3.2 + 2 = 8$$

$$n = 3, 3n + 2 = 3.3 + 2 = 11$$

$$n = 4, 3x + 2 = 3.4 + 2 = 14$$

.....

.....

∴ The required pattern of numbers against the given algebraic expression is,
 $5, 8, 11, 14, \dots$

Ques. 03 7, 13, 19, 25, is a pattern.

- a. Express 325 as the sum of two squares in two different ways. 2

- b. Find the 52th term by forming an algebraic expression of the pattern. 4

- c. Find the sum of first 130 terms of the pattern. 4

• Dhaka Board 2019

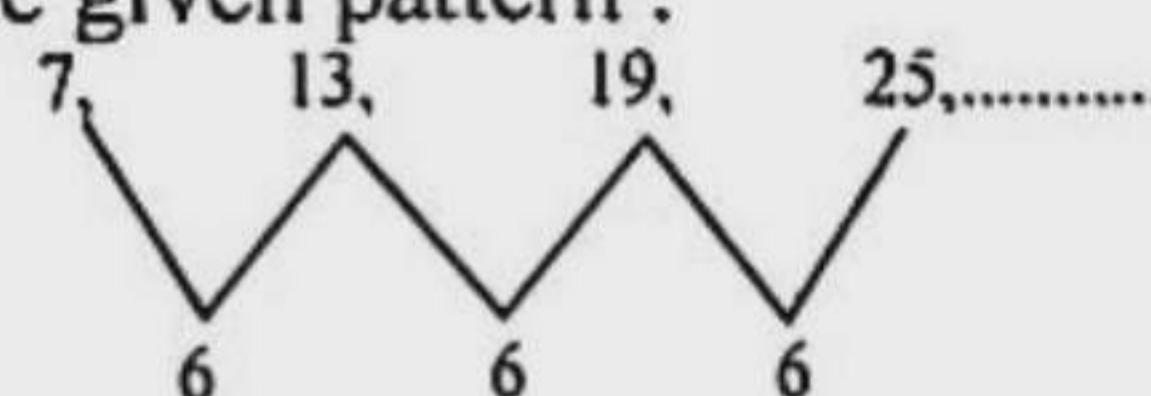
Solution to Question No. 03 :

a. Here, $325 = 1 + 324 = 1^2 + 18^2$

Again, $325 = 100 + 225 = 10^2 + 15^2$

Thus, $1^2 + 18^2$ and $10^2 + 15^2$ are two different forms of expression of 325.

- b. Here, the given pattern :



∴ The above pattern can be written as—

$$1^{\text{st}} \text{ term}, 7 = 6.1 + 1$$

$$2^{\text{nd}} \text{ term}, 13 = 6.2 + 1$$

$$3^{\text{rd}} \text{ term}, 19 = 6.3 + 1$$

$$4^{\text{th}} \text{ term}, 25 = 6.4 + 1$$

.....

.....

$$n^{\text{th}} \text{ term} = 6.n + 1$$

So, the given pattern can be expressed in the algebraic expression, $6n + 1$, where $n \in \mathbb{N}$.

∴ 52th term of the pattern = $6.52 + 1 = 313$ (Ans.)

- c. From 'b' above, we have the algebraic expression of the given pattern = $6n + 1$.

∴ 130th term of the expression = $6.130 + 1 = 781$

Now, the summation of the 1st 130 terms of the pattern = $7 + 13 + 19 + 25 + \dots + 781$.

Here, the 1st term = 7

the last term = 781

and number of terms = 130

$$\therefore \text{Summation} = \frac{7 + 781}{2} \times 130 = \frac{788}{2} \times 130 \\ = 788 \times 65 = 51220$$

So, the required sum of the 1st 130 terms of the given pattern is 51220.

Ques. 04 (i) 3, 8, 13, 18,

(ii) 7, 18, 29, 40, are two patterns of natural number.

- a. By finding the value of 11th term of algebraic expression ($a^2 - 4$) expresses it as the sum of two squares. 2
- b. Which algebraic expression is followed by pattern (i), present it with logic. 4
- c. Find the sum of the first 51 numbers of pattern (ii). 4

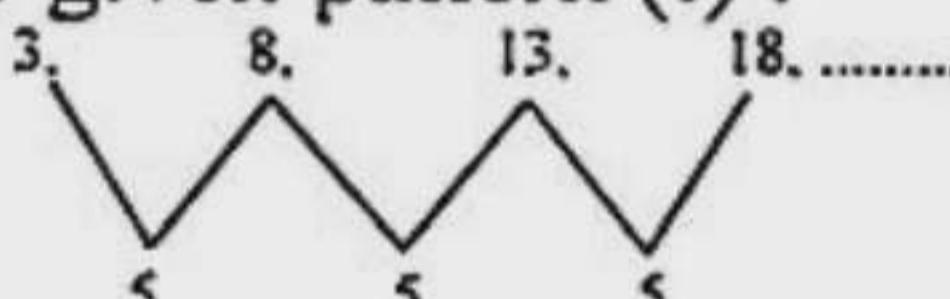
• Rajshahi Board 2019

Solution to Question No. 04 :

- a. Here, the algebraic expression = $a^2 - 4$
 $\therefore 11^{\text{th}}$ term of the algebraic expression = $11^2 - 4$
 $= 117$

Now, 117 is expressed as the sum of two squares below : $117 = 81 + 36 = 9^2 + 6^2$

- b. Here, the given pattern (i) :



difference : 5 5 5
Now, it is observed that, the difference between the two consecutive terms of the pattern is 5.

\therefore The terms of the given pattern can be expressed in the form of an algebraic expression in the following way :

1st term, 3 = 5 - 2 = 5.1 - 2

2nd term, 8 = 10 - 2 = 5.2 - 2

3rd term, 13 = 15 - 2 = 5.3 - 2

4th term, 18 = 20 - 2 = 5.4 - 2

.....

nth term = 5.n - 2, where n ∈ N

\therefore The algebraic expression of the given pattern (i) = 5n - 2.

- c. The given pattern (ii) :

7, 18, 29, 40, and it follows (11n - 4) an algebraic expression.

$$\therefore 51^{\text{th}} \text{ number of the pattern} = (11 \times 51 - 4) \\ = 557$$

Now, 1st number = 7

and, 51th number = 557

\therefore Sum of first 51 numbers of the pattern (ii)

$$= \frac{1^{\text{st}} \text{ term} + 51^{\text{th}} \text{ term}}{2} \times \text{Number of terms}$$

$$= \frac{7 + 557}{2} \times 51 = 14382$$

\therefore The determined sum is 14382.

Ques. 05 (i) 6, 10, 14, 18,

(ii) 5, 8, 11, 14,

- a. Find the next two consecutive numbers from the following list of numbers : 5, 6, 8, 11..... 2

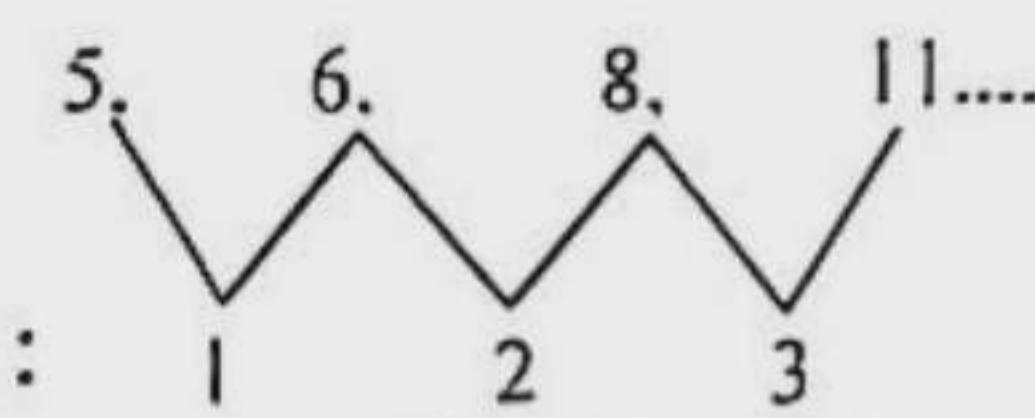
- b. Find the algebraic expression of the pattern (i) and find the 60th number. 4

- c. Find the sum of first 30 terms of the pattern (ii). 4

• Jashore Board 2019

Solution to Question No. 05 :

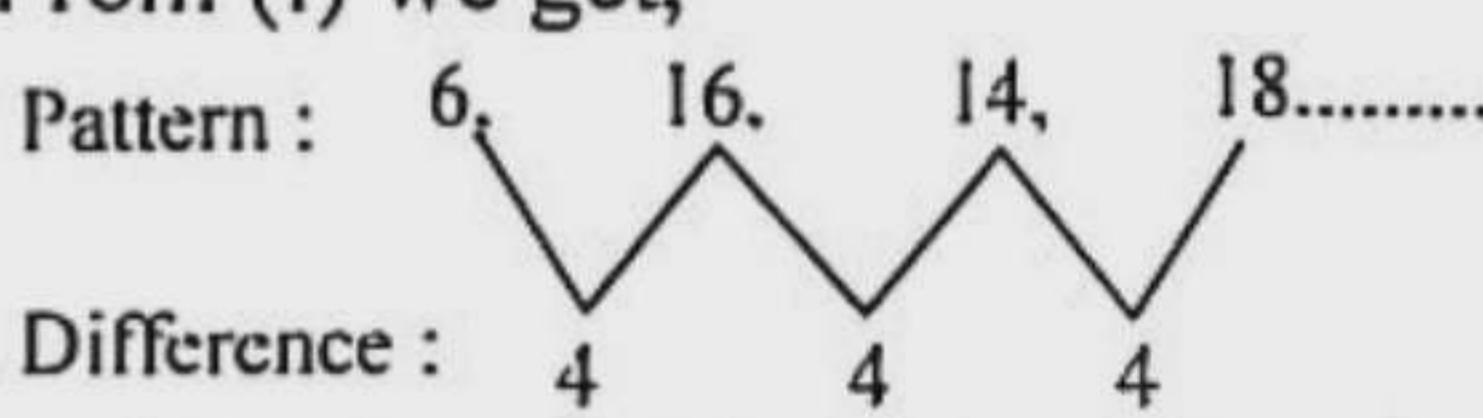
- a. Given, Pattern :



Difference : 1 2 3

Therefore next two terms are : $11 + 4 = 15$
 $15 + 5 = 20$ (Ans.)

- b. From (i) we get,



Difference : 4 4 4

Now, it is observed that the difference between the two consecutive terms of the pattern is 4.

The terms of the given pattern can be expressed in the form of an algebraic expression in the following way :

1st term, 6 = 4.1 + 2

2nd term, 10 = 4.2 + 2

3rd term, 14 = 4.3 + 2

.....

.....

