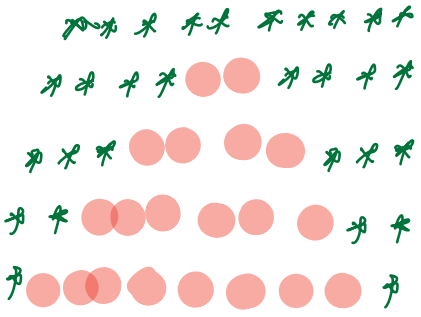
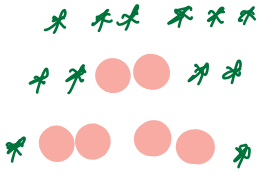
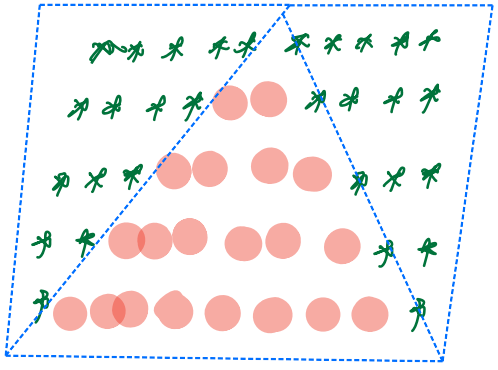
// Q1 N = 5



N = 3



N = 5



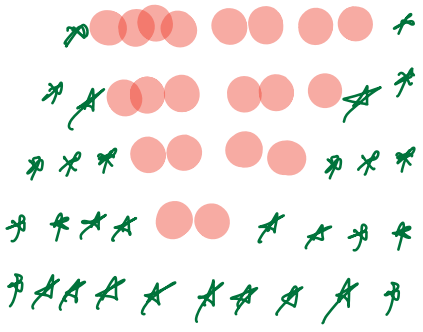
Row	*1	spaces	*2
1	5	0	5
2	4	2	4
3	3	4	3
4	2	6	2
5	1	8	1
	n+1−row	2×row−2	n+1−row

2 × row ≅ spaces

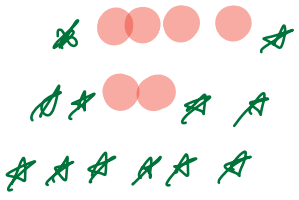
```
for(int r=1; r<=n; r++){
    // Print *1
    for(int star=1; star<=n+1-row; star++){
        SOP(*)
    }
    // Print spaces
    for(int spaces=1; spaces<=2*r-2 , spaces++){
        SOP(" ")
    }
```

```
// Print A2
for(int star = 1; star <= n+1-row; star++){
        SOP(*)
}
    SOPln()
}
```

