

Module 2.5 : Patterns

```
#include <stdio.h>
main()
{
    int i,j,n=5;
    for(i=1; i<=n; ++i)
    {
        for(j=1; j<=i; ++j)
        {
            printf("*");
        }
        printf("\n");
    }
}
```

Output

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

Dry run		n=5
i	j	
1	1	
2	1,2	
3	1,2,3	
4	1,2,3,4	
5	1,2,3,4,5	
⑥	Loop terminates	

```
#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=1; i<=n; ++i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=1; j<=i; ++j)
        {
            printf("*");
        }
        printf("\n");
    }
}
```

Output

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

Dry run			n=5
i	k	j	
1	1,2,3,4	1	
2	1,2,3	1,2	
3	1,2	1,2,3	
4	1	1,2,3,4	
5	-	1,2,3,4,5	
⑥	Loop terminates		

```
#include <stdio.h>
main()
{
    int i,j,n=5;
    for(i=1; i<=n; ++i)
    {
        for(j=1; j<=i; ++j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}
```

Output

```
1
12
123
1234
12345
```

Dry run		n=5
i	j	
1	1	
2	1,2	
3	1,2,3	
4	1,2,3,4	
5	1,2,3,4,5	
⑥	Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=1; i<=n; ++i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=1; j<=i; ++j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}

```

Output

```

1
12
123
1234
12345

```

Dry run

n=5

i	k	j
1	1,2,3,4	1
2	1,2,3	1,2
3	1,2	1,2,3
4	1	1,2,3,4
5	-	1,2,3,4,5
(6) Loop terminates		

```

#include <stdio.h>
main()
{
    int i,j,n=5;
    for(i=n; i>=1; --i)
    {
        for(j=1; j<=i; ++j)
        {
            printf("$");
        }
        printf("\n");
    }
}

```

Output

```

$$$$$
$$$$$
$$$
$$
$

```

Dry run

n=5

i	j
5	1,2,3,4,5
4	1,2,3,4
3	1,2,3
2	1,2
1	1
(0) Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=n; i>=1; --i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=1; j<=i; ++j)
        {
            printf("$");
        }
        printf("\n");
    }
}

```

Output

```

$$$$$
$$$$$
$$$
$$
$

```

Dry run

n=5

i	k	j
5	-	1,2,3,4,5
4	1	1,2,3,4
3	1,2	1,2,3
2	1,2,3	1,2,
1	1,2,3,4	1,
(0) Loop terminates		

```

#include <stdio.h>
main()
{
    int i,j,n=5;
    for(i=n; i>=1; --i)
    {
        for(j=1; j<=i; ++j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}

```

Output

```

12345
1234
123
12
1

```

Dry run		n=5
i	j	
5	1,2,3,4,5	
4	1,2,3,4	
3	1,2,3	
2	1,2	
1	1	
①	Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=n; i>=1; --i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=i; j>=1; --j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}

```

Output

```

0 54321
  4321
   321
    21
     1

```

Dry run		n=5
i	k	j
5	-	5,4,3,2,1
4	1	4,3,2,1
3	1,2	3,2,1
2	1,2,3	2,1
1	1,2,3,4	1
①	Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,n=5;
    for(i=1; i<=n; ++i)
    {
        for(j=i; j>=1; --j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}

```

Output

```

1
21
321
4321
54321

```

Dry run		n=5
i	j	
1	1	
2	2,1	
3	3,2,1	
4	4,3,2,1	
5	5,4,3,2,1	
⑥	Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=1; i<=n; ++i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=1; j<=i; ++j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}

```

Output

```

1
12
123
1234
12345

```

Dry run			n=5
i	k	j	
1	1,2,3,4	1	
2	1,2,3	1,2	
3	1,2	1,2,3	
4	1	1,2,3,4	
5	-	1,2,3,4,5	
⑥	Loop terminates		

```

#include <stdio.h>
main()
{
    int i,j,n=5;
    for(i=n; i>=1; --i)
    {
        for(j=1; j<=i; ++j)
        {
            printf("$");
        }
        printf("\n");
    }
}

```

Output

```

$$$$$
$$$$$
$$$
$$
$

```

Dry run		n=5
i	j	
1	1,2,3,4,5	
5	1,2,3,4	
4	1,2,3	
3	1,2	
2	1	
1		
①	Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=n; i>=1; --i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=1; j<=i; ++j)
        {
            printf("$");
        }
        printf("\n");
    }
}

