

$$d = 2a/x$$

Session 2

ASUFE CP C

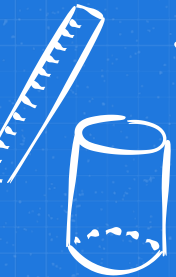
$$\gamma = \frac{d}{z}$$



$$y=mx+b$$

Agenda:

- 1- Revision on array
- 2- Prefix sum
- 3- 2D Prefix sum
- 4- Frequency array
- 5- Built-in functions





$$\gamma = \frac{d}{N}$$

Let's Start!



$$d = 2a/x$$

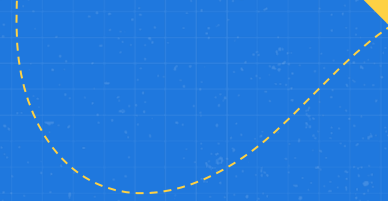
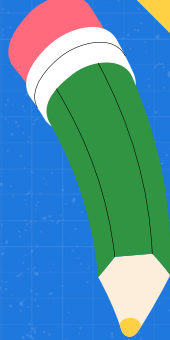



$$d = 2a/x$$



0 1

Revision on
array:



$$\gamma = \frac{d}{Z}$$


Array name:

0	1	2	3	4	5	6	7



$$y=mx+b$$

Some new benefits of array:

- 1- Fibonacci series
- 2- Counting objects



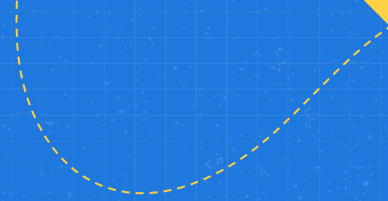
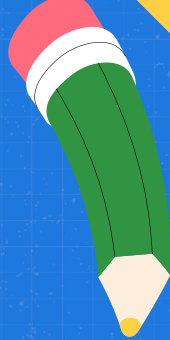
$$y = mx + b$$




$$d = 2a/x$$



0 2 Prefix sum:



$$\gamma = \frac{d}{Z}$$


arr

0	1	2	3	4	5	6
1	2	1	1	3	4	3

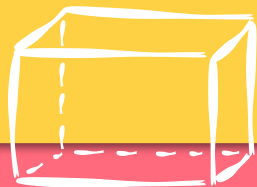
prefix

0	1	2	3	4	5	6
1	3	4	5	8	12	15



$$y = mx + b$$

WHY?



$$y=mx+b$$

Range sum



$$y = mx + b$$

$\text{prefix}[x] = \text{arr}[x] + \text{arr}[x-1] \dots + \text{arr}[0]$

$\text{prefix}[y] = \text{arr}[y] + \text{arr}[y-1] \dots + \text{arr}[0]$

if $x > y$:

$\text{prefix}[x] = \text{arr}[x] + \text{arr}[x-1] + \dots +$
 $\text{arr}[y] + \text{arr}[y-1] + \dots + \text{arr}[0]$

$\text{arr}[x] + \text{arr}[x-1] + \dots + \text{arr}[y] = ?$



$$y = mx + b$$

Implementation



$$y=mx+b$$

```
1  #include<iostream>
2
3  using namespace std;
4
5  int main()
6  {
7      const int N = 7;
8      int arr[N] = {0, 0, 1, 1, 1, 2, 5};
9      int prefix[N];
10     prefix[0] = arr[0];
11     for(int i = 1; i < N; i++)
12     {
13         prefix[i] = prefix[i - 1] + arr[i];
14     }
15
16     int l, r;
17     cin>>l>>r;
18     if(l > 0) cout<<prefix[r] - prefix[l - 1]<<endl;
19     else cout<<prefix[r]<<endl;
20     return 0;
21 }
```

Important facts



$$y=mx+b$$

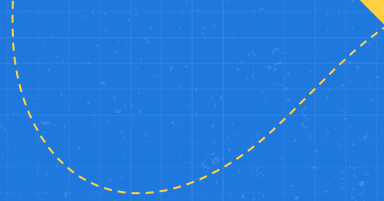
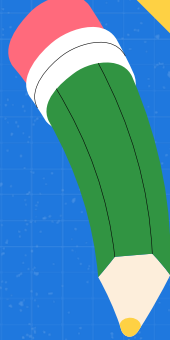


$$d = 2a/x$$



0 3

2D Prefix sum:



$$\gamma = \frac{d}{Z}$$
A hand-drawn circle in white lines containing the numbers 12 and 11.

	0	1	2
0	1	2	3
1	4	5	6
2	7	8	9

Initial Matrix

	0	1	2
0	1	3	6
1	5	12	21
2	12	27	45

Prefix Matrix



$$y = mx + b$$

	0	1	2
0	1	2	3
1	4	5	6
2	7	8	9

	0	1	2
0	1	3	6
1	4	9	15
2	7	15	24

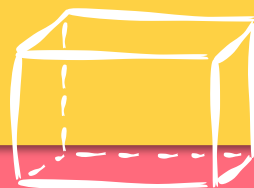
	0	1	2
0	1	3	6
1	5	12	21
2	12	27	45

Implementation



$$y=mx+b$$

```
1  #include<iostream>
2
3  using namespace std;
4
5  int main()
6  {
7      int matrix[3][3] = {{1, 2, 3},
8                          {4, 5, 6},
9                          {7, 8, 9}};
10
11     for(int i = 0 ; i < 3; i++)
12     {
13         for(int j = 1; j < 3; j++)
14         {
15             matrix[i][j] += matrix[i][j-1];
16         }
17     }
18
19     for(int i = 1; i < 3; i++)
20     {
21         for(int j = 0; j < 3; j++)
22         {
23             matrix[i][j] += matrix[i-1][j];
24         }
25     }
26     return 0;
27 }
28
```