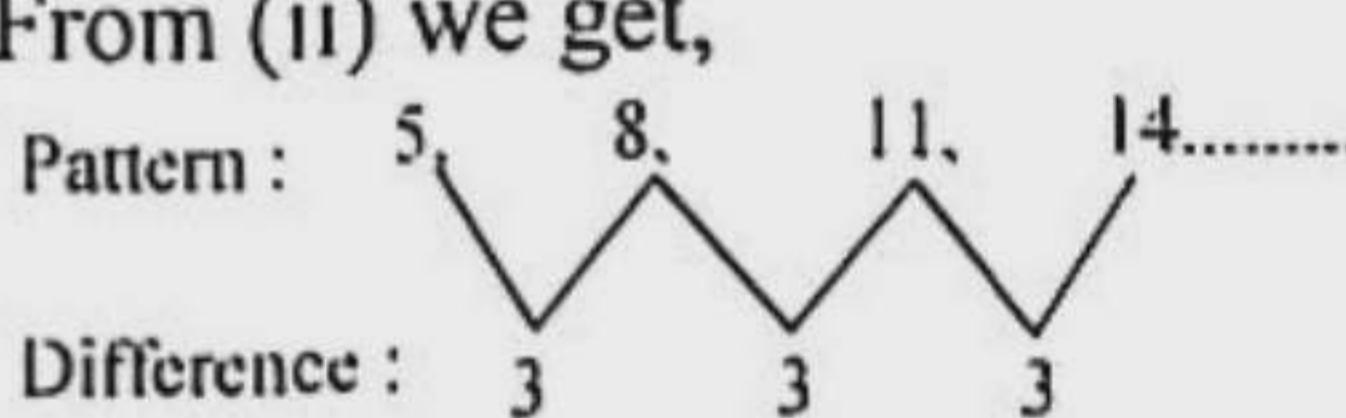
nth term = 4n + 2

\therefore Algebraic expression of the given pattern = 4n + 2

Therefore, 60th term of the pattern

$$= 4.60 + 2 = 240 + 2 = 242 \text{ (Ans.)}$$

- c. From (ii) we get,



Difference : 3 3 3

Now, it is observed that the difference between the two consecutive terms of the pattern is 3.

The terms of the given pattern can be expressed in the form of an algebraic expression in the following way :

1st term, 5 = 3.1 + 2

2nd term, 8 = 3.2 + 2

3rd term, 11 = 3.3 + 2

.....

.....

nth term = 3n + 2

\therefore Algebraic expression of the given pattern = 3n + 2

∴ 30th term of the pattern = $3 \times 30 + 2 = 90 + 2 = 92$

\therefore Sum of 1st 30 terms = $\frac{1^{\text{st}} \text{ term} + 30^{\text{th}} \text{ term}}{2} \times \text{Number of terms}$

$$= \frac{5 + 92}{2} \times 30 = 97 \times 15 = 1455 \text{ (Ans.)}$$

- Ques. 06** (i) 2, 9, 16, 23, and
(ii) 6, 11, 16, 21 are two number patterns.
a. Determine the 50th term of $(2A + 1)$. 2
b. To make the algebraic expression of the pattern
(i), determine the next 4 terms. 4
c. Which term of pattern (ii) is 1026? 4

• Cumilla Board 2019

Solution to Question No. 06 :

- a Given, algebraic expression = $2A + 1$
 $\therefore 50^{\text{th}}$ term of the expression = $2 \times 50 + 1$
= $100 + 1 = 101$ (Ans.)

- b From (i) we get,



Now, it is observed that the difference between the two consecutive terms of the pattern is 7.

\therefore The terms of the given pattern can be expressed in the form of an algebraic expression in the following way :

$$1^{\text{st}} \text{ term}, 2 = 7 - 5 = 7.1 - 5$$

$$2^{\text{nd}} \text{ term}, 9 = 14 - 5 = 7.2 - 5$$

$$3^{\text{rd}} \text{ term}, 16 = 21 - 5 = 7.3 - 5$$

$$4^{\text{th}} \text{ term}, 23 = 28 - 5 = 7.4 - 5.$$

.....

$$n^{\text{th}} \text{ term} = 7n - 5$$

\therefore Algebraic expression of the pattern = $7n - 5$; where $n \in \mathbb{N}$

$$\text{Now, } 5^{\text{th}} \text{ term of the pattern} = 7 \times 5 - 5 = 35 - 5 = 30$$

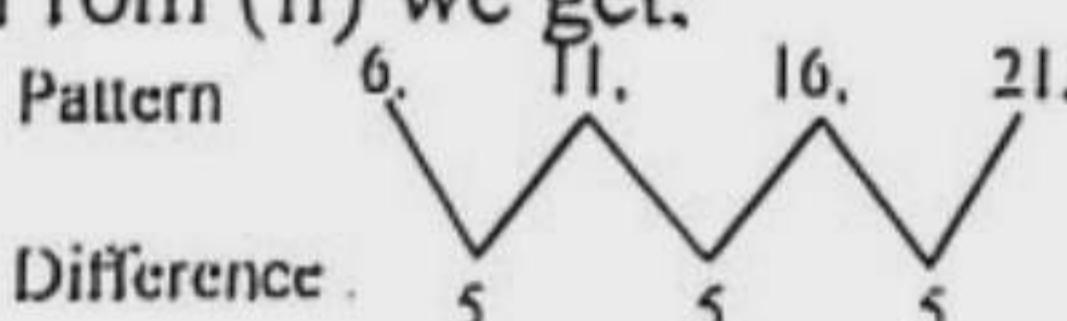
$$6^{\text{th}} \text{ term of the pattern} = 7 \times 6 - 5 = 42 - 5 = 37$$

$$7^{\text{th}} \text{ term of the pattern} = 7 \times 7 - 5 = 49 - 5 = 44$$

$$\text{and } 8^{\text{th}} \text{ term of the pattern} = 7 \times 8 - 5 = 56 - 5 = 51$$

\therefore Next 4 terms are 30, 37, 44, 51 (Ans.)

- c From (ii) we get,



Now, it is observed that the difference between the two consecutive terms of the pattern is 5.

The terms of the given pattern can be expressed in the form of an algebraic expression in the following way :

$$1^{\text{st}} \text{ term}, 6 = 5 + 1 = 5.1 + 1$$

$$2^{\text{nd}} \text{ term}, 11 = 10 + 1 = 5.2 + 1$$

$$3^{\text{rd}} \text{ term}, 16 = 15 + 1 = 5.3 + 1$$

$$n^{\text{th}} \text{ term}, 21 = 20 + 1 = 5.4 + 1$$

.....

$$n^{\text{th}} \text{ term} = 5n + 1$$

\therefore Algebraic expression of the pattern = $5n + 1$; where $n \in \mathbb{N}$

$$\text{Let, } n^{\text{th}} \text{ term} = 1026$$

$$\therefore 5n + 1 = 1026$$

$$\text{or, } 5n = 1026 - 1$$

$$\text{or, } 5n = 1025$$

$$\text{or, } n = \frac{1025}{5}$$

$$\therefore n = 205$$

$\therefore 205^{\text{th}}$ term is 1026 (Ans.)

- Ques. 07** – 1, 2, 5, 8, 11 is a pattern.

- a. Express 29 and 37 as the sum of two squares. 2
b. Which algebraic expression is followed by the pattern? Present it with logic. 4
c. Find the sum of the 30 numbers of the list. 4

• Chattogram Board 2019

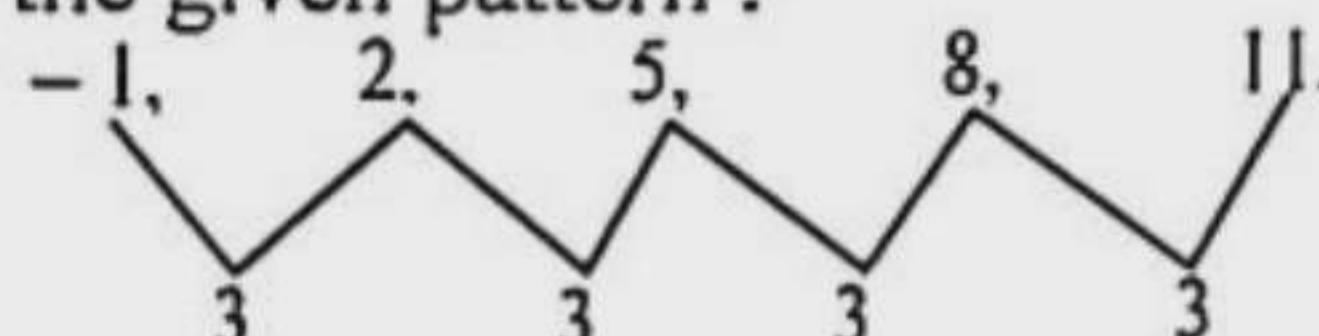
Solution to Question No. 07 :

- a 29 and 37 are expressed into sum of squares :

$$29 = 4 + 25 = 2^2 + 5^2$$

$$37 = 1 + 36 = 1^2 + 6^2$$

- b Here, the given pattern :



Now it is observed that, the difference between the two consecutive terms of the pattern is 3.

\therefore The terms of the given pattern can be expressed in the form of an algebraic expression in the following way :

$$1^{\text{st}} \text{ term}, -1 = 3 - 4 = 3.1 - 4$$

$$2^{\text{nd}} \text{ term}, 2 = 6 - 4 = 3.2 - 4$$

$$3^{\text{rd}} \text{ term}, 5 = 9 - 4 = 3.3 - 4$$

$$4^{\text{th}} \text{ term}, 8 = 12 - 4 = 3.4 - 4$$

$$5^{\text{th}} \text{ term}, 11 = 15 - 4 = 3.5 - 4$$

$$n^{\text{th}} \text{ term} = 3.n - 4, \text{ where } n \in \mathbb{N}$$

\therefore Algebraic expression of the given pattern = $3n - 4$.

- c The given pattern is :

-1, 2, 5, 8, 11, and it follows $(3n - 4)$, an algebraic expression.

$$\therefore 30^{\text{th}} \text{ number} = 3 \times 30 - 4 = 86$$

Now, 1st number = -1

and 30th number = 86

\therefore Sum of first 30 terms of the pattern

$$= \frac{1^{\text{st}} \text{ term} + 30^{\text{th}} \text{ term}}{2} \times \text{Number of terms}$$

$$= \frac{-1 + 86}{2} \times 30 = 1275.$$

- Ques. 08** (i) 38, 49, 62, 77, 94,

- (ii) 10, 17, 24, 31, 38,

- a. Express the first two numbers of the list (ii) as the sum of two squares. 2

- b. Find the next three numbers in the list (i). 4

- c. Find the sum of the first 60 numbers in the list (ii). 4

• Sylhet Board 2019

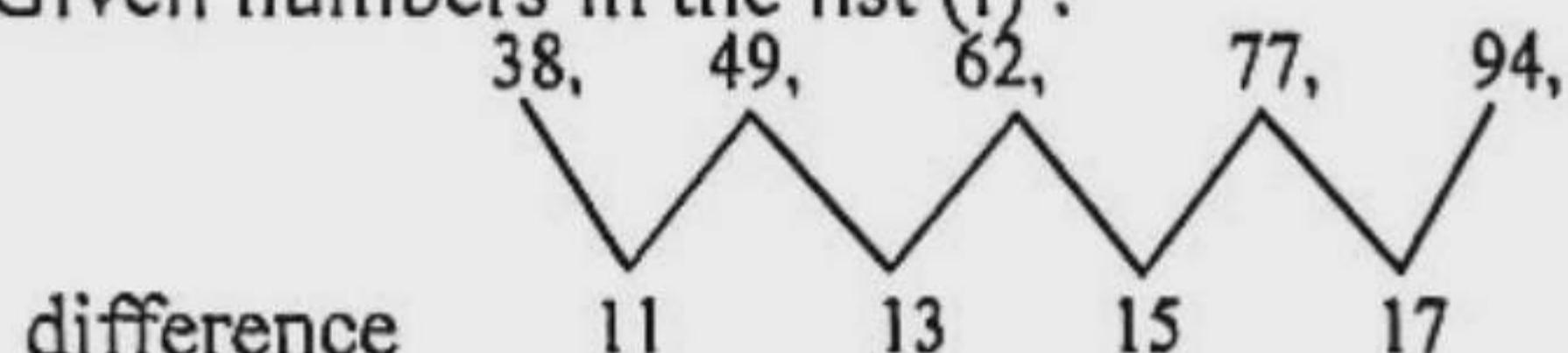
Solution to Question No. 08 :

- a Here, first two numbers of the list (ii) are 10 and 17. Now, 10 and 17 are expressed into sum of two squares below :

$$10 = 1 + 9 = 1^2 + 3^2$$

$$\text{and } 17 = 1 + 16 = 1^2 + 4^2$$

D Given numbers in the list (i) :



Note that each time difference increases by 2. Hence, the next three numbers in the list are—

$$94 + 19 = 113$$

$$113 + 21 = 134$$

$$\text{and } 134 + 23 = 157$$

∴ The next three numbers in the list (i) are 113, 134 and 157.

