

Theme: Building Up logical thinking

Date: / /
 Sat Sun Mon Tue wed Thu Fri

Patterns :

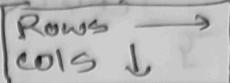
→ Basically Nested for loops

1st

```
* * * *
x x x x
x x x x
x x x x
```

4 lines → 4 times outer loop

How ?



- Count the number of lines (for outer loop)
- Focus on the columns & connect them somehow to the rows
- Print '*' inside inner for loop
- observe symmetry

every line we are printing 4 stars.

```
for (j=0 ; j < 4 ; j++) { * }
```

code :

```
for (int i=0 ; i<n ; i++)
{
    for (j=0 ; j<n ; j++)
        cout << "\n";
}
```

2nd

```
x
* *
xx x
```

```
for (int i=0 ; i<n ; i++)
{
    for (int j=0 ; j < i ; j++) { -cout << * }
    cout << endl;
}
```

3rd

```
1
1 2
1 2 3
```

```
for (i=1 ; i<n ; i++)
{
    for (j=1 ; j < i ; j++)
        cout << j
    cout << endl;
}
```

Fourth

```
1
2 2
3 3 3
```

```
for (int i=1 ; i<n ; i++)
{
    for (j=1 ; j < i ; j++)
        cout << j
    cout << endl;
}
```

Theme:

5th
 * * *
 * * *
 *

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

  { for (j=n; j>i; j--) cout << *;
```

cout << endl;

{}

Striver's sol:

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

```
{ for (int j=0; j<n-i+1; j++)
```

cout << *;

cout << endl;

{}

6th

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

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

```
{ for (j=1; j<n+2-i; j++)
```

cout << j;

cout << endl;

{}

Striver: (j=1; j<n-i+1; j++)

7th

0 - - * - - [3, 1, 3]
 1 - * * * - - [2, 3, 2]
 2 * * * * - - [1, 5, 1]

spaces: n-i-1

stars: 2i+1

spaces: n-i-1

we need

spaces, stars, space

[4, 1, 1]

spaces → n-i-1

[3, 3, 3]

stars → 2i+1

[2, 5, 2]

spaces → n-i-1

[1, 7, 1]

[0, 9, 0]

for (i=0, i<n; i++)

{ for (j=0, j<n-i-1; j++)

{ cout < spaces }

for (j=0; j<2*i+1; j++)

{ cout <

for (j=0; j<n-i-1; j++)

{ cout < " " }

{ }

{}

$i+2n-1-2$
 $0+6-1=5$
 Date 24 $b-1-1=9$
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Theme:

0
1
2
 n

8th
 $\begin{matrix} * & * & * & * & * \\ * & x & x & x & x \\ x & x & x & x & x \end{matrix}$ $\begin{bmatrix} 0 & 5 & 0 \\ 1 & 3 & 1 \\ 2 & 1 & 2 \end{bmatrix}$
 outer loop $\rightarrow n$ times spaces $\cong \text{row}(i)$
 $\rightarrow \text{stars} \cong 2n - (2i + 1)$

```

for (i=0; i<n; i++) {
  for (j=0; j<i; j++) cout space
  for (j=0; j< 2n - (2i + 1); j++) cout *
  for (j=0; j<i; j++) cout space
}
    
```

9th

$\begin{matrix} * & * & * \\ * & x & x \\ x & x & x \end{matrix}$

combo of P7 & P8.

```

for (i=0; i<n; i++) {
  for (j=0; j< n-i-1; j++) cout space
  for (j=0; j< 2n - (2i + 1); j++) cout *
  for (j=0; j<i; j++) cout space
  cout endl;
}

for (i=0; i<n; i++) {
  for (j=0; j<i; j++) cout *
  cout << space;
  for (j=0; j< 2n - (2i + 1); j++) cout *
  for (j=0; j<i; j++) cout space
  cout endl;
}
    