	0	1	2
0	1	2	3
1	4	5	6
2	7	8	9

$[1][1] \rightarrow [2][2]$

$\text{matrix}[2][2]$
 $= 28$

– $\text{matrix}[0][2]$

– $\text{matrix}[2][0] + \text{matrix}[0][0]$



$y = mx + b$

$$[r1][c1] \rightarrow [r2][c2]$$

```
int c1, r1, c2, r2;  
cin>>r1>>c1>>r2>>c2;
```

```
// 1-based
```

```
int ans = matrix[r2][c2] - matrix[r1 - 1][c2] - matrix[r2][c1 - 1] + matrix[r1 - 1][c1 - 1];
```

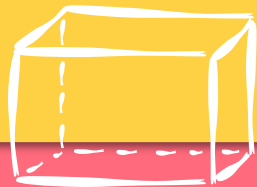
```
// 0-based
```

```
int ans = matrix[r2][c2];  
if(r1 != 0) ans -= matrix[r1 - 1][c2];  
if(c1 != 0) ans -= matrix[r2][c1 - 1];  
if(r1 != 0 && c1 != 0) ans += matrix[r1 - 1][c1 - 1];
```

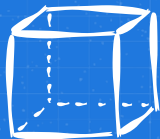


$$y=mx+b$$

Break



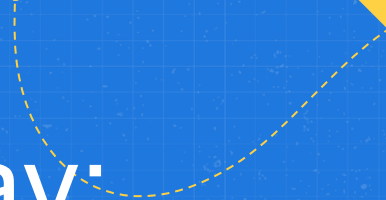
$$y=mx+b$$




$$d = 2a/x$$



0 4 Frequency array:



$$\gamma = \frac{d}{Z}$$
A hand-drawn circle containing the numbers 12 and 11, with a dashed line between them.

Sample of elements: 0 1 1 1 2 4 2 4 1 2 1 0 0 1 0 1 2 3 2 1 2
1 2 3 5 4 3 0 0 0

Element	Frequency
0	7
1	9
2	8
3	2
4	3
5	1



$$y = mx + b$$

Big Problem!



$$y=mx+b$$

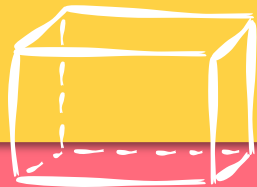
Implementation



$$y=mx+b$$

```
1      #include<iostream>
2
3      using namespace std;
4
5      int main()
6      {
7          const int N = 7;
8          int arr[N] = {0, 0, 1, 1, 1, 2, 5};
9          const int MAX_VALUE = 100;
10         int freq[MAX_VALUE + 1];
11         for(int i = 0; i <= MAX_VALUE; i++) freq[i] = 0;
12         for(int i = 0; i < N; i++)
13         {
14             int x = arr[i];
15             freq[x] += 1; // freq[arr[i]]++;
16         }
17         return 0;
18     }
19
```

Break



$$y=mx+b$$



$$d = 2a/x$$



05 Built-in Functions;

$$\gamma = \frac{d}{Z}$$



Max & Min & Swap

```
int a, b;  
a = 5, b = 3;  
max(a, b);  
min(a, b);  
swap(a, b);
```



$$y = mx + b$$

Sort

```
int arr[5] = {5, 4, 2, 3, 1};
```

```
sort(arr, arr + n);
```

```
reverse(arr, arr + n);
```



$$y=mx+b$$

Sort

```
string str = "hello world";
```

```
sort(str.begin(), str.end());  
reverse(str.begin(), str.end());
```



$$y=mx+b$$

find

```
find (const char *str, size_t pos, size_t n);
```

```
string str = "Hi all";  
str.find("all");
```



$$y=mx+b$$

substr

```
string substr (size_t pos, size_t len) const;
```

```
string str = "ASUFE CPC";  
string r = str.substr(3, 2);
```



$$y=mx+b$$

Fill

```
int arr[5];  
fill(arr, arr + 5, 8);  
cout<<arr[0];
```



$$y=mx+b$$

Other

```
pow(x, y);  
sqrt(x);  
toupper('c');  
tolower('A');  
floor(2.4);  
ceil(9.6);
```



$$y=mx+b$$

Any Questions ?



$$y=mx+b$$

Thank You



$$y=mx+b$$

Problems & Answers



$$y = mx + b$$

Problem:

<https://codeforces.com/problemset/problem/433/B>

Answer:

<https://ideone.com/JoT3w8>



$$y=mx+b$$

Problem:

<https://codeforces.com/problemset/problem/313/B>

Answer:

<https://ideone.com/suNWWB>



$$y=mx+b$$

Problem:

<https://codeforces.com/problemset/gymProblem/101853/J>

Answer:

<https://ideone.com/rVDiDR>



$$y=mx+b$$

Problem:

<https://codeforces.com/problemset/problem/520/A>

Answer:

<https://ideone.com/nZUJCh>



$$y=mx+b$$

Resources



$$y=mx+b$$

Frequency array and Prefix sum:

<https://www.youtube.com/watch?v=kzpng3DsYcw&t=4s>

2D Prefix sum:

<https://www.youtube.com/watch?v=itNTYRo in KU&t=1s>



$$y=mx+b$$