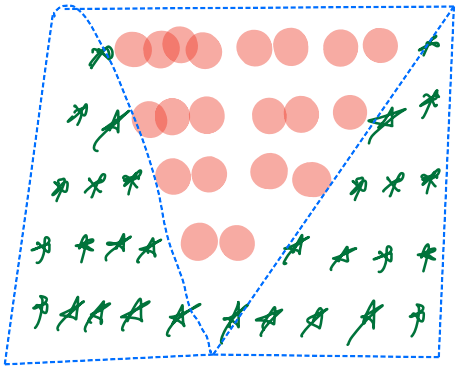
// Q2 N = 5



N = 3



N = 5



Row	A1	spaces	A2
1	1	8	1
2	2	6	2
3	3	4	3
4	4	2	4
5	5	0	5
	row	2n-2row	row

2 x row = spaces

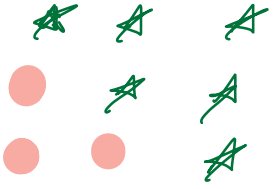
2 x row + spaces = 2n

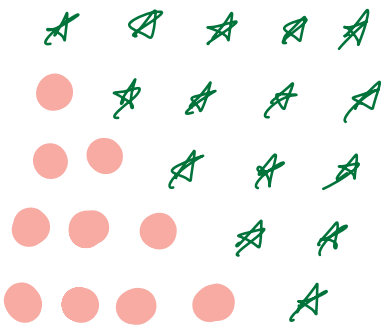
spaces = 2n - 2row

```
for (int r = 1; r <= n ; r++) {
```

```
// Print *1
for(int star = 1; star <= row , star++){
        SOP(*)
}
// Print spaces
for(int spaces = 1; spaces <= 2*n - 2*r , spaces ++){
        SOP(" ")
}
// Print *2
for(int star = 1; star <= row ; star++){
        SOP(*)
}
        SOPln()
}
```