```

Output

```

$$$$$
  $$$$
    $$$
      $$
        $

```

Dry run			n=5
i	k	j	
1	-	1,2,3,4,5	
5	1	1,2,3,4	
4	1,2	1,2,3	
3	1,2,3	1,2	
2	1,2,3,4	1	
1			
①	Loop terminates		

```

#include <stdio.h>
main()
{
    int i,j,n=5;
    for(i=n; i>=1; --i)
    {
        for(j=1; j<=i; ++j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}

```

Output

```

12345
1234
123
12
1

```

Dry run		n=5
1	j	
5	1,2,3,4,5	
4	1,2,3,4	
3	1,2,3	
2	1,2	
1	1	
⑥	Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=n; i>=1; --i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=i; j>=1; --j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}

```

utput

```

0 54321
  4321
    321
      21
        1

```

Dry run		n=5
i	k	j
5	-	5,4,3,2,1
4	1	4,3,2,1
3	1,2	3,2,1
2	1,2,3	2,1
1	1,2,3,4	1
⑥	Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,n=5;
    for(i=1; i<=n; ++i)
    {
        for(j=i; j>=1; --j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}

```

Output

```

1
21
321
4321
54321

```

Dry run		n=5
1	j	
1	1	
2	2,1	
3	3,2,1	
4	4,3,2,1	
5	5,4,3,2,1	
⑥	Loop terminates	


```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=1; i<=n; ++i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=i; j>=1; --j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}

```

Output

```

1
21
321
4321
54321

```

Dry run			n=5
i	k	j	
1	1,2,3,4	1	
2	1,2,3	2,1	
3	1,2	3,2,1	
4	1	4,3,2,1	
5	-	5,4,3,2,1	
⑥	Loop terminates		

```

#include <stdio.h>
main()
{
    int i,j,n=5;
    for(i=n; i>=1; --i)
    {for(j=i; j>=1; --j)
    {
        printf("%d",j);
    }
    printf("\n");
    }
}

```

Output

```

54321
4321
321
21
1

```

Dry run		n=5
i	j	
5	5,4,3,2,1	
4	4,3,2,1	
3	3,2,1	
2	2,1	
1	1	
①	Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=n; i>=1; --i)
    {for(k=1; k<=n-i; ++k)
    {printf(" ");
    }
    for(j=1; j<=i; ++j)
    {
        printf("%d",j);
    }
    printf("\n");
    }
}

```

Output

```

12345
1234
123
12
1

```

Dry run			n=5
i	k	j	
5	-	1,2,3,4,5	
4	1	1,2,3,4	
3	1,2	1,2,3	
2	1,2,3	1,2	
1	1,2,3,4	1	
①	Loop terminates		

```
#include <stdio.h>
```

```
main()
```

```
{
    int i,j,n=5;
    for(i=1; i<=n; ++i)
    {
        for(j=n; j>=i; --j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}
```

Output

```
54321
5432
543
54
5
```

Dry run

n=5

i	j
1	5,4,3,2,1
2	5,4,3,2
3	5,4,3
4	5,4
5	5
⑥	Loop terminates

```
#include <stdio.h>
```

```
main()
```

```
{
    int i,j,k,n=5;
    for(i=n; i>=1; --i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=n-i+1; j<=n; ++j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}
```

Output

```
12345
2345
345
45
5
```

Dry run

n=5

i	k	j
5	-	1,2,3,4,5
4	1	2,3,4,5
3	1,2	3,4,5
2	1,2,3	4,5
1	1,2,3,4	5
⑦	Loop terminates	

```
#include <stdio.h>
```

```
main()
```

```
{
    int i,j,n=5;
    for(i=1; i<=n; ++i)
    {
        for(j=n; j>=n-i+1; --j)
        {
            printf("%d",j);
        }
        printf("\n");
    }
}
```

Output

```
5
54
543
5432
54321
```

Dry run

n=5

i	j
1	5
2	5,4
3	5,4,3
4	5,4,3,2
5	5,4,3,2,1
⑥	Loop terminates

```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=n; i>=1; --i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=1; j<=i; ++j)
        {
            printf("%d", i);
        }
        printf("\n");
    }
}

```

Output

```

55555
4444
333
22
1

```

Dry run		n=5
i	k	j
5	-	1,2,3,4,5
4	1	1,2,3,4
3	1,2	1,2,3
2	1,2,3	1,2
1	1,2,3,4	1
⑥	Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,n=5;
    for(i=n; i>=1; --i)
    {
        for(j=1; j<=i; ++j)
        {
            printf("%d", i);
        }
        printf("\n");
    }
}

