Lecture 7

Pattern Programs

Pattern 1

Pattern → Nested loop

Find no. of pattern = 1

S1

S2

S3

```
for(int i=1; i<=4; i++){
    for (int j=1; j<= i; j++){
        printf("*");
    }
    printf("\n");
}
```

Table

i	j
1	1
2	1 2
3	1 2 3
4	1 2 3 4

Formulate Relation

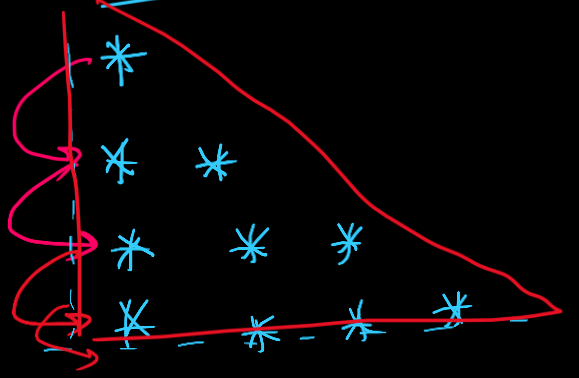
$i = j$

Dry Run

i = 1 2 3 4

j = 1 - 4

Termination



#Tamil program

```
for (int i = 1; i <= 5; i++) {
    for (int j = 1; j <= i; j++) {
        printf("*");
    }
    printf("\n");
}
```

1 → 1

2 → 2 2

3 → 3 3 3

4 → 4 4 4 4

5 → 5 5 5 5 5

*

* *

* * *

* * * *

* * * * *

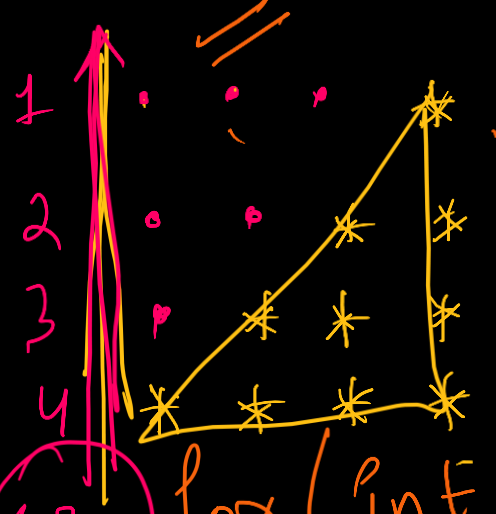
3 → _ _ 3

4 → _ 4 4 4

2 3 4

1 2 3

P2



S1 No. of patterns = 2

S2 P1 P2

S3

```
for(int i=1; i<=4; i++){
    for(int j=1; j<=4-i; j++){
        printf(" ");
    }
    for(int k=1; k<=i; k++){
        printf("*");
    }
    printf("\n");
}
```

