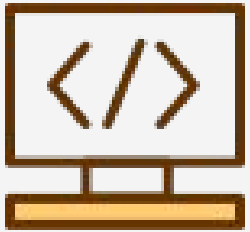


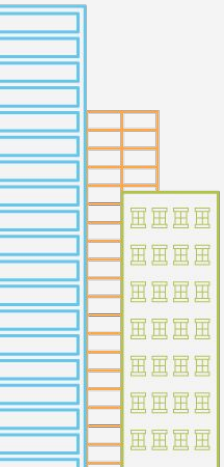
Recap Final SCPC

COMPFEST 9

Final SCPC

Soal-soal pada final SCPC dipersiapkan oleh:

- Muhammad Ayaz Dzulfikar
- Degoldie Sonny
- Firman Hadi Prayoga
- Norman Bintang
- Usama
- Windi Chandra



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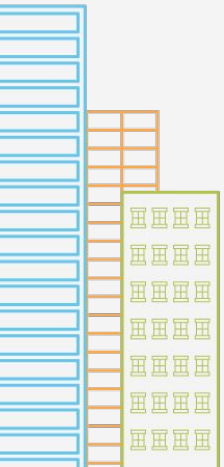
Final SCPC

Terima kasih juga pada proofreader:

- Ammar Fathin Sabili

Dan tester:

- BubbleTeaM



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Overview

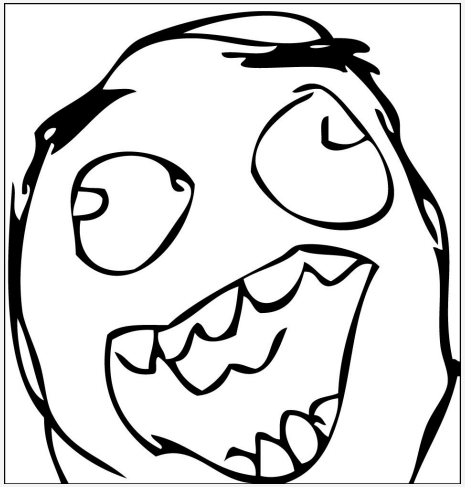
- Tim hadir: 20 tim
- Soal favorit: E - Menginap
- Soal “favorit”: G - Pertukaran Chanek
- Soal “terpanas: H - Perjalanan Aneh

Warna Balon

- A - Angka Ajaib : Ungu
- **B - Bersama Waifu : Hitam**
- C - Kuota Maksimum : Hijau
- **D - Xor-or : Biru Muda**
- E - Menginap : Merah Muda
- **F - Pasti Menang! : Merah**
- **G - Pertukaran Chanek : Biru**
- H - Perjalanan Aneh : Kuning
- I - Percobaan Median : Abu-Abu

“Easy”

- C. Kuota Maksimum
- E.Menginap
- H. Perjalanan Aneh



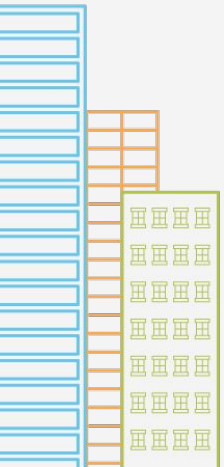
Kuota Maksimum

Author: Ryan Leonel
Tag: Greedy, DP

COMPFEST 9

Kuota Maksimum

Jumlah AC:	20
Jumlah WA:	26
Jumlah TLE:	3
Jumlah RTE:	8
Jumlah CE:	0



Kuota Maksimum

First Solve: YangBosanJuara (14')

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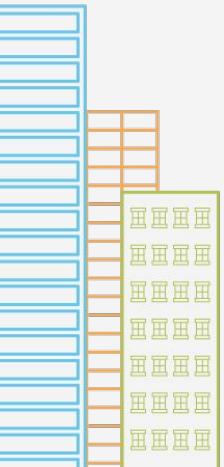
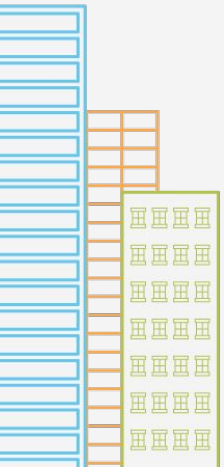
Kuota Maksimum

- DP Knapsack
- O(NM)
- Constraint aneh?



Kuota Maksimum

- Greedy
- Sort berdasarkan P_i / S_i, lalu ambil secara greedy
- O(N log N)



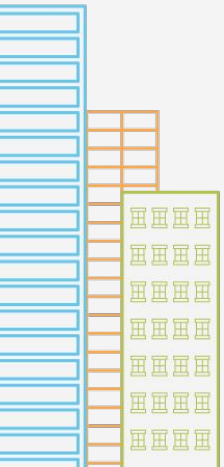
Menginap

Author: M. Ayaz Dzulfikar
Tag: Math

COMPFEST 9

Menginap

Jumlah AC:	20
Jumlah WA:	8
Jumlah TLE:	0
Jumlah RTE:	0
Jumlah CE:	0



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Menginap

First Solve: GantengGantengKoder (8')

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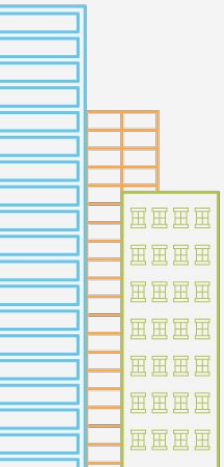
Menginap