```

Output

```

55555
4444
333
22
1

```

Dry run		n=5
i	j	
5	1,2,3,4,5	
4	2,3,4,5	
3	3,4,5	
2	4,5	
1	5	
⑥	Loop terminates	

```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=1; i<=n; ++i)
    {
        for(k=1; k<i; ++k)
        {
            printf(" ");
        }
        for(j=1; j<=n-i+1; ++j)
        {
            printf("%d", i);
        }
        printf("\n");
    }
}

```

Output

```

11111
2222
333
44
5

```

Dry run		n=5
i	k	j
1	-	1,2,3,4,5
2	1	1,2,3,4
3	1,2	1,2,3
4	1,2,3	1,2
5	1,2,3,4	1
⑥	Loop terminates	


```
#include <stdio.h>
main()
```

```
{
    int i,j,k,n=5;
    for(i=1; i<=n; ++i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=1; j<=i; ++j)
        {
            printf("%d ",i); /* one (1) space after %d*/
        }
        printf("\n");
    }
}
```

Output

```

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

Dry run			n=5
i	k	j	
1	1,2,3,4	1	
2	1,2,3	1,2	
3	1,2	1,2,3	
4	2	1,2,3,4	
5	-	1,2,3,4,5	
⑥	Loop terminates		

```
#include <stdio.h>
main()
```

```
{
    int i,j,k,n=5;
    for(i=n; i>=1; --i)
    {
        for(k=1; k<=i; ++k)
        {
            printf(" ");
        }
        for(j=n; j>=i; --j)
        {
            printf("%d ",i); /* one (1) space after %d*/
        }
        printf("\n");
    }
}
```

Output

```

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

Dry run			n=5
i	k	j	
5	1,2,3,4	5	
4	1,2,3	5,4	
3	1,2	5,4,3	
2	2	5,4,3,2	
1	-	5,4,3,2,1	
①	Loop terminates		

```
#include <stdio.h>
main()
```

```
{
    char ch='a'-1;
    int i,j,k,n=5;
    for(i=1; i<=n; ++i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }

```

Output

```

a
a b
a b c
a b c d
a b c d e
```

Dry run			n=5
i	k	j	
5	1,2,3,4	5	
4	1,2,3	5,4	
3	1,2	5,4,3	
2	2	5,4,3,2	
1	-	5,4,3,2,1	
①	Loop terminates		

```

        for(j=1; j<=i; ++j)
        {
            printf("%c ",ch+j); /* one (1) space after %d*/
        }
        printf("\n");
    }
}

```

```

#include <stdio.h>
main()
{
    int i,j,k,n=5;
    for(i=1; i<=n; ++i)
    {
        for(k=1;k<=n-i;++k)
        {
            printf(" ");
        }
        for(j=1; j<=i; ++j)
        {
            printf("* "); /* one (1) space after '*' */
        }
        printf("\n");
    }
}

```

Output

```

      *
     * *
    * * *
   * * * *
  * * * * *

```

Dry run

n=5		
i	k	j
1	1,2,3,4	1
2	1,2,3	1,2
3	1,2	1,2,3
4	2	1,2,3,4
5	-	1,2,3,4,5
⑥	Loop terminates	

```

#include <stdio.h>
main()
{
    char ch='a'-1;
    int i,j,k,n=5;
    for(i=n; i>=1; --i)
    {
        for(k=1; k<=n-i; ++k)
        {
            printf(" ");
        }
        for(j=1; j<=i; ++j)
        {
            printf("%c ",ch+j); /* one (1) space after %d*/
        }
        printf("\n");
    }
}

```

Output

```

a b c d e
 a b c d
  a b c
   a b
    a

```

Dry run

n=5		
i	k	j
5	-	1,2,3,4,5
4	1	1,2,3,4
3	1,2	1,2,3
2	1,2,3	1,2
1	1,2,3,4	1
⑥	Loop terminates	

```
#include <stdio.h>
```

```
main()
```

```
{
```

```
int i,j,k,n=5;
```

```
for(i=n; i>=1; --i)
```

```
{
```

```
for(k=1;k<=n-i;++k)
```

```
{
```

```
printf(" ");
```

```
}
```

```
for(j=1; j<=i; ++j)
```

```
{
```

```
printf("* "); /* one (1) space after '*' */
```

```
}
```

```
printf("\n");
```

```
}
```

Output

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

Dry run

n=5

i	k	j
5	-	1,2,3,4,5
4	1	1,2,3,4
3	1,2	1,2,3
2	1,2,3	1,2
1	1,2,3,4	1
①	Loop terminates	