i	j (space)	4-i = j
1	3	3
2	2	2
3	1	1
4	0	0

i	k (star)	i = k
1	1	
2	2	
3	3	
4	4	

P3

$j = 3 - i$

$i * 2 - 1 = \text{Star}$

S2

Pattern = 2

Table

P1

i	j (space)
3 − 1	2
3 − 2	1
3 − 3	0

$3 - i = j$

$p^2 + q = 1$

$2 \times p + q = 3$

$p = -2$

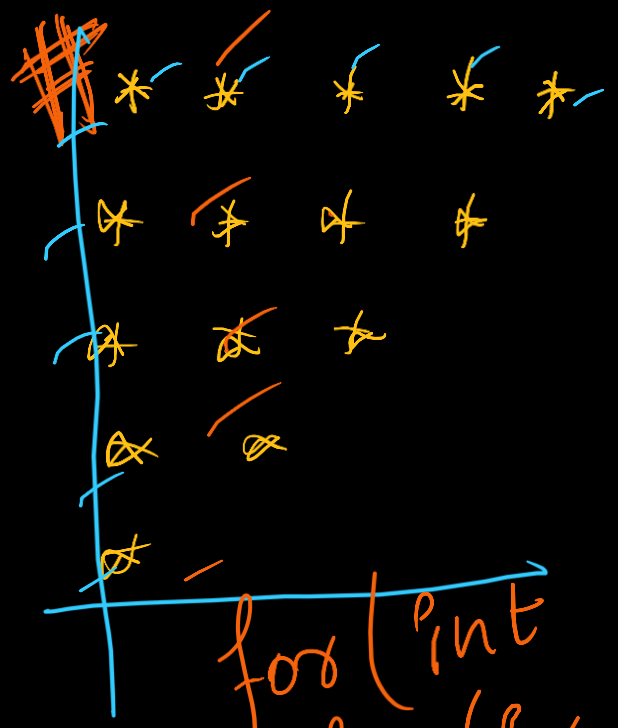
$q = -1$

P2

i	K (star)
$1 \times p + q = 1$	
$2 \times p + q = 3$	
3	5

```
for (int i = 1; i <= 3; i++) {
    for (int j = 1; j <= 3-i; j++) {
        printf(" ");
    }
    for (int k = 1; k <= i*2-1; k++) {
        printf("*");
    }
    printf("\n");
}
```

P4



S1 No. of patterns = 1

S2 Table

i	j
1	5
2	4
3	3
4	2
5	1

$j = 6 - i$

```
for(int i=1; i<=5; i++){
    for(int j=1; j<=6-i; j++){
        printf("*");
    }
    printf("\n");
}
```

PS

S1 No. of patterns = 2

S2 Space (j) Stud (k)

$j = i - 1$

$1 \times b + a = 0$ $\quad 6 - 1 \quad 5$

$2 \times b + a = 1$ $\quad 6 - 2 \quad 4$

$3 \quad 2 \quad 6 - 3 \quad 3$

$4 \quad 3 \quad 6 - 4 \quad 2$

$1\,5 \quad 4 \quad 6 - 5 \quad 1$

P6

#

P7

P8 Program

i = 23

j = 1 - 3

t = 1 2 3 4 5 6

int cb = 1

for(int i=1; i<=4; i++)

x1

for(int j=1; j<i; j++){

printf(cb);

cb++;

}

printf("\n");

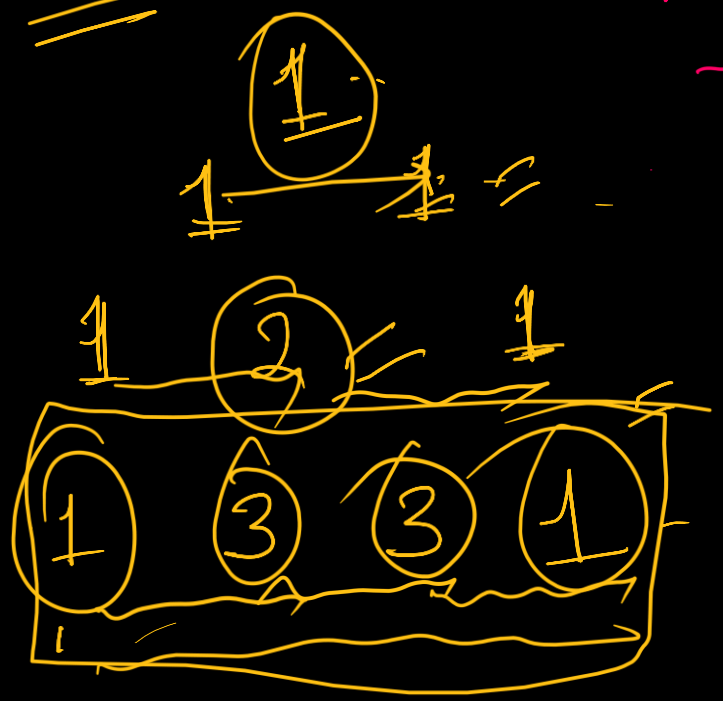
1

2 3

4 5 6

P9

Pascal's Triangle



1

1 1

2 → $^2C_0$ $^2C_1$ $^2C_2$

3 → $^3C_0$ $^3C_1$ $^3C_2$ $^3C_3$

$^4C_0$ $^4C_1$ $^4C_2$ $^4C_3$ $^4C_4$

$^1C_0$ $^1C_1$

$^2C_0$ $^2C_1$ $^2C_2$

$^3C_0$ $^3C_1$ $^3C_2$ $^3C_3$

$^4C_0$ $^4C_1$ $^4C_2$ $^4C_3$ $^4C_4$

$^4C_0$ $^4C_1$

$^4C_0$

Combination

P1 P2 P3 P4 P5

Problem?