```

Theme:

10th

$$\begin{bmatrix} 0 & & & \\ 1 & * & & \\ 2 & *x & x & \\ 3 & xx & x & \\ 4 & x & & \end{bmatrix}$$

outer loop $i=1 : i \leq 2n-1$
 $\star \text{ int stars} = i ; \text{ if } (i > n) \text{ stars} = 2n - i ; \star$
 $\star \text{ for } (\text{int } j=0; j \leq \text{stars}; j++)$
 $\star \text{ cout} \ll \text{stars} >$ after symmetrical position, it decrease

11th

$$\begin{bmatrix} 0 & & & \\ 1 & & & \\ 10 & & & \\ 0 & 0 & & \end{bmatrix}$$

Lines $\rightarrow n \quad i < n ; i = 0 \rightarrow \text{outer loop}$
 even rows $\rightarrow \text{starts} = 1$
 odd rows $\rightarrow \text{starts} = 0$
 $\star \text{ or } \star \text{ flips} \rightarrow \text{start} = 1 ; \text{ start} = 1 - \text{start}$

int start = 1;
 $\text{for } (\text{int } i=0; i < n; i++)$
 $\star \text{ if } (i \% 2 == 0) \text{ start} = 1 ;$
 $\star \text{ else start} = 0 ;$
 $\star \text{ for } (\text{int } j=0; j < \text{start}; j++)$
 $\star \text{ cout} \ll \text{start} ;$
 $\star \text{ start} = 1 - \text{start} ;$

12th

$$\begin{bmatrix} 1 & & & & \\ 1 & 2 & & & \\ 1 & 2 & 3 & & \\ 1 & 2 & 3 & 4 & \end{bmatrix}$$

Dear

$\begin{bmatrix} 1 & 6 & 1 \\ 2 & 4 & 2 \\ 3 & 2 & 3 \\ 4 & 0 & 4 \end{bmatrix}$

int space = $2(n-1)$
 $\text{for } (\text{int } i=1; i \leq n; i++)$ {
 $\star \text{ for } (\text{int } j=0; j \leq i; j++) \{ \text{cout} \ll j ; \}$
 $\star \text{ for } (\text{int } j=1; j \leq 2(n-1); j++) \text{ cout} \ll \text{space} ;$
 $\star \text{ for } (\text{int } j=1; j > 1; j--) \text{ cout} \ll j ;$
 $\text{cout} \text{ endl} ;$
 $\text{space} -= 2 ;$

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13thouter $\leq n$ inner $\leq \text{outer}(i)$ 1 2 3
+ 5 6

Num start = 1 num = num + 1;

int num;

for (int i=1; i<n; i++) { for (j=1; j<=i; j++) cout < num; num++; }

num += 1;

19thouter $\leq n$ A
AB
ABCin \rightarrow for (ch = 'A'; ch <='A'+i; ch++) { cout ch; cout endl; }15th

ABCD

ABC

AB

A

i $\leq n$ in \rightarrow ch = 'A'; ch \leq 'A' + (n - i - 1); ch++;16th

A

BB

ccc

DDDD

outer $\leq n$

char ch = 'A' + i; ch++;

for (int j=0; j <= i; j++)

cout endl;

{ cout < ch; }

outer = n times from before.

spaces $\rightarrow n - i - 1$ Number of character's \rightarrow 17th

A

AB

ABA

ABCB

ABCB

Inc

Dec

Break

symmetry breaks at $\left\lceil \frac{n}{2} + 1 \right\rceil$ post \rightarrow

++

-

-

-

-

char ch = 'A'; int break = (2 * i + 1) / 2;

for (j=0; j <= 2 * i + 1; j++) cout ch;

if (j <= break) cnt++

else ch -= 1;

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Theme:

* 18th

0 → E
1 → DE
2 → CDE
3 → BCDEF
4 → ABCDEF

E - i = P

```
for (i=0; i<n; i++)
    for (char ch = E[i]; ch <= E[i]; ch++)
        cout <ch>
    cout endl;
```

19th

n=5
* * * * *
* * * * *
* * * * *
* * * * *
* * * * *

1 → * * * * *
2 → * * * * *
3 → * * * * *
4 → * * * * *
5 → * * * * *

// Stars // Space // Stars

```
for (i=0; i<n; i++)
    2 pt. [0 → 5 > 0 5]
    i → 1 2
    4 → 1 2 1
```

// Stars => n-i+2

// Spaces => +2

1st Part

```
int init = 0;
for (i=0; i<n; i++)
    1st for (j=1; j<n-i; j++) cout *
    1st for (j=0; j<init; j++) cout u
    1st for (j=1; j<n-i; j++) cout *
    init += 2
    cout endl;
```

3rd

int init = 2n-2; i < n; i++)

```
for (int i=0; i<n; i++)
    for (j=1; j<i; j++) cout *
    for (j=0; j<init; j++) cout u
    for (j=1; j<i; j++) cout *
```

init -= 2;

cout endl;

2nd Part

[1 9 1]
[2 6 2]
[3 4 3]

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Theme:

20th

```

1 * 1 2 3 4 5 6 7 8 *
2 xx
3 xxo
4 xxox
5 xxox x
6 xxox x
7 xxox
8 xx
9 x
    
```

int spaces = $2n - 2$
 for ($i = 1$; $i \leq 2n - 1$; $i++$)

{ int stars = i ;

if ($i > n$) stars = $2n - i$

// Stars

for ($j = 1$; $j \leq stars$; $j++$) cout *

// SP for ($j = 1$; $j \leq spaces$; $j++$) cout " "

ctrl v

cout endl;

if ($i < n$) spaces = $2i$

else spaces + = $2i$

}

21st
 Boundaries has stars only

```

n [ x x x x
   x x x x
   x x x x
   x x x x
   0 1 2 3
    
```

i=0; j=n-1
 j=0 j=n-1

Boundaries

for ($i = 0$; $i < n$; $i++$)

for ($j = 0$; $j < n$; $j++$)

if ($i == 0 || j == 0 || i == n - 1 || j == n - 1$)

cout << *

else cout << " ";

cout endl;

}