Pattern_01

M colums

N Rows

```
* * * * *
* * * * *
* * * * *
* * * * *
* * * * *
```

Here N = M, so here we will use two for loops from 0 to N and print the desired pattern.

Pattern_02

```
1 st row   *          1 star
2 nd row   * *        2 star
3 rd row   * * *      3 star
4 th row   * * * *    4 stars
5 th row   * * * * *  5 stars
```

So here we can see the no of stars is equal to the number of row it is in so here first loop will be for the row and second loop will be for the number of stars in that row.

Pattern_03

```
1 st row   1          till 1
2 nd row   1 2        till 2
3 rd row   1 2 3      till 3
4 th row   1 2 3 4    till 4
```

5 th row 1 2 3 4 5 till 5

So it is just a little modification of the above pattern here the nth row contain the number from 1 to n. So here the first loop will be for the row and the second loop will be for printing the numbers from 1 to n, where n is the number of row it is in.

Pattern_04

1 st row	1	1, 1 times				
2 nd row	2	2	2, 2 times			
3 rd row	3	3	3	3, 3 times		
4 th row	4	4	4	4	4, 4 times	
5 th row	5	5	5	5	5	5, 5 times

So it is similar to the above pattern but here we need to print the i, i times wher i is the number of row it is in so the first loop will be for the row and second loop will print the row number, i times where i is the number of row.

Pattern_05 Here N = 5

1 st row	*	*	*	*	*	(N+1)−1 stars
2 nd row	*	*	*	*	(N+1)−2 stars	
3 rd row	*	*	*	(N+1)−3 stars		
4 th row	*	*	(N+1)−4 stars			
5 th row	*	(N+1)−5 stars				

So here we can see that i th row contains (N+1)−i stars so here first loop will be for number of rows and second loop will be (N+1) − i stars where i will be the number of row it is in.

Pattern_06 Here N = 5

1 st row	1	2	3	4	5	1 to (N+1)−1
2 nd row	1	2	3	4	1 to (N+1)−2	

3 rd row	1	2	3	1 to (N+1) − 3	
4 th row	1	2	1 to (N+1) − 4		
5 th row	1	1 to (N+1) − 5			

So here we can see the relation that i th row contains the numbers from 1 to (N + 1) − i. So here first loop will be for the number of row and second loop will be for printing the numbers from 1 to (N + 1) − i where i will be the number of row it is in.

Pattern_07

Here N = 5

1 st row				*						N − 1 space then 2X1 − 1 stars
2nd row			*	*	*					N − 2 space then 2X2 − 1 stars
3 rd row		*	*	*	*	*				N − 3 space then 2X3 − 1 stars
4 th row	*	*	*	*	*	*	*			N − 4 space then 2X4 − 1 stars
5th row	*	*	*	*	*	*	*	*	*	N − 5 space & 2X5 − 1 stars

So here we can see that i th row has first N − i space then it has 2 X i − 1 stars so here first loop will be for the number of rows and then second loop will be for printing N − i space and the third loop will be for printing 2 X i − 1 stars and here i will be the number of row it is in.

Pattern_08

Here N = 5

1 st row	*	*	*	*	*	*	*	*	*	1 − 1 space, 2X(N+1−1)−1 *
2nd row		*	*	*	*	*	*	*		2 − 1 space, 2X(N+1−2)−1 *
3 rd row			*	*	*	*	*			3 − 1 space, 2X(N+1−3)−1 *
4 th row				*	*	*				4 − 1 space, 2X(N+1−4)−1 *
5 th row					*					5 − 1 space, 2X(N+1−5)−1 stars

So here in this question we can see that i - th row has first i − 1 spaces and than the 2X((N+1) − i) − 1 stars. So the first loop will be for the number of rows then second loop will be for i − 1 spaces and then third loop will be for 2X((N + 1) − i) − 1 stars

where i is the number of row it is in.

Pattern_09

```
            *
        *   *   *
    *   *   *   *   *
  *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *
-------------------------------------
*   *   *   *   *   *   *   *   *
  *   *   *   *   *   *   *
    *   *   *   *   *
        *   *   *
            *
```

Pattern no 7 of the video

+

Pattern no 8 of the video.

So lets divide this pattern into two parts. Now if you look closely then it is the combination of previous two patters. So here first print the above part first then below part.

Pattern_10

```
*
*   *
*   *   *
*   *   *   *
*   *   *   *   *
-----------------------
*   *   *   *
*   *   *
*   *
*
```

Pattern 2 in the video

+

Pattern 5 in the video but runs N-1 times

So here also divide the pattern into two parts. The above part is pattern 2 in this video and below part is pattern 5 in this video but the row start with N-1 and there is one less row than pattern 5.

Pattern_11 Here N = 5

1 st row	1			start with 1
2 nd row	0	1		start wit 0 then alternate
3 rd row	1	0	1	starts wit 1 then alternate

4 th row	0	1	0	1	starts with 0 then alternate
5 th row	1	0	1	0	1 starts wit 1 then alternate

So here we can see that it is same as pattern 2 but every row start with alternate 0 and 1 and then colums follow alternate 0 and 1 too

So we will use first loop for number of rows and then use one variable for alternating and then run the second loop changing and printing the alternating values.