C The given pattern in the list (ii) is :

10, 17, 24, 31, 38, and it follows $(7n + 3)$ an algebraic expression.

$$\therefore 60^{\text{th}} \text{ number of the list} = 7 \times 60 + 3 \\ = 423$$

$$\text{Now, } 1^{\text{st}} \text{ number} = 10$$

$$\text{and } 60^{\text{th}} \text{ number} = 423$$

∴ Sum of first 60 numbers of the list (ii)

$$= \frac{1^{\text{st}} \text{ number} + 60^{\text{th}} \text{ number}}{2} \times \text{Number of terms} \\ = \frac{10 + 423}{2} \times 60 = 12990.$$

Ques. 09 $3a + 2$ is an algebraic expression, where 'a' is a natural number.

- Express 5th term of the expression as the sum of two squares. 2
- Find the sum of the first 60 terms of the expression. 4
- Verify your result with drawing geometric pattern of third and fourth term. 4

• Barishal Board 2019

Solution to Question No. 09 :

a Given algebraic expression = $3a + 2$.

$$\text{Now, } 5^{\text{th}} \text{ term of the expression} = 3 \times 5 + 2 \\ = 15 + 2 = 17$$

Here, $17 = 1 + 16 = 1^2 + 4^2$; which is expressed as the sum of two squares.

b Given algebraic expression = $3a + 2$

$$\therefore 1^{\text{st}} \text{ term of the pattern} = 3 \cdot 1 + 2 = 3 + 2 = 5 \\ \text{and } 60^{\text{th}} \text{ term of the pattern} = 3 \cdot 60 + 2 = 180 + 2 \\ = 182$$

$$\text{Now, the sum of } 1^{\text{st}} \text{ to } 60^{\text{th}} \text{ terms of the pattern} = \frac{1^{\text{st}} \text{ term} + 60^{\text{th}} \text{ term}}{2} \times \text{number of terms} \\ = \frac{5 + 182}{2} \times 60 \\ = 187 \times 30 \\ = 5610$$

$$\therefore \text{Required sum} = 5610 \text{ (Ans.)}$$

c Here, Algebraic expression = $3a + 2$

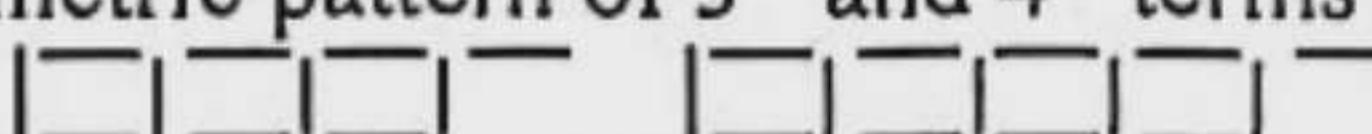
$$\text{Now, } 1^{\text{st}} \text{ term} = 3 \cdot 1 + 2 = 5$$

$$2^{\text{nd}} \text{ term} = 3 \cdot 2 + 2 = 8$$

$$3^{\text{rd}} \text{ term} = 3 \cdot 3 + 2 = 11$$

$$\text{and } 4^{\text{th}} \text{ term} = 3 \cdot 4 + 2 = 14$$

The geometric pattern of 3rd and 4th terms are :



It is evident that number of lines in the geometric pattern of the 3rd and 4th terms are equal. Thus, the result is verified.

Ques. 10 (i) 3, 5, 7, 9 is a number pattern.

(ii) $3x + 1$ is an algebraic expression of another pattern.

- Express 260 as the sum of two distinct square numbers in two different ways. 2
- Determine the 100th term of the pattern (i). 4
- Determining the number pattern construct the 1st four figure of the pattern (ii) 4

• Dinajpur Board 2019

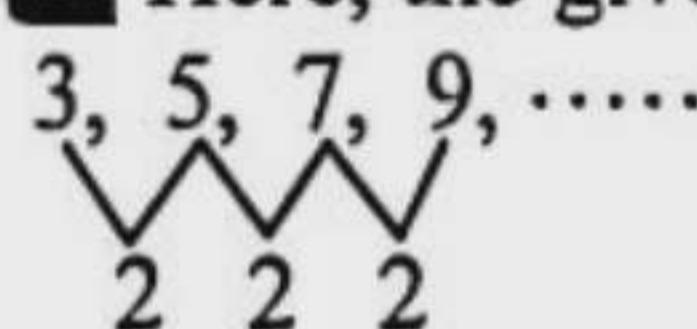
Solution to Question No. 10 :

a Here, $260 = 4 + 256 = 2^2 + 16^2$

Again, $260 = 64 + 196 = 8^2 + 14^2$

Thus, $2^2 + 16^2$ and $8^2 + 14^2$ are two different forms of expression of 260.

b Here, the given pattern (i) :



∴ The above pattern can be written as—

$$1^{\text{st}} \text{ term, } 3 = 2 \cdot 1 + 1$$

$$2^{\text{nd}} \text{ term, } 5 = 2 \cdot 2 + 1$$

$$3^{\text{rd}} \text{ term, } 7 = 2 \cdot 3 + 1$$

$$4^{\text{th}} \text{ term, } 9 = 2 \cdot 4 + 1$$

.....

.....

$$n^{\text{th}} \text{ term} = 2 \cdot n + 1$$

So, the given pattern can be expressed in the algebraic expression $2n + 1$, where $n \in \mathbb{N}$

$$\therefore 100^{\text{th}} \text{ term of the pattern} = 2 \cdot 100 + 1 = 201 \text{ (Ans.)}$$

c Here, the algebraic expression is $(3x + 1)$

In 1st term the number of lines = $3 \cdot 1 + 1 = 4$

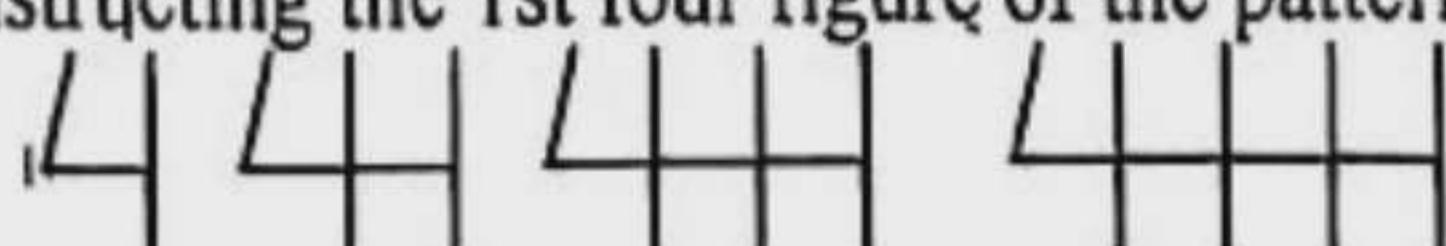
In 2nd term the number of lines = $3 \cdot 2 + 1 = 7$

In 3rd term the number of lines = $3 \cdot 3 + 1 = 10$

In 4th term the number of lines = $3 \cdot 4 + 1 = 13$

So, the pattern obtained from the algebraic expression : 4, 7, 10, 13,

Now, constructing the 1st four figure of the pattern below :



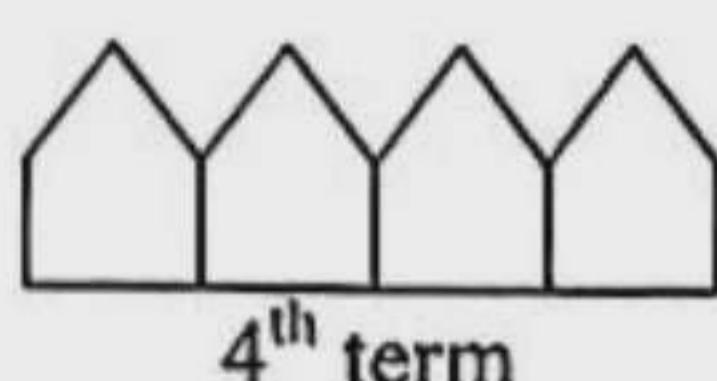
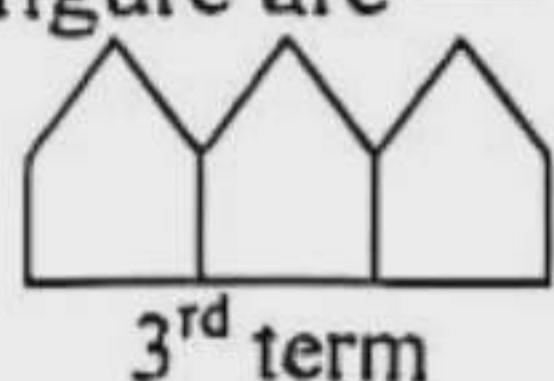
Ques. 11 (i) 8, 13, 18, 23, is a pattern and (ii) $5A + 2$ is an algebraic expression.

- Draw the figures 3rd and 4th pattern of the algebraic expressions $4A + 1$. 2
- Which algebraic expressions followed by pattern (i)? Present it with logic. 4
- Find, how many lines will be required to form the first 91 patterns of the algebraic expression (ii). 4

• Mymensingh Board 2019

Solution to Question No. 11 :

- a** Here,
the algebraic expression = $4A + 1$
In 3rd term number of lines = $4 \cdot 3 + 1 = 13$
In 4th term number of lines = $4 \cdot 4 + 1 = 17$
 \therefore The figure are —



- b** Given,
Pattern of number : 8, 13, 18, 23,

Difference : 5 5 5

Here, each time the differences of two consecutive number is 5.

- 1st number, 8 = $5 \times 1 + 3$
2nd number, 13 = $5 \times 2 + 3$
3rd number, 18 = $5 \times 3 + 3$
4th number, 23 = $5 \times 4 + 3$

.....
.....

That is, the algebraic expression for the number of the pattern = $5n + 3$.