// Q3 N = 3 N = 5





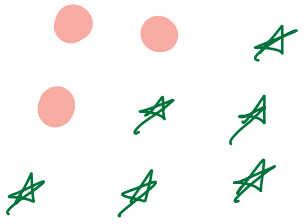
N = 5

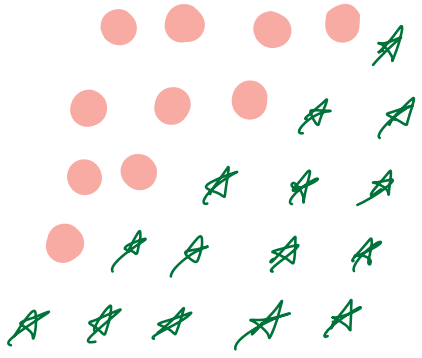
Row	spaces	stars
1	0	5
2	1	4
3	2	3

4 3 2
5 4 1

row-1 n+1-row

// Q4 N=3 N=5



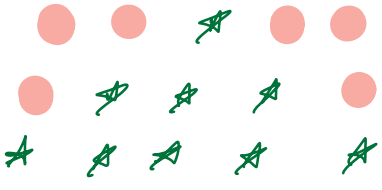


Row	space	star
1	4	1
2	3	2
3	2	3
4	1	4
5	0	5

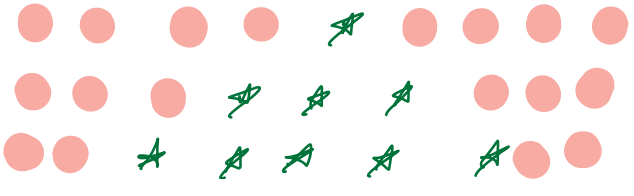
n-row row

// Q5

N=3



N=5

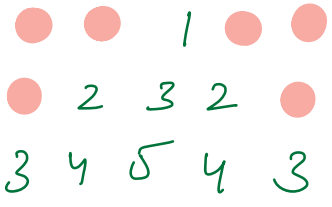


Row	space	star
1	4	1
2	3	3
3	2	5
4	1	7
5	0	9
	n-row	2 x row - 1

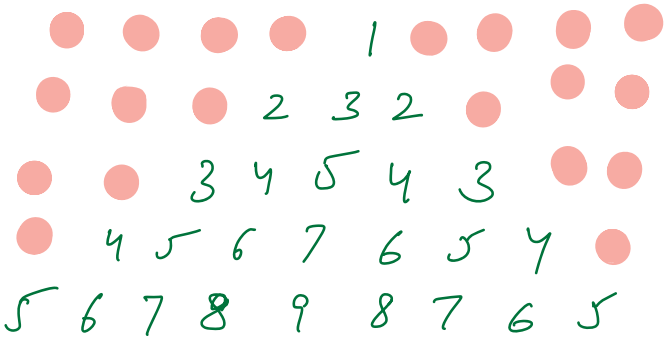
2row ≅ star

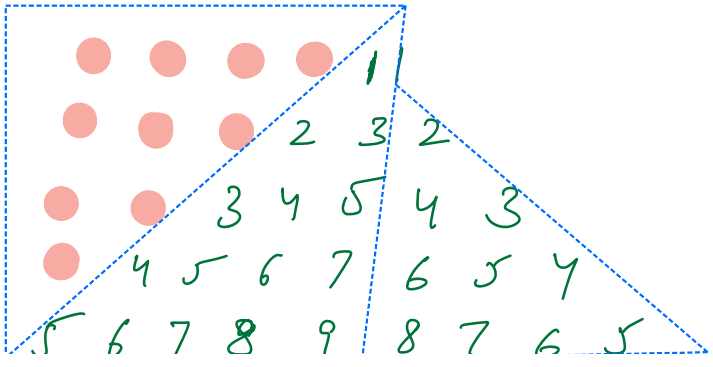
// Q6

N = 3

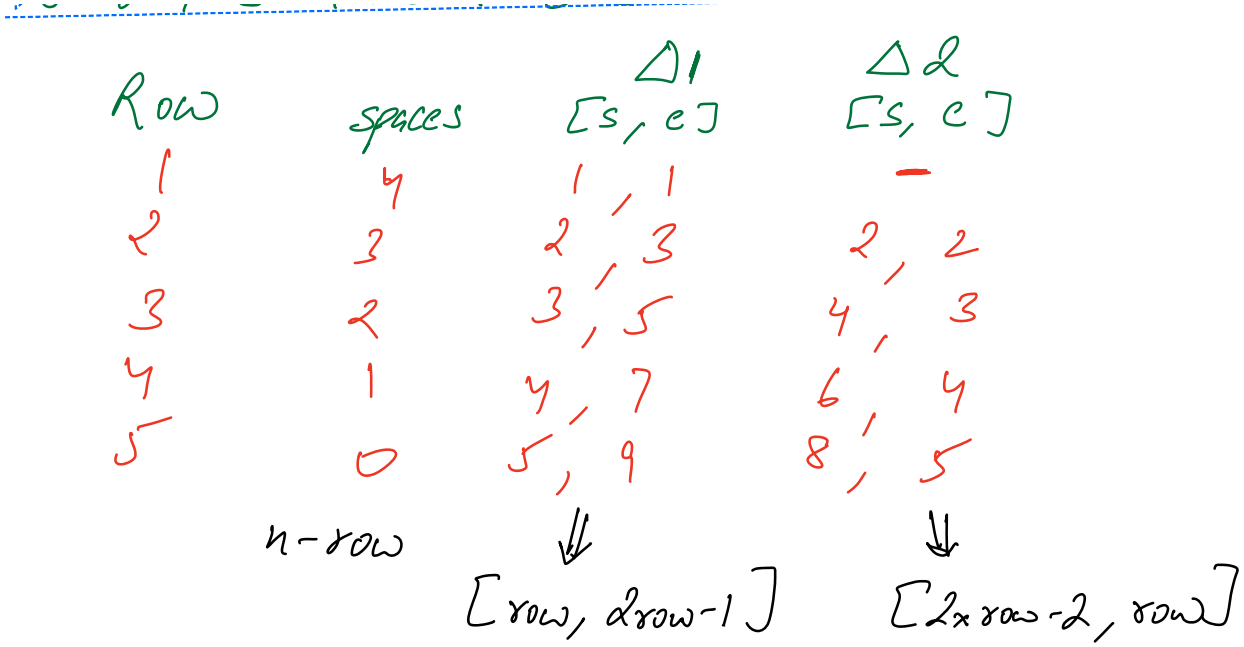


N = 5





N=5



Maths

- Power
- Logs
- AP
- GP
- LCM
- HCF

Powers / Exponents

$x^{y} = z$

y → Power / exponent

$$\underbrace{x \cdot x \cdot x \cdot \ldots \cdot x}_{y \text{ times}} = z$$

$2^3 = 2 \times 2 \times 2 = 8$

$x = 2, \quad y = 3, \quad z = 8$

$4^6 = 4096$

$x = 4, \quad y = 6, \quad z = 4096$

$2 \cdot 73^{-1} = \frac{1}{(2 \cdot 73)^1} \approx 0.367$

$3 \cdot 17^{-1.5} = \frac{1}{3 \cdot 17^{1.5}}$

$(-4 \cdot 3)^{-\pi} = \frac{1}{(-4 \cdot 3)^{\pi}}$

Logs

$x^y = z$

If $z = 16$ and $x = 2$
what is the value of y?

