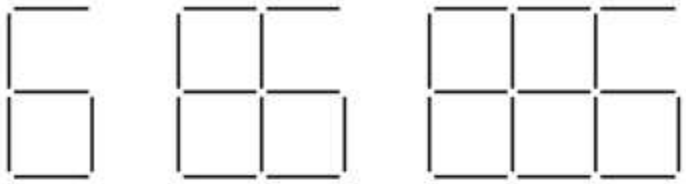
Algebraic Expressions: Exercise 12.4

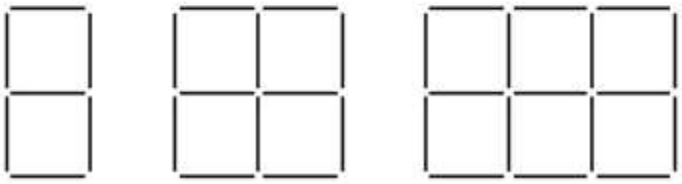
Q.1 Observe the patterns of digits made from line segments of equal length. You will find such segmented digits on the display of electronic watches or calculators.

(a) 

6 11 16 21 ... (5*n* + 1) ...

(b) 

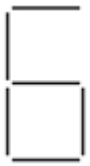
4 7 10 13 ... (3*n* + 1) ...

(c) 

7 12 17 22 ... (5*n* + 2) ...

If the number of digits formed is taken to be n, the number of segments required to form n digits is given by the algebraic expression appearing on the right of each pattern. How many segments are required to form 5, 10, 100 digits of the kind 

Sol:



(a) Since, the numbers of segments required to form n digits of the kind is (5n + 1).

So, number of segments required to form 5 digits = ((5 × 5) + 1)

= (25 + 1)

= 26

And number of segments required to form 10 digits = ((5 × 10) + 1)

= (50 + 1)

= 51

Now, number of segments required to form 100 digits = ((5 × 100) + 1)

= (500 + 1)

= 501

(b) Since, the numbers of segments required to form n digits of the kind

is (3n + 1).

So, number of segments required to form 5 digits = ((3 × 5) + 1)
= (15 + 1)
= 16

And number of segments required to form 10 digits = ((3 × 10) + 1)
= (30 + 1)
= 31

Now, number of segments required to form 100 digits = ((3 × 100) + 1)
= (300 + 1)
= 301

(c) Since, the numbers of segments required to form n digits of the kind

is (5n + 2).

So, number of segments required to form 5 digits = ((5 × 5) + 2)
= (25 + 2)
= 27

And number of segments required to form 10 digits = ((5 × 10) + 2)
= (50 + 2)
= 52

Now, number of segments required to form 100 digits = ((5 × 100) + 1)
= (500 + 2)
= 502

Q.2 Use the given algebraic expression to complete the table of number patterns.

S. No.	Expression	Terms									
		1st	2nd	3rd	4th	5th	...	10th	...	100th	...
(i)	$2n - 1$	1	3	5	7	9	-	19	-	-	-
(ii)	$3n + 2$	5	8	11	14	-	-	-	-	-	-
(iii)	$4n + 1$	5	9	13	17	-	-	-	-	-	-
(iv)	$7n + 20$	27	34	41	48	-	-	-	-	-	-
(v)	$n^2 + 1$	2	5	10	17	-	-	-	-	10,001	-

Sol: From above table:

(i) Given expression: (2n – 1)

So, for 100th term n = 100

= (2 × 100) – 1

= 200 – 1

= 199

(ii) Given expression: (3n + 2)

So, for 5^{th} term n = 5
= (3 × 5) + 2
= 15 + 2
= 17
And for 10^{th} term n = 10
= (3 × 10) + 2
= 30 + 2
= 32
Now, for 100^{th} term n = 100
= (3 × 100) + 2
= 300 + 2
= 302

(iii) Given expression: (4n + 1)
So, for 5^{th} term n = 5
= (4 × 5) + 1
= 20 + 1
= 21
And for 10^{th} term n = 10
= (4 × 10) + 1
= 40 + 1
= 41
Now, for 100^{th} term n = 100
= (4 × 100) + 1
= 400 + 1
= 401

(iv) Given expression: (7n + 20)
So, for 5^{th} term n = 5
= (7 × 5) + 20
= 35 + 20
= 55
And for 10^{th} term n = 10
= (7 × 10) + 20
= 70 + 20
= 90
Now, 100^{th} term n = 100
= (7 × 100) + 20
= 700 + 20
= 720

(v) Given expression: (n^2 + 1)
So, for 5^{th} term n = 5
= (5^2) + 1
= 25+ 1
= 26
And for 10^{th} term n = 10
= (10^2) + 1
= 100 + 1
= 101
Thus, the table is completed.

S. No.	Expression	Terms									
		1st	2nd	3rd	4th	5th	...	10th	...	100th	...
(i)	$2n - 1$	1	3	5	7	9	-	19	-	**199**	-
(ii)	$3n + 2$	5	8	11	14	**17**	-	**32**	-	**302**	-
(iii)	$4n + 1$	5	9	13	17	**21**	-	**41**	-	**401**	-
(iv)	$7n + 20$	27	34	41	48	**55**	-	**90**	-	**720**	-
(v)	$n^2 + 1$	2	5	10	17	**26**	-	**101**	-	10,001	-