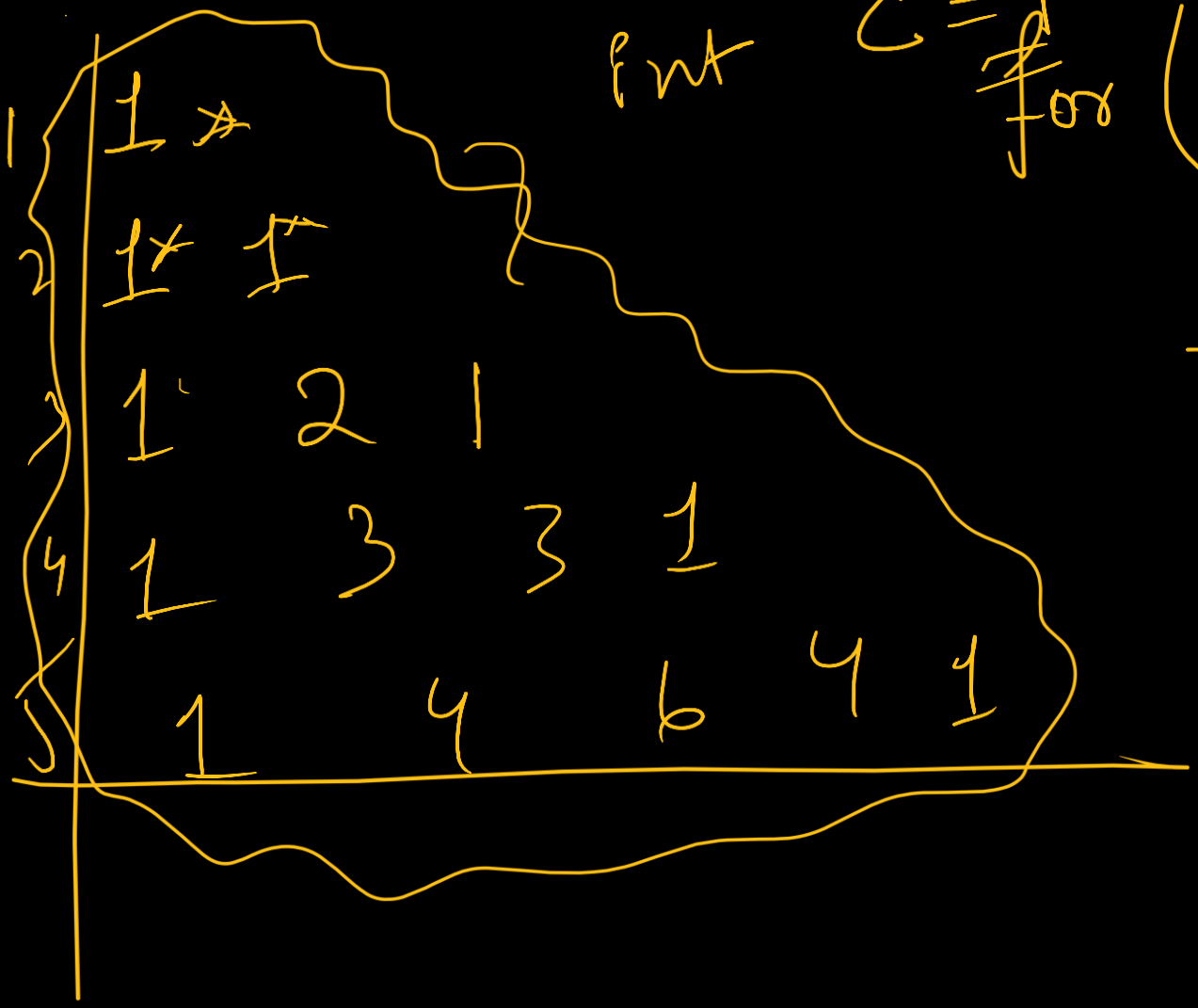
$n <= p$

$n!$

$1 \times 2 \times 3 \times 4 \times 5 = 5!$

$$^{n}C_{p} = \frac{n!}{(n-r)! \times r!}$$

$$^{5}C_{3} = \frac{5!}{(5-3)! \times 3!}$$




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