Ans = 4

$2 \times x = 8$

$2 - x = 8$

$2^y = 16$

$\Rightarrow y = \log_2 16$

$2 \times 2 \times 2 \times 2 = 16$

$2^4 = 16$

$4 = \log_2 16$

Log Base Product = Power

$\log_x z = y$

Exponent $2^3 = 8$ $\quad 5^3 = 125$

Log $3 = \log_2 8$ $\quad 3 = \log_5 125$

Exponent $6^{-2} = 1/6^2 = 1/36$

$-2 = \text{Log}_6 (1/36)$

$\log 1000 = 3 \quad \Rightarrow [10^3 = 1000]$

$\log_2 64 = 6 \Rightarrow [2^6 = 64]$

Arithmetic Progression (AP)

↳ Mathematical series

$S_1 = 2, 5, 8, 11, 14 \ldots$

$S_2 = 2, 4, 5, 7, 1, 0, -1$

$S_3 = 4, 2, 0, -2, -4, \ldots$

$T_1 = 2 = 2 + 0 \times 3$

$T_2 = 5 = 2 + 3 = 2 + 1 \times 3$

$T_3 = 8 = 5 + 3 = 2 + 2 \times 3$

$T_4 = 11 = 8 + 3 = 2 + 3 \times 3$

$T_5 = 14 = 11 + 3 = 2 + 4 \times 3$

$T_n = 2 + (n-1) \times 3$

$T_5 = 2 + (5-1) \times 3 = 2 + 4 \times 3 = 2 + 12 = 14$

$T_1 = a$

$T_n - T_{n-1} = d$ = common difference

$T_n = a + (n-1)d$

$a = 4$
$d = 3$
$n = 100$

$T_{100} = 4 + (100-1) \times 3 = 4 + 99 \times 3$
$= 4 + 297$
$= 301$

$a = 4$
$d = -2$
$n = 5$

$T_5 = 4 + (5-1) \times -2 = 4 + 4 \times -2$
$= 4 - 8$
$= -4$

Sum of N terms of a series

$S_n = T_1 + T_2 + T_3 + \ldots + T_n$
$S_n = T_n + T_{n-1} + T_{n-2} + \ldots + T_2 + T_1$

$\Rightarrow S_n = (a) + (a+d) + (a+2d) \ldots + (a+(n-1)d)$
$\Rightarrow S_n = (a+(n-1)d) + (a+(n-2)d) + (a+(n-3)d) + \ldots (a)$

$2a + (n-1)d \quad 2a + (n-1)d \quad 2a + (n-1)d \quad 2a + (n-1)d$

$$2S_n = N * (2a + (N-1)d)$$

$$S_n = \frac{N}{2} * (2a + (N-1)d)$$

Geometic Progression (GP)

S_1 = 2, 4, 8, 16, 32 ....

S_2 = 1, -1, 1, -1, 1, -1 ....

Common ratio $\Rightarrow r$

$T_1 = a$

$T_1 = a \times r^0$ $[r^0 = 1]$

$T_2 = a \times r^1$

$T_3 = a \times r^2$

$T_4 = a \times r^3$

$T_n = a \times r^{(n-1)}$

$a = 2$

$r = 3$

$n = 4$

$= 2 \times 3^{(4-1)}$

$= 2 \times 3^3$

$= 2 \times 27$

$= 54$

$a = 7 \quad = 7 \times 2^{(2-1)}$

$r = 2 \quad = 7 \times 2^{2}$

$n = 3 \quad = 7 \times 4$

$= 28$

Sum. of N terms of GP

$$S_n = \begin{cases} \dfrac{a(r^n - 1)}{r-1}, & r \neq 1 \\ an, & r = 1 \end{cases}$$