- c** Here, the given expression = $5A + 2$
 \therefore Number of lines in 1st figure = $5 \cdot 1 + 2 = 7$
 \therefore Number of lines in 91st figure = $5 \cdot 91 + 2 = 457$
 \therefore The number of lines required to form the first 91 patterns = $\frac{(\text{lines in 1}^{\text{st}} \text{ figure} + \text{lines in 91}^{\text{st}} \text{ figure}) \times 91}{2}$
 $= \frac{(7 + 457) \times 91}{2} = \frac{42224}{2}$
 $= 21112 \text{ (Ans.)}$

Ques. 12 9, 14, 19, 24,

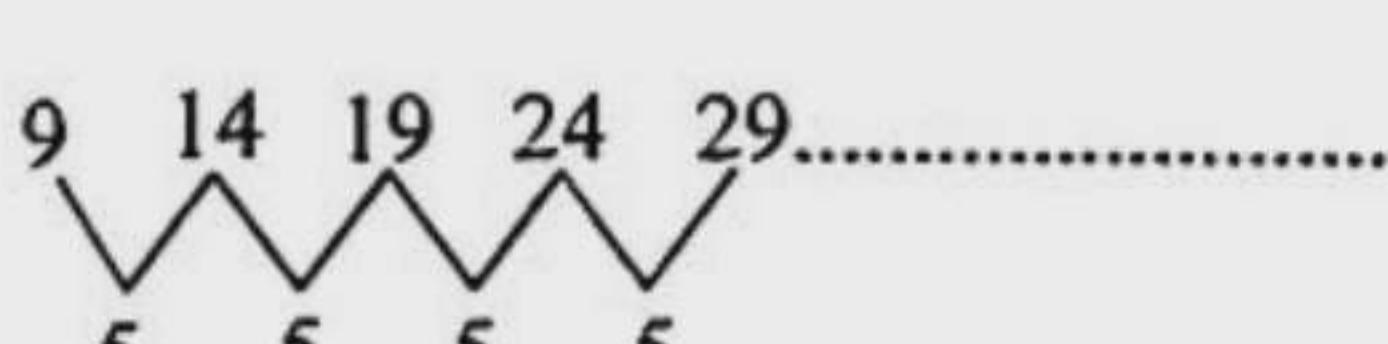
- a. Express 6th term of the list as the sum of two perfect squares. 2
b. Which algebraic expression is followed by the list of the stem? Present it with logic. 4
c. Find the sum of first 120 terms of the pattern. 4

• Dhaka Board 2018

Solution to Question No. 12 :

- a** Here, the given pattern is 9, 14, 19, 24,
The difference between two consecutive terms is 5 and 4th term is 24.
 \therefore 6th term of the pattern is $(24 + 5 + 5)$ or, 34.
Now, $34 = 25 + 9 = 5^2 + 3^2$, which is the required sum of two perfect square of 6th term.

- b** The pattern that we have is 9, 14, 19, 24,
Here,



From the above figure, it is evident that the two consecutive terms of the pattern differ by 5.

\therefore An algebraic expression of the pattern can be taken in the form of $5n + 4$, where $n \in \mathbb{N}$.
Now, by using the expression $5n + 4$, we get,
When $n = 1$, $5n + 4 = 9$
when $n = 2$, $5n + 4 = 14$
when $n = 3$, $5n + 4 = 19$
when $n = 4$, $5n + 4 = 24$ and so on.

\therefore So, $5n + 4$, where $n \in \mathbb{N}$, is the desired algebraic expression for the given pattern.

- c** From (b) above, we have found an algebraic expression, $5n + 4$, where $n \in \mathbb{N}$ for the given pattern.

\therefore 120th term of the pattern = $5 \times 120 + 4 = 604$

$$119^{\text{th}} \quad " \quad " \quad " \quad " = 5 \times 119 + 5 = 599$$

$$118^{\text{th}} \quad " \quad " \quad " \quad " = 5 \times 118 + 4 = 594$$

$$117^{\text{th}} \quad " \quad " \quad " \quad " = 5 \times 117 + 4 = 589$$

Let S be the sum of 1st 120 terms of the pattern.

$$\therefore S = 9 + 14 + 19 + 24 + \dots + 589 + 594 + 599 + 604$$

$$\underline{\text{And } S = 604 + 599 + 594 + 589 + \dots + 24 + 19 + 14 + 9}$$

$$\begin{aligned} \text{Adding : } 2S &= 613 + 613 + 613 + 613 + \dots + 613 \\ &+ 613 + 613 + 613 \end{aligned}$$

= 613×120 , Since we are going to find the sum of 120 terms.

$$= 73560$$

$$\therefore S = \frac{73560}{2} \text{ or, } 36780.$$

So, the required sum of 1st 120 terms of the given pattern is 36780.

Ques. 13 0, 3, 8, 15,

- a. Express 145 as the sum of two squares in two different ways. 2
b. Determine an algebraic expression for the list. 4
c. Determine the sum of first 30 differences of the list. 4

• Rajshahi Board 2018

Solution to Question No. 13 :

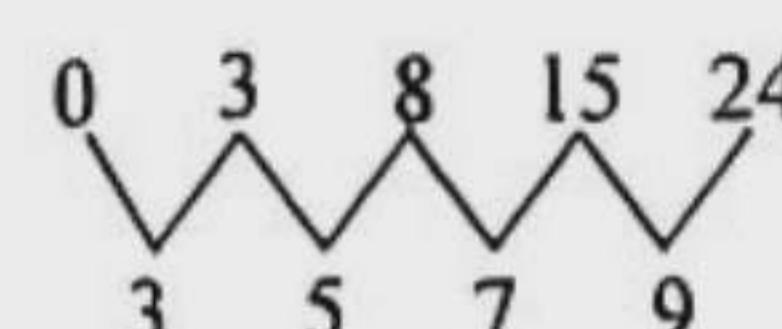
a $145 = 1 + 144 = 1^2 + 12^2$

Again, $145 = 64 + 91 = 8^2 + 9^2$

Thus, $1^2 + 12^2$ and $8^2 + 9^2$ are two different forms of expressions of 145.

- b** Given, a sequence 0, 3, 8, 15,

Now,



Based on the above shown pattern, general term of sequence is $n^2 - 1$, where $n \in \mathbb{N}$

So, the algebraic expression for the list is $n^2 - 1$.

- c** From the solution of (b) above, general term = $n^2 - 1$, where $n \in \mathbb{N}$.

$$\therefore 30^{\text{th}} \text{ term of the pattern} = 30^2 - 1$$

$$= 900 - 1 = 899$$

Let, 'S' be the sum of 1st 30 differences of the pattern.



Here 1st difference = 3

2nd difference = 5

3rd difference = 7

.....

.....

nth difference = $2n + 1$, where $n \in \mathbb{N}$

∴ 30th difference = $2 \times 30 + 1$ or 61.

∴ $S = 3 + 5 + 7 + \dots + 57 + 59 + 61$ and

$S = 61 + 59 + 57 + \dots + 7 + 5 + 3$

Adding : $2S = 64 + 64 + 64 + \dots + 64 + 64 + 64$
 $= 30 \times 64$

$$\therefore S = \frac{30 \times 64}{2} \text{ or, } 960$$

∴ The required sum is 960.

Ques. 14 (i) 5, 7, 9, 11, (ii) $4 + 7 + 10 + 13 + \dots$

- a. Determine the 6th term of the pattern 1, 3, 4, 7, 11, and write the prime numbers from first to 6th term of the pattern. 2
- b. Present with logic which algebraic expression follows the pattern given in stem (i). 4
- c. Draw the figures of geometric pattern up to 5th term of the stem (ii). 4

● Jashore Board 2018

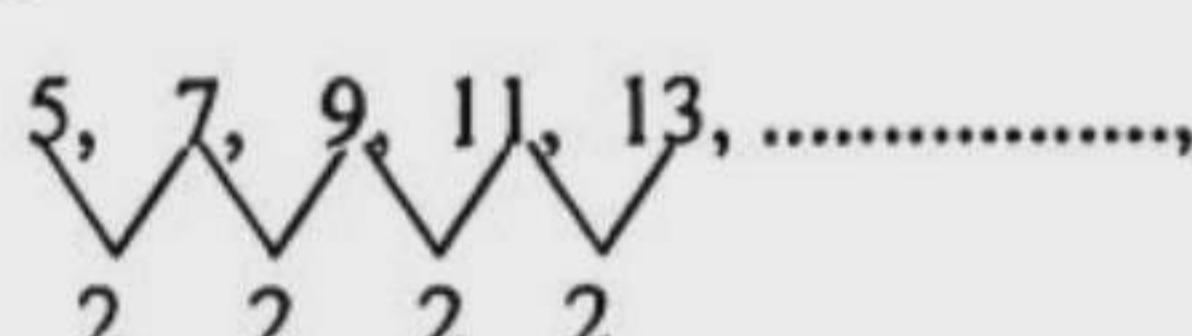
Solution to Question No. 14 :

a. The given pattern : 1, 3, 4, 7, 11, 18, 29, -----

∴ 6th term of the pattern = 18

Again, the prime numbers of the pattern from 1st to 6th term are 3, 7.

b. Pattern (i) is



that is, the difference between the two consecutive terms is 2.

Here, 1st term : $5 = 2 + 3$

$$= 2.1 + 3$$

= Difference of consecutive terms \times 1st term + 3

2nd term : $7 = 2.2 + 3$

3rd term : $9 = 2.3 + 3$

.....

.....

nth term : $2n + 3 = 2.n + 3$.

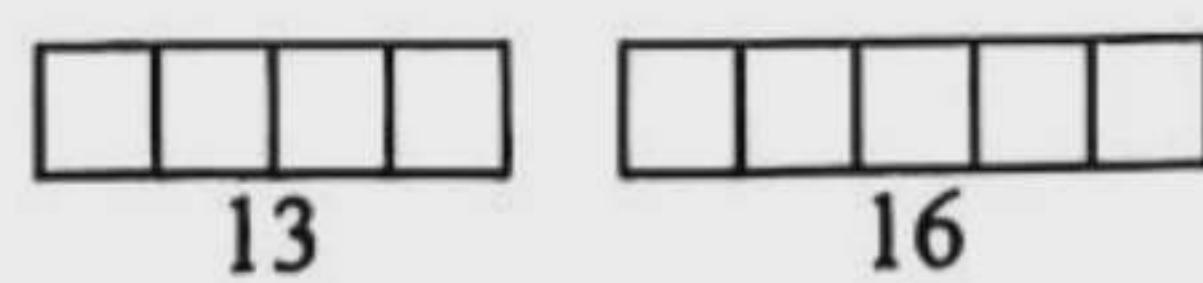
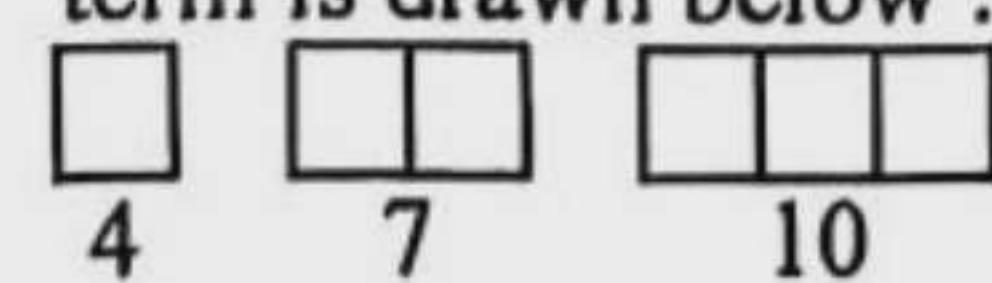
∴ An algebraic expression of the pattern is $2n + 3$.

c. Pattern (ii) is $4 + 7 + 10 + 13 + \dots$

Here Algebraic expression of the pattern = $3n + 1$, where $n \in \mathbb{N}$.

∴ 5th term = $3 \times 5 + 1 = 16$.