Pattern _ 12

Here N = 4

1 st row	1							1	1..1, 2X(N-1)space, 1..1
2 nd row	1	2					2	1	1..2, 2X(N-2)space, 2..1
3 rd row	1	2	3			3	2	1	1..3, 2X(N-3)space, 3..1
4 th row	1	2	3	4	4	3	2	1	1..4, 2X(N-4)space, 4..1

So we can see that the i th row has first numbers from 1 to i then it has space of 2X (N - i) and then again numbers but in reverse from i to 1. So here first loop will be for the number of rows then second loop for printing 1 to i, then third loop for the 2X (N - i) space and 4 th loop for reverse printing of number from i to 1, where i is the number of row we are in.

Pattern _ 13

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

Similar to pattern 2 of the video.

This pattern is similar to pattern 2 in this video but there is the catch we use one counter variable to print the value and increase the counter after that and insted of "*" in pattern 2 print this counter.

Pattern _ 14

```
A
A  B
A  B  C
A  B  C  D
A  B  C  D  E
```

Similar to pattern 2 in the video with slight changes.

So here the first loop is for the number of rows then there use one variable with value 65 that is the ASCII value of "A" and print this value by converting to char and the second loop will run i times where i is the number of row it is in.

Pattern _ 15

```
A  B  C  D  E
A  B  C  D
A  B  C
A  B
A
```

Pattern similar to patter 5

Here the only change is that we use one count variable that value is 65 at the start of each row than print the value by converting it to char and increasing it upto N - i times where i is the number of row in which we currently are.

Pattern _ 16

```
A
B  B
C  C  C
```

Similar to pattern 2 with

D D D D

E E E E E

slight change.

So here maintain the global variable with value 65 and print it i times by converting it to char for i th row and after the end of each row increase the value of global variable by 1.

Pattern – 17

```
        A
      A B A
    A B C B A
  A B C D C B A
A B C D E D C B A
```

So here in this pattern first print N – i spaces for the i th row then for i th row first increase the variable value from 65 to 65+i then decrease the value from 65+i to 65 for the i th row and here print the value of the variable by converting it to character.

Pattern – 18

```
E
D E
C D E
B C D E
A B C D E
```

Similar to pattern 2 with slight changes.

So here for the i th row we use the global variable with the value of 65 + N + 1 – i. and then print the variable by converting it to car and the printing loop should run i th times for i th row and in the loop subtract the value of variable upto 65 + N – 1.

Pattern – 19

Here N = 4

1st row * * * * * * * * (N+1)−1 *, 2X(1−1) space, (N+1)−1 *
2nd row * * * * * * (N+1)−2 *, 2X(2−1) space, (N+1)−2 *
3rd row * * * * (N+1)−3 *, 2X(3−1) space, (N+1)−3 *
4th row * * (N+1)−4 *, 2X(4−1) space, (N+1)−4 *

1st row * * 1 *, 2X(4−1) space, 1 *
2nd row * * * * 2 *, 2X(4−2) space, 2 *
3rd row * * * * * * * 3 *, 2X(4−3) space, 3 *
4th row * * * * * * * * 4 *, 2X(4−4) space, 4 *

First break this pattern in two parts. So in the first part i-th row has first (N+1)−i stars then it has 2 X (i − 1) spaces, then again (N+1)−i stars, for the second part of the pattern the i th row has i stars then it has 2 X (N − i) spaces then again it has i stars.

Pattern_20

```
*       *
*  *    *  *
*  *  *    *  *  *
*  *  *  *  *  *  *  *
---------------------------
*  *  *    *  *  *
*  *       *  *
*           *
```

Part 2nd of the previous pattern

Part 1 of the previous pattern with one less row

First divide the above pattern in two parts. So for this we need to run the second loop of the previous previous pattern first to obtain its part 1 and to obtain part two we just need to run the first loop of the previous pattern 1 time less.

Pattern_21

Here N = 5

1st row * * * * N − 1 stars
2nd row * * 1 star, N − 3 spaces, 1 star
3rd row * * 1 star, N − 3 spaces, 1 star
4th row * * 1 star, N − 3 spaces, 1 star
5th row * * * * N − 1 stars.

So here we can see only the first and last row has N − 1 stars and rest of the rows have 1 star then N − 3 white spaces and then again 1 star.

Pattern_22

5	5	5	5	5	5	5	5	5
5	4	4	4	4	4	4	4	5
5	4	3	3	3	3	3	4	5
5	4	3	2	2	2	3	4	5
5	4	3	2	1	2	3	4	5
5	4	3	2	2	2	3	4	5
5	4	3	3	3	3	3	4	5
5	4	4	4	4	4	4	4	5
5	5	5	5	5	5	5	5	5

So lets simplify this pattern by drawing some lines. So now can you see it clear that it is nothing but pattern 20 so first we will print the left part then insted of the space of pattern 20 we will print its corresponding number. And now look through its code.

Pattern_23

Bonus pattern

$t = 0$

	1	2	3	4	5	
	16	17	18	19	6	
$l = 0$	15	24	25	20	7	$r = N - 1$
	14	23	22	21	8	
	13	12	11	10	9	

$b = N - 1$

So as I have written this pattern in the same order I will solve this pattern. I will use the vector to store the pattern and use 4 variables. So let me show you live how the values of these 4 pointers will change.

$t = 0, 1, 2, 3$

$b = N-1, N-2, N-3$

$l = 0, 1, 2$

$r = N-1, N-2, N-3$

Now lets look into its code.