Now, geometric figure of the pattern (ii) upto 5th term is drawn below :



Ques. 15 (i) 5, 9, 13,

(ii) 3, 6, 9,

a. Find the 5th term of the expression $(5n + 1)$ and express into the sum of two squares. 2

b. Find the sum of first 65 terms of the pattern (i). 4

c. Find the algebraic expression of the pattern (ii) and draw the geometric figure of next three terms. 4

● Cumilla Board 2018

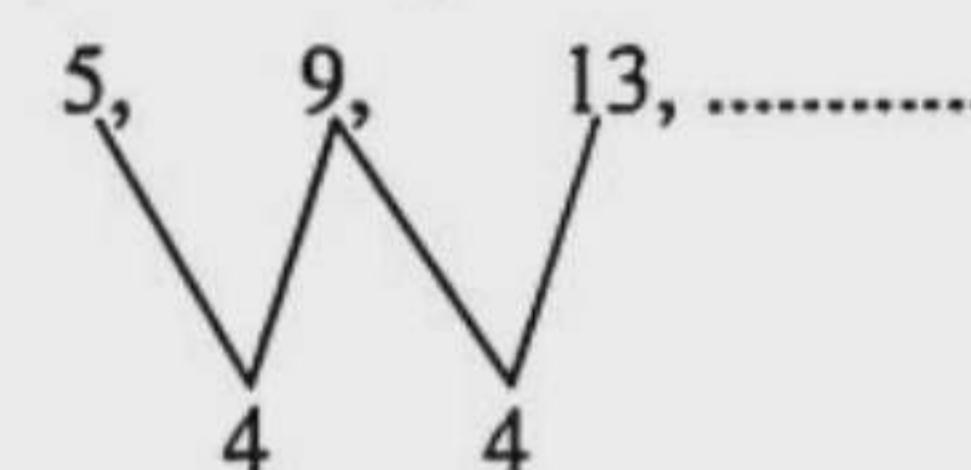
Solution to Question No. 15 :

a. Here, 5th term of the expression $(5n + 1) = 5.5 + 1 = 26$.

Again, 26 can be expressed as the sum of square of two numbers as under :

$$26 = 25 + 1 = 5^2 + 1^2 \Rightarrow 26 = 5^2 + 1^2.$$

b. The given pattern (i) is :



An algebraic expression of the above pattern is $4n + 1$.

$$\therefore 65^{\text{th}} \text{ term} = 4.65 + 1 = 261$$

$$64^{\text{th}} \text{ term} = 4.64 + 1 = 257$$

$$63^{\text{rd}} \text{ term} = 4.63 + 1 = 253$$

Let the Sum of the 1st 65 terms of the pattern is S.

$$\therefore S = 5 + 9 + 13 + \dots + 253 + 257 + 261$$

$$\text{And } S = 261 + 257 + 253 + \dots + 13 + 9 + 5$$

Adding the above two series, we get,

$$2S = 266 + 266 + 266 + \dots + 266 + 266 + 266,$$

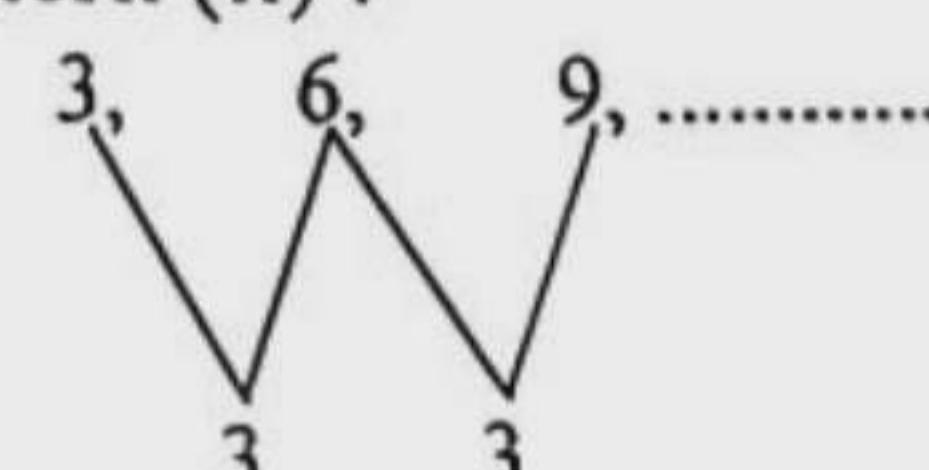
totalling 65 terms.

$$= 65 \times 266 \text{ or, } 17290$$

$$\therefore S = 8645$$

Thus, the required sum is 8645.

c. Given pattern (ii) :



An algebraic expression of the above pattern = $3n$ where $n \in \mathbb{N}$.

∴ The next 3 terms, that is, 4th, 5th, 6th, terms of the pattern are as under :

$$4^{\text{th}} \text{ term} = 3n = 3.4 = 12 \text{ when } n = 4$$

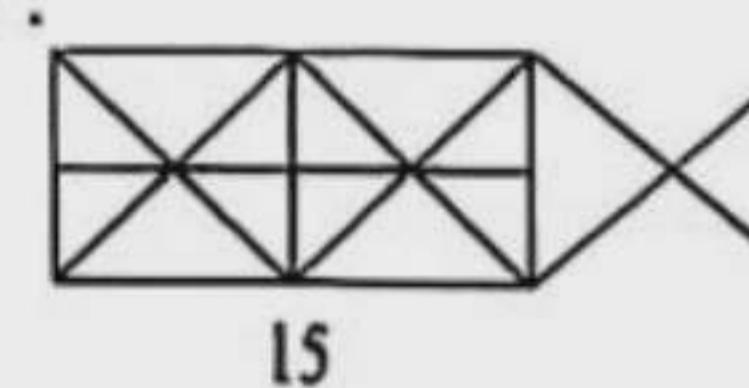
$$5^{\text{th}} \text{ term} = 3n = 3.5 = 15 \text{ when } n = 5$$

$$6^{\text{th}} \text{ term} = 3n = 3.6 = 18 \text{ when } n = 6$$

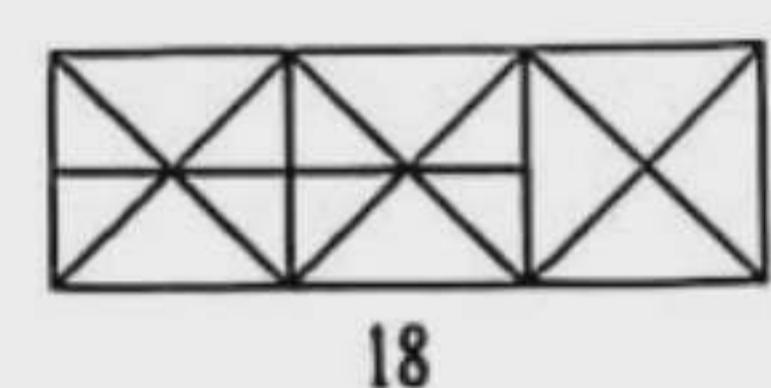
Now, geometric figures of 4th, 5th and 6th terms are drawn below :



12



15



18

- Ques. 16** (i) 8, 13, 18, 23, 28,
(ii) 5, 9, 13, 17,

- a. How many prime numbers are there between 5th and 8th term of the algebraic expression of the pattern $(5A - 1)$? 2
b. Find out the sum of the first 125 terms of the list (i) by using formula. 4
c. Show that by which formula make pattern (ii), and build up a formula for finding any term with the help of variable 'a' and draw a geometric pattern of first 2 terms. 4

• Chatogram Board 2018

Solution to Question No. 16 :

a. The given algebraic expression = $5A - 1$.

$$\therefore 5^{\text{th}} \text{ term of the pattern} = 5.5 - 1 \text{ or, } 24 \\ 8^{\text{th}} \text{ " " " " } = 5.8 - 1 \text{ or, } 39$$

Now, the prime numbers between 24 and 39 are 29, 31, 37.
∴ No. of prime numbers between 5th term and 8th term of the pattern = 3.

b. The given pattern (i) is 8, 13, 18, 23, 28,

Here, algebraic expression of the pattern = $5n + 3$, where $n \in \mathbb{N}$.

$$\therefore 125^{\text{th}} \text{ term of the pattern} = 5.125 + 3 \text{ or, } 628$$

Let, S be the sum of the 1st 125 terms of the pattern

$$\therefore S = 8 + 13 + 18 + \dots + 618 + 623 + 628 \dots (1)$$

$$\text{And } S = 628 + 623 + 618 + \dots + 18 + 13 + 8 \dots (2)$$

Now, adding (1) and (2), we get,

$2S = 636 + 636 + 636 + \dots + 636 + 636 + 636$, totalling 125 terms.

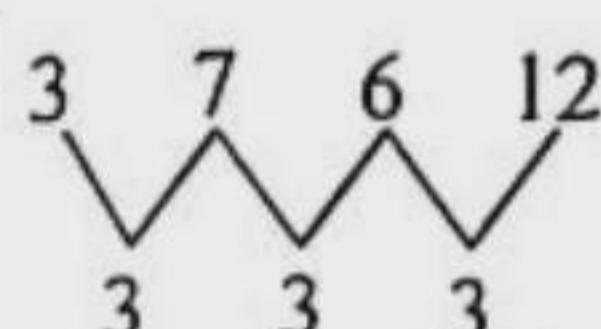
$$\text{or, } 2S = 636 \times 125$$

$$\text{or, } 2S = 79500$$

$$\text{or, } S = 39750$$

∴ The determined sum is 39,750

c. Given pattern (ii) :



∴ Related algebraic expression is $3a$.

$$\text{Now, } 1^{\text{st}} \text{ pattern} = 3.1 = 3$$

$$2^{\text{nd}} \text{ pattern} = 3.2 = 6$$

$$3^{\text{rd}} \text{ pattern} = 3.3 = 9$$

$$n^{\text{th}} \text{ pattern} = 3a$$

∴ The algebraic expression or formula for finding any term of the pattern = $3a$, where $a \in \mathbb{N}$.

Again, geometric patterns of 1st two terms of the pattern are drawn below :

For 1st term ie 3 :

For 2nd term ie 3 :

- Ques. 17** 8, 15, 22, 29, and 19, 29, 39, 49, are two patterns of natural numbers.
a. Find the difference of 1st and 2nd terms of an algebraic expression $(5a - 2)$ of a pattern. 2
b. Expressing the first pattern as an algebraic expression, find its 27th term. 4
c. Determine the first 55 terms of the 2nd pattern. 4

• Sylhet Board 2018

Solution to Question No. 17 :

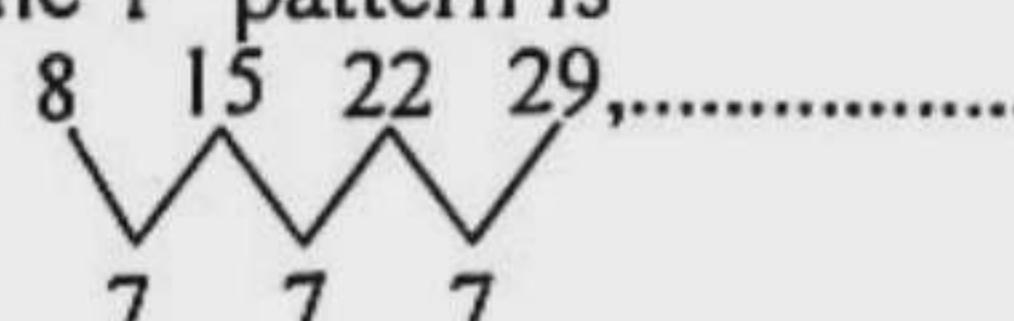
a. Here, given algebraic expression = $5a - 2$, where $a \in \mathbb{N}$.

$$\text{When } a = 1, 5a - 2 = 3$$

$$\text{when } a = 2, 5a - 2 = 8$$

∴ The difference of the 1st and the 2nd terms of the given algebraic expression = $(8 - 3)$ or, 5.

b. Here, the 1st pattern is



Now, it is observed that the difference between the two consecutive terms of the pattern is 7.

∴ The terms of the given pattern can be expressed in the form of an algebraic expression in the following way :

$$1^{\text{st}} \text{ term, } 8 = 7 + 1 = 7.1 + 1$$

$$2^{\text{nd}} \text{ term, } 15 = 14 + 1 = 7.2 + 1$$

$$3^{\text{rd}} \text{ term, } 22 = 21 + 1 = 7.3 + 1$$

$$4^{\text{th}} \text{ term, } 29 = 28 + 1 = 7.4 + 1$$

.....

$$\text{nth term, } = 7.n + 1, \text{ where } n \in \mathbb{N}.$$

∴ The general or common term of the pattern = $7n + 1$.

$$\therefore 27^{\text{th}} \text{ term of the pattern} = 7.27 + 1 \text{ or, } 190$$

c. Here, the 2nd pattern is 19, 29, 39, 49,

It is observed that the difference between the consecutive terms of the pattern is 10.

∴ Common or general term of the pattern can be express as $10n + 9$ where $n \in \mathbb{N}$.

$$\therefore 1^{\text{st}} \text{ term} = 10n + 9 = 19 \text{ when } n = 1$$

$$2^{\text{nd}} \text{ term} = 10n + 9 = 29 \text{ when } n = 2$$

$$3^{\text{rd}} \text{ term} = 10n + 9 = 39 \text{ when } n = 3$$

$$52^{\text{th}} \text{ term} = 10.52 + 9 = 529 \text{ when } n = 52$$

$$53^{\text{th}} \text{ term} = 10.53 + 9 = 539 \text{ when } n = 53$$

$$54^{\text{th}} \text{ term} = 10.54 + 9 = 549 \text{ when } n = 54$$

$$55^{\text{th}} \text{ term} = 10.55 + 9 = 559 \text{ when } n = 55.$$

∴ The desired pattern is 19, 29, 39, ..., 529, 539, 549, 559 containing 1st 55 terms.

Ques. 18 7, 12, 17, 22, is a pattern.

a. Determine the difference between 5th and 6th term of the pattern. 2

b. Express the pattern by an algebraic expression and determine the 50th term. 4

c. Draw the geometrical figures of the pattern. 4

• Barishal Board 2018

Solution to Question No. 18 :

a. Here,

difference between the 2nd and 1st term = 5 and
" " " 3rd " 2nd " = 5 and

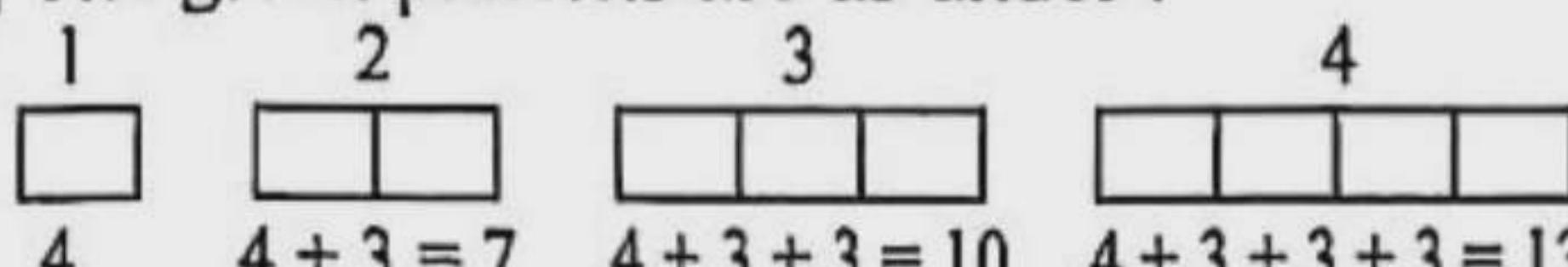
Thus common difference = 5

$$\therefore 5^{\text{th}} \text{ term} = 4^{\text{th}} \text{ term} + 5 = 22 + 5 = 27 \text{ and}$$

$$6^{\text{th}} \text{ term} = 5^{\text{th}} \text{ term} + 5 = 27 + 5 = 32$$

∴ Difference between 6th and 5 th term
= $(32 - 27) = 5$

b The given patterns are as under :



From the above information, we can have a sequence of number of line segments of the given pattern as under : 4, 7, 10, 13,

Here, the difference of consecutive numbers is 3, that is, difference of 2nd and 1st numbers = 3, difference of 3rd and 2nd numbers = 3, and so on.

$\therefore n^{\text{th}}$ number of the above sequence = $3n + 1$, where

$$n = 1, 2, 3, 4, \dots$$

$\therefore 3n + 1$ is the algebraic expression representing the given patterns in terms of number of line segments.

c From (b) above, we have a general number of line segments of the given pattern as under :

General numbers = $3n + 1$, where $n = 1, 2, 3, \dots, n, \dots$ (1)

Now if $n = 40$, then the total numbers, s of line segments to be required to construct 1st 40 figures of the pattern is,

$$S = 4 + 7 + 10 + \dots + \{3 \times 40 + 1\}, \text{ putting } n = 40 \text{ in (1)}$$

$$\text{or, } S = 4 + 7 + 10 + \dots + 121 \quad (2), \text{ arranging number, in ascending order.}$$

$$\text{Again } S = 121 + 118 + 115 + \dots + 4 \quad (3), \text{ arranging the number in descended order.}$$

Now adding (1) and (2), we get,

$$2S = (125 + 125 + 125 + \dots \text{ upto } 40^{\text{th}} \text{ number})$$

$$\text{or, } 2S = 40 \times 125$$

$$\text{or, } S = 20 \times 125, \text{ dividing both sides by 2.}$$

$$\text{or, } S = 2500$$

Therefore, 2500 line segments in total will be required to construct the 1st 40 figures of the patterns.

Ques. 22 7, 11, 15, 19, 23, 27 is the patterns of numbers.

a. Express 40 as the subtract of two squares and 100 as the sum of two squares. 2

b. Show that by which formula the number in the stem make pattern. And build up a formula for finding any term with help of variable 'a'. 4

c. Find the sum of the first 25 numbers in the patterns. 4

● Jashore Board 2017

Solution to Question No. 22 :

a $40 = 49 - 9 = 7^2 - 3^2$.

$100 = 64 + 36 = 8^2 + 6^2$.

b Here we have,

$7 = 4.1 + 3, 1^{\text{st}}$ term

$11 = 4.2 + 3, 2^{\text{nd}}$ term

$15 = 4.3 + 3, 3^{\text{rd}}$ term

.....

.....

$$n = 4.n + 3, \text{ nth term.}$$

\therefore Formula for finding any term of the pattern is $4n + 3$, where $n = 1, 2, 3, \dots$

c From (b) above, we know that, the formula for finding any term of the given pattern = $4n + 3$.

$$\therefore 1^{\text{st}}$$
 term = 7,

$$2^{\text{nd}}$$
 term = 11

$$3^{\text{rd}}$$
 term = 15

.....

$$25^{\text{th}}$$
 term = 103

Let the sum of the 1st 25 terms of the pattern is S .

$$\therefore S = 7 + 11 + 15 + \dots + 103 \text{ and}$$

$$S = 103 + 99 + 95 + \dots + 7.$$

(Adding), $2S = 110 + 110 + 110 + \dots + 110$, totaling 25 terms.

$$= 110 \times 25$$

$$\therefore S = \frac{110 \times 25}{2} = 55 \times 25 = 1375.$$

So, the sum of the 1st 25 terms of the pattern is 1375.

Ques. 23 3a + 1 an algebraic expression of any list.

a. Express 325 as the sum of to squares in two different ways. 2

b. According to the stem, draw the geometrical pattern of the 3rd and 4th term and verify the correctness of the drawing. 4

c. Find out the sum of the first 100 terms in the expression. 4

● Cumilla Board 2017

Solution to Question No. 23 :

a $325 = 6^2 + 17^2$

$$325 = 10^2 + 15^2$$

b The given algebraic expression = $3a + 1$

\therefore For 1st pattern, number of sticks of equal length = 4, putting $a = 1$

For 2nd pattern, number of sticks = 7, putting $a = 2$

For 3rd pattern, number of sticks = 10, putting $a = 3$

For 4th pattern, number of sticks = 13, putting $a = 4$

$\therefore 3^{\text{rd}}$ pattern :

and 4^{th} pattern :

From the above figures, it is seen that the 3rd pattern consists of 10 sticks and the 4th pattern consists of 13 sticks.

So, the geometric patterns of the 3rd and 4th terms are drawn correctly.

c Here, given algebraic expression = $3a + 1$

$$\therefore 100^{\text{th}}$$
 term of the expression = $3.100 + 1 = 301$

Let, the sum of the 1st 100 terms = s

$$\therefore s = 4 + 7 + 10 + \dots + 301 \quad (1)$$

$$s = 301 + 298 + 295 + \dots + 4 \quad (2)$$

Adding (1) and (2), we get,

$$2s = 305 + 305 + 305 + \dots + 305, \text{ totalling 100 terms}$$

$$= 305 \times 100 = 30500$$

$$\therefore s = \frac{30500}{2} = 15,250$$

So, the required sum of the 1st 100 terms is 15250.

Ques. 24



The above geometric figures has made a pattern which is made of the line segment of the same length.

- Express 41 and 58 into the sum of the two squares. 2
- By constructing the fourth figure of the pattern, present with reason which algebraic expression the pattern supports. 4
- Determine how many line segments will be needed to make the first 30 figures in the pattern. 4

• Chatogram Board 2017

Solution to Question No. 24 :

a. $41 = 25 + 16 = 5^2 + 4^2$

$$58 = 49 + 9 = 7^2 + 3^2$$

b. Here, the 1st figure of the pattern consists of 4 line segments. The 2nd figure of the pattern consists of 7 line segments the 3rd figure of the pattern consists of 10 line segments.

∴ It can be written as —

Figure No.	No. of line segment	Difference between the consecutive figure
1	4	—
2	7	3
3	10	3
4	13	3

So, the fourth figure of the pattern will be,



c. Here, number of line segments needs to draw the given pattern are described below :

1. = 4 line segments = $(3 + 1)$ line segments.

2. = 7 line segments = $(2 \times 3 + 1)$ line segments.

3. = 10 line segments = $(3 \times 3 + 1)$ line segments

n. = $(n \times 3 + 1)$ line segments

Now if $n = 30$, then the total number of line segments will be required to make 1st 30 patterns is —

$$S = 4 + 7 + 10 + \dots + (30 \times 3 + 1)$$

$$\text{or, } S = 4 + 7 + 10 + \dots + 91 \quad (\text{i})$$

$$\text{and } S = 91 + 88 + 85 + \dots + 4 \quad (\text{ii})$$

$$\text{Adding, } 2S = 95 + 95 + 95 + \dots + 95, \text{ total 30 terms}$$

$$= 30 \times 95 = 2850$$

$$\therefore S = 1425$$

Therefore, 1425 line segments will be required to make 1st 30 patterns.

Ques. 25 6, 11, 16, 21, 26,

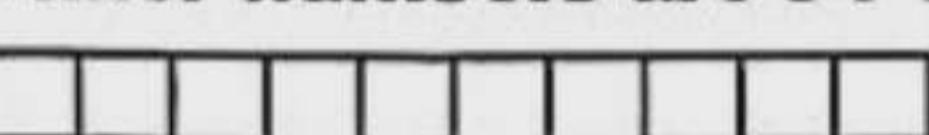
- Express 325 as the sum of two perfect squares in two different ways. 2
- Find two later numbers of the pattern and draw Geometric pattern of this two numbers. 4
- Find the sum of first 55 numbers of the pattern. 4

• Sylhet Board 2017

Solution to Question No. 25 :

a. $325 = 15^2 + 10^2 = 17^2 + 6^2$

b. Next two later numbers are 31 and 36.

6th pattern : 

7th pattern : 

c. 1st term $a = 6$,

Common difference (d) = $11 - 6 = 5$, No. of term $n = 55$.

$$\therefore S = \frac{n}{2} \{2a + (n - 1)d\}$$

$$= \frac{55}{2} \{2 \times 6 + (55 - 1). 5\}$$

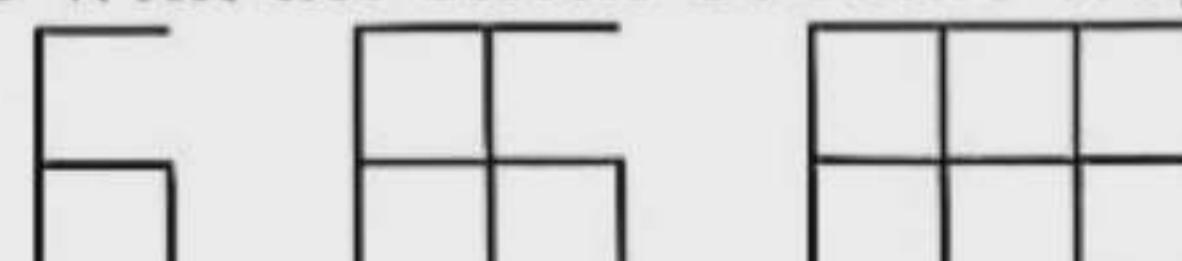
$$= \frac{55}{2} \{12 + 54 \times 5\}$$

$$= \frac{55}{2} \{12 + 270\}$$

$$= \frac{55}{2} \times 282$$

$$= 55 \times 141 = 7755.$$

Ques. 26 The following algebraic patterns have been made with the sticks of same length.



- Make the fifth figure of the stem and find the number of stick. 2

- Find an algebraic expression in the light of the stem and find how many sticks are necessary to make the 50th pattern. 4

- Find how many sticks are necessary to make the first 100 figures. 4

• Barishal Board 2017

Solution to Question No. 26 :

a. The 5th figure of the stem is —



The number of sticks of the 5th figure is 26.

b According to the given stem,
The number of sticks in pattern-1

$$= 6 = 5n + 1,$$

where $n = 1, 2, \dots$

the number of sticks in pattern-2

$$= 5.2 + 1$$

$$= 11$$

The number of sticks in pattern-3

$$= 5.3 = 1$$

$$= 16$$

\therefore The number of sticks in pattern - 50

$$= 5.50 + 1 = 251$$

\therefore 251 sticks are required to make 50th pattern.

c According to (b) above,
the sequence of number of sticks required to make
the 1st 100 figures is shown below :

$$\text{1st figure} = 5.1 + 1 = 6 \text{ sticks}$$

$$\text{2nd figure} = 5.2 + 1 = 11 \text{ sticks},$$

$$\text{3rd figure} = 5.3 + 1 = 16 \text{ sticks}$$

$$\therefore \text{100th figure} = 5.100 + 1 = 501 \text{ sticks}$$

Now let total number of sticks required to make
the 1st 100 figures is S.

$$\therefore S = 6 + 11 + 16 + \dots + 501, \text{ total 100 terms} \quad (1)$$

$$\text{and } S = 501 + 496 + 491 + \dots + 6, \text{ total 100 terms} \quad (2)$$

Adding (1) and (2), we get,

$$2S = (6 + 501) + (11 + 496) + (16 + 491) + \dots + (501 + 6), \text{ total 100 terms}$$

$$= 507 + 507 + 507 + \dots + 507, \text{ total 100 terms}$$

$$= 100 \times 507 = 50700$$

$$\therefore S = 25350$$

Therefore, to make the 1st 100 figures, 25350 sticks are required.

Ques. 27 $(5n + 7)$ is an algebraic expression,
where n is natural number.

- Find the 1st and 2nd term. 2
- According to the stimulus, form first three patterns and find out the total numbers of lines. 4
- Find the sum of the first fifty numbers by formula. 4

• Dinajpur Board 2017

Solution to Question No. 27 :

a Here, 1st term = 12 and
2nd term = 17.

b Here, given algebraic expression = $5n + 7$

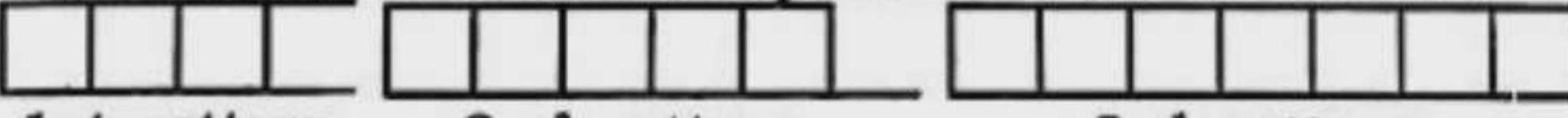
\therefore 1st term of the pattern = 12

2nd term of the pattern = 17

3rd term of the pattern = 22

From the above data, it is obvious that the geometric figure of 1st, 2nd and 3rd patterns will consist of line segments of equal length of numbers 12, 17 and 22 respectively.

Therefore, the 1st three patterns are as under :



1st pattern 2nd pattern 3rd pattern

From the above figure, the 1st three patterns consist of number of lines = $12 + 17 + 22 = 51$.

c Given that the algebraic expression = $5n + 7$, where $n = 1, 2, \dots$

$$\therefore 50\text{th} \text{ number} = 5 \times 50 + 7 = 250 + 7 = 257$$

Let the sum of 1st 50 numbers of the pattern is S.

$$\therefore S = 12 + 17 + 22 + \dots + 257, \text{ arranging in ascending order}$$

$$\text{Again, } S = 257 + 252 + 247 + \dots + 12, \text{ arranging in descending order}$$

Adding the above two equations,

$$2S = 269 + 269 + 269 + \dots + 269, \text{ totalling 50 terms}$$

$$= 269 \times 50 = 13450$$

$$\therefore S = \frac{13450}{2} = 6725$$

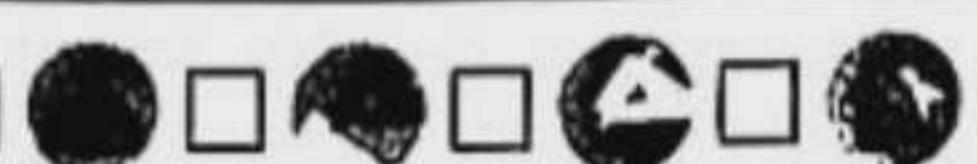
So, the required sum of the 1st 50 numbers is 6725.



Solutions to Textual Activities



Along with textual reference



Activity 01 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, are Fibonacci numbers. Do you find any pattern in the list?

► Textbook Page 3

Hints : The sum of any two consecutive numbers is the next number; for example, $2 = 1 + 1$, $3 = 1 + 2$, $21 = 8 + 13$ and so on. Find the next 10 Fibonacci numbers.

Solution : Yes, there is a pattern. From the given list of numbers, we find that the sum of any two consecutive numbers is the next number.

The next 10 Fibonacci numbers of the given patterns are :

$$21 + 34 = 55; 34 + 55 = 89; 55 + 89 = 144; 89 + 144 = 233; 144 + 233 = 377; 233 + 377 = 610; 377 + 610 = 987; 610 + 987 = 1597; 987 + 1597 = 2584; 1597 + 2584 = 4181.$$

So, the next 10 numbers are :

$$55, 89, 144, 233, 377, 610, 987, 1597, 2584, 4181.$$

Activity 02 Finding the sum of natural numbers from 1 to 15, establish the formula. ► Textbook Page 4

Solution : Here,

$$1 + 2 + 3 + 4 + \dots + 15 = S \text{ (say)}$$

$$15 + 14 + 13 + 12 + \dots + 1 = S$$

(Adding) : $16 + 16 + 16 + 16 + \dots + 16 = 2S$

$$\text{or, } (1 + 15) \times 15 = 2S \quad (1)$$

or, $2S = 16 \times 15$

or, $S = \frac{16 \times 15}{2}$

or, $S = 8 \times 15$

or, $S = 120$

∴ The required sum of natural numbers from 1 to 15 is 120.

Now, from (1) we can write,

$$\begin{aligned} S &= \frac{(1+15) \times 15}{2} \\ &= \frac{(\text{1st term} + \text{last term}) \times \text{number of terms}}{2} \end{aligned}$$

refers to the required formula to find the sum of a series of natural numbers.

Activity 03 Find the sum : ▶ Textbook Page 5

$$1 + 4 + 7 + 10 + 13 + 16 + 19 + 22 + 25 + 28 + 31$$

Solution : Let,

$$S = 1 + 4 + 7 + 10 + \dots + 31 \quad (1)$$

$$\therefore S = 31 + 28 + 25 + 22 + \dots + 1 \quad (2)$$

Adding (1) and (2)

$$2S = 32 + 32 + 32 + 22 + \dots + 32$$

= 32×11 , since there are 11 numbers in the pattern.

$$\therefore S = \frac{32 \times 11}{2} = 16 \times 11 = 176$$

∴ The required sum : 176.

Activity 04 Express 130, 170, 185 as the sum of squares of two natural numbers in two different ways. ▶ Textbook Page 5

Solution : $130 = 9 + 121 = 3^2 + 11^2$

$$130 = 49 + 81 = 7^2 + 9^2$$

$$170 = 1 + 169 = 1^2 + 13^2$$

$$170 = 49 + 121 = 7^2 + 11^2$$

$$185 = 16 + 169 = 4^2 + 13^2$$

$$185 = 64 + 121 = 8^2 + 11^2$$

Activity 05 Express 325 as the sum of squares of two natural numbers in three different ways. ▶ Textbook Page 5

Solution : $325 = 1 + 324 = 1^2 + 18^2$

$$325 = 36 + 289 = 6^2 + 17^2$$

$$325 = 100 + 225 = 10^2 + 15^2$$

Activity 06 Construct a magic square of order 4 by a different technique. ▶ Textbook Page 7

Solution : A magic square of order-4 is constructed below :

1	4	14	15
13	16	2	3
8	5	11	10
12	9	7	6

Activity 07 Try to construct a magic square of order 5 as a group work. ▶ Textbook Page 7

Solution : Construction of the magic square of order 5—A square is divided into 5 parts along length and width into 25 smaller squares. In each small square, the consecutive normal numbers from 1 to 25 are arranged so that the sum is 65 when added side by side, up, down and diagonally.

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9



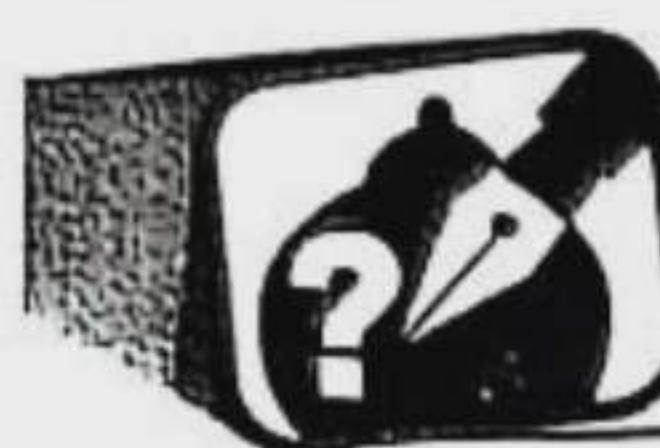
Super Suggestions



Super Suggestions with 100% preparatory questions selected by the Master Trainer Panel

Dear learners, important multiple choice, short and creative questions of this chapter selected by Master Trainer Panel for Half-Yearly and Annual Exams are presented below. Learn the answers to the mentioned questions well to ensure 100% preparation.

Question Pattern	7★	5★	3★
MCQs with Answers	Learn each MCQs in this chapter thoroughly.		
Short Q/A	5, 8, 14, 18, 22, 28, 32, 37, 43, 48	2, 10, 17, 20, 24, 30, 36, 40, 45, 51	7, 13, 15, 19, 26, 31, 34, 41, 47, 49
Creative Q/A	3, 8, 13, 19, 24	6, 11, 17, 21, 26	4, 10, 15, 18, 25



Assessment & Evaluation



A question bank presented in the form
of a class test to assess the preparation

Class Test

Time : 3 hours

Mathematics Class : Eight

Full marks : 100

Multiple Choice Questions (Each question carries 1 mark)

$1 \times 30 = 30$

[N.B. : Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Question Type Examination.]

1. What is the next number in the pattern of 25, 22, 19, 16, · ?
Ⓐ 10 Ⓑ 12 Ⓒ 13 Ⓓ 9
2. How many prime numbers are there in between 1 to 25?
Ⓐ 6 Ⓑ 7 Ⓒ 8 Ⓓ 9
3. Which one is the algebraic expression of the pattern of odd natural numbers?
Ⓐ 2a Ⓑ 3a + 1 Ⓒ 2a - 1 Ⓓ 3a
- Answer to the questions No. 4 and 5 based on the following information :

4	9	8
11	A	3
6	5	10

← is a magic square of order 3
4. Which one is the appropriate number for marked 'A' in the square?
Ⓐ 21 Ⓑ 12 Ⓒ 7 Ⓓ 2
5. What is the magic number of the given magic square?
Ⓐ 2 Ⓑ 7 Ⓒ 12 Ⓓ 21
6. The diverse nature is full of various—.
Ⓐ patterns Ⓑ animals Ⓒ insects Ⓓ birds
7. 779 is the 111th term of which algebraic expression?
Ⓐ $7A - 2$ Ⓑ $7A + 2$
Ⓒ $555A + 224$ Ⓓ $777A + 2$
8. Which numbers are Fibonacci numbers in the following?
Ⓐ 0, 1, 1, 2, 3, Ⓑ 0, 0, 1, 2, 3,
Ⓒ 0, 1, 2, 3, 4, Ⓒ 0, 2, 4, 6, 8,
9. How many prime numbers are there from 1 to 20?
Ⓐ 7 Ⓑ 8 Ⓒ 9 Ⓓ 10
10. Which one of the following is the Fibonacci number's pattern?
Ⓐ 3, 6, 9, 12, 15, Ⓑ 2, 4, 8, 16, 32,
Ⓒ 2, 3, 5, 8, Ⓒ 2, 4, 6, 8, 10,
11. Which one is the algebraic expression of - 1, 2, 7, 14,
Ⓐ $A - 2$ Ⓑ $3A - 4$ Ⓒ $A^2 - 2$ Ⓓ $2A^2 - 3$
12. Which one of the following is a pattern of Fibonacci number?
Ⓐ 0, 0, 1, 2, 3 Ⓑ 0, 1, 2, 3, 4
Ⓒ 0, 1, 2, 4, 6 Ⓒ 0, 1, 1, 2, 3
13. What is the next number of the pattern 1, 4, 10, 19, 31?
Ⓐ 34 Ⓑ 43 Ⓒ 46 Ⓓ 49
14. $1 + 2 + 3 + 4 + \dots + 40 =$ What?
Ⓐ 800 Ⓑ 820 Ⓒ 1600 Ⓓ 1640
15. What is the number of prime numbers between 1 to 20?
Ⓐ 5 Ⓑ 6 Ⓒ 7 Ⓓ 8

16. $1 + 2 + 3 + 4 + 5 + \dots + 20 = ?$
Ⓐ 210 Ⓑ 200 Ⓒ 63 Ⓓ 21
17. If 100th term of $4n + 3$ is 403, then which one is 50th term?
Ⓐ 201.5 Ⓑ 203 Ⓒ 303 Ⓓ 806
- Answer to the questions No. 18 and 19 based on the following information :
Dola wrote consecutive natural numbers from 1 to 20.
18. How many odd numbers are there in written number of Dola.
Ⓐ 9 Ⓑ 10 Ⓒ 11 Ⓓ 20
19. What is the sum of odd numbers written by her?
Ⓐ 10 Ⓑ 20 Ⓒ 100 Ⓓ 210
20. Between 1 to 20, how many numbers can be expressed as the sum of two squares?
Ⓐ 3 Ⓑ 4 Ⓒ 5 Ⓓ 6
21. Which one of the following algebraic expression represents a pattern of 0, 3, 8, 15, 24
Ⓐ $2a + 1$ Ⓑ $a^2 - 1$ Ⓒ $a^2 + 1$ Ⓓ $2a^2 - 1$
22. For algebraic expression $(A^2 - 1)$ —
 - i. 1st term is zero
 - ii. The sum of first 4 numbers is 26
 - iii. The difference of consecutive two terms is 5
 Which one is correct?
Ⓐ i & ii Ⓑ i & iii Ⓒ ii & iii Ⓓ i, ii & iii
23. What is the magic number for the magic square of order 5?
Ⓐ 34 Ⓑ 35 Ⓒ 60 Ⓓ 65
24. Which one of the following is the magic number of magic square of order 4?
Ⓐ 15 Ⓑ 17 Ⓒ 34 Ⓓ 40
25. If the sum of 23 and number obtained by interchanging digits is divided by 11, then what will be the remainder?
Ⓐ 0 Ⓑ 1 Ⓒ 2 Ⓓ 3
26. What is the difference of the number obtained by exchanging the places of 72 and its two digits?
Ⓐ 45 Ⓑ 50 Ⓒ 60 Ⓓ 40
27. 3, 5, 7, 9 what is the general term?
Ⓐ $2A$ Ⓑ $2A$ Ⓒ $A + 1$ Ⓓ $3A - 2$
- Answer to the questions no. 28 and 29 based on the following information :
 $(2A + 1)$ is an algebraic expression.
28. What is the 1st term of the expression?
Ⓐ 0 Ⓑ 1 Ⓒ 2 Ⓓ 3
29. What is the 10th term of the expression?
Ⓐ 1 Ⓑ 10 Ⓒ 21 Ⓓ 13
30. What is the magic number of order 7?
Ⓐ 175 Ⓑ 135 Ⓒ 145 Ⓓ 185



Short-Answer Question (Each question carries 2 marks)**Answer any 10 of the following questions :** $2 \times 10 = 20$

1. What do you mean by pattern?
2. Find the next two numbers from the following list of numbers: 6, 12, 24, 48, 96, ...
3. Find the next two terms in the list 1, 4, 10, 19, 31, ...
4. Find the next two numbers in the list -4, -1, 4, 11, 20, ...
5. What is Fibonacci Pattern? Give example.
6. Write the formula for determining the sum of consecutive natural numbers.
7. Find the sum of first 10 even natural numbers.
8. Find the sum of the 4th and 5th terms of the algebraic expression expressed by $n^2 + 3$.

9. Express 41 and 58 as the sum of two squares.
10. Express 185 in two ways as the sum of two squares.
11. Express 80 as the sum of the squares of two integers and the difference of the squares of two integers.
12. Express 130 in two different ways as the sum of the squares of two numbers.
13. Express the fifth term of the algebraic expression $(3n + 2)$ as the sum of two squares.
14. What is magic square?
15. Find the number of sticks in the fifth figure of the following geometric pattern.

Creative Question (Each question carries 10 marks)**Answer any 5 of the following questions :** $10 \times 5 = 50$

1. 7, 13, 19, 25, is a pattern.
 - a. Express 325 as the sum of two squares in two different ways. 2
 - b. Find the 52th term by forming an algebraic expression of the pattern. 4
 - c. Find the sum of first 130 terms of the pattern. 4
2. (i) 6, 10, 14, 18,
 (ii) 5, 8, 11, 14,
 a. Find the next two consecutive numbers from the following list of numbers : 5, 6, 8, 11..... 2
 b. Find the algebraic expression of the pattern (i) and find the 60th number. 4
 c. Find the sum of first 30 terms of the pattern (ii). 4
3. (i) 38, 49, 62, 77, 94,
 (ii) 10, 17, 24, 31, 38,
 a. Express the first two numbers of the list (ii) as the sum of two squares. 2
 b. Find the next three numbers in the list (i). 4
 c. Find the sum of the first 60 numbers in the list (ii). 4
4. (i) 3, 5, 7, 9 is a number pattern.
 (ii) $3x + 1$ is an algebraic expression of another pattern.
 - a. Express 260 as the sum of two distinct square numbers in two different ways. 2
 - b. Determine the 100th term of the pattern (i). 4
 - c. Determining the number pattern construct the 1st four figure of the pattern (ii) 4

Answer Sheet ► Multiple Choice Questions

1	©	2	①	3	©	4	©	5	②	6	③	7	④	8	⑤	9	⑥	10	©	11	©	12	⑦	13	©	14	⑧	15	⑨
16	⑩	17	⑪	18	⑫	19	©	20	⑬	21	⑭	22	⑮	23	⑯	24	©	25	⑰	26	⑱	27	⑲	28	⑳	29	©	30	⑳

Solving Reference ► Short-Answer Questions

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|---------------------------|---------------------------|----------------------------|----------------------------|
| 1 ► See Page 10; Ques. 01 | 5 ► See Page 11; Ques. 10 | 9 ► See Page 12; Ques. 22 | 13 ► See Page 13; Ques. 35 |
| 2 ► See Page 11; Ques. 03 | 6 ► See Page 11; Ques. 13 | 10 ► See Page 12; Ques. 25 | 14 ► See Page 13; Ques. 38 |
| 3 ► See Page 11; Ques. 05 | 7 ► See Page 12; Ques. 16 | 11 ► See Page 12; Ques. 28 | 15 ► See Page 14; Ques. 44 |
| 4 ► See Page 11; Ques. 07 | 8 ► See Page 12; Ques. 19 | 12 ► See Page 13; Ques. 32 | |

Solving Reference ► Creative Questions

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|---------------------------|---------------------------|---------------------------|---------------------------|
| 1 ► See Page 15; Ques. 03 | 3 ► See Page 17; Ques. 08 | 5 ► See Page 19; Ques. 13 | 7 ► See Page 21; Ques. 18 |
| 2 ► See Page 16; Ques. 05 | 4 ► See Page 18; Ques. 10 | 6 ► See Page 20; Ques. 15 | 8 ► See Page 23; Ques. 23 |