- Linearity of Expectation
- Hitung nilai harapan masing-masing kejadian



Menginap

- Nilai harapan kejadian ke-i: $(R_i - L_i) / 2$
- Absolute precision: bisa pakai int saja
- O(N)

Perjalanan Aneh

Author: Alham Fikri Aji

Tag: Shortest Path

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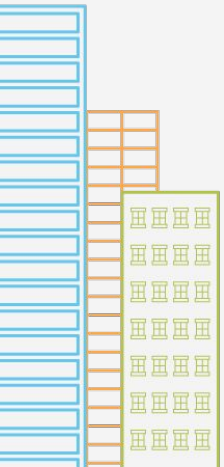
Perjalanan Aneh

Jumlah AC:	12
Jumlah WA:	97
Jumlah TLE:	45
Jumlah RTE:	15
Jumlah CE:	2



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Perjalanan Aneh

First Solve: Andi-chan (55')

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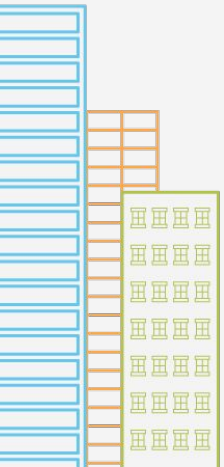
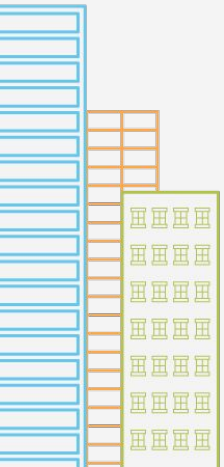
Perjalanan Aneh

- Opsi terbaik setiap saat: menunggu hingga waktu yang dibutuhkan untuk menempuh jalan = 1
- Hitung menggunakan simple math
- Karena bisa menunggu, lebih baik sampai secepat mungkin ke suatu kota



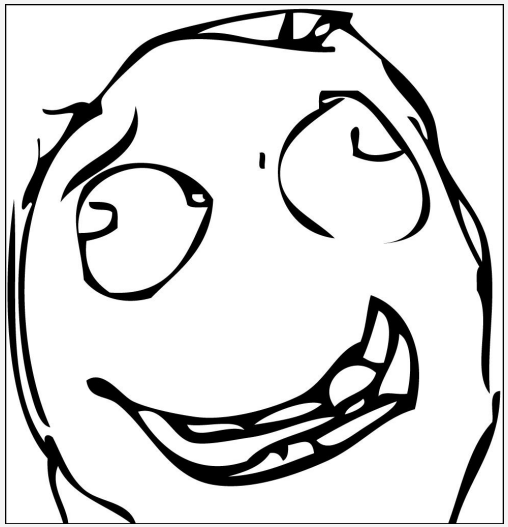
Perjalanan Aneh

- Shortest path!
- Pakai Dijkstra’s algorithm
- O(M log N)



“Medium”

- D. Xor-or
- A. Angka Ajaib
- I. Percobaan Median



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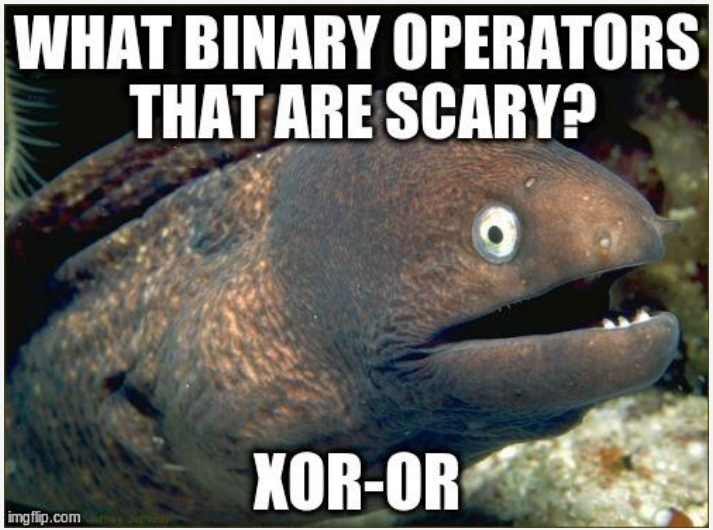
Xor-or

Author: M. Ayaz Dzulfikar
Tag: Bitwise, Graph Traversal



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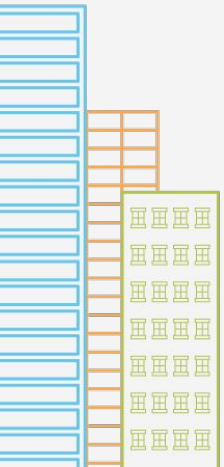
Xor-or

Jumlah AC:	0
Jumlah WA:	0
Jumlah TLE:	0
Jumlah RTE:	1
Jumlah CE:	0



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Xor-or

First Solve: ???

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Xor-or

- Hasil akhir di-or; Kerjakan per-bit saja
- Untuk tiap bit, kerjakan di masing-masing komponen graf

Xor-or

- DFS/BFS dengan state [posisi][paritas_bit_sekarang]
- [N][0/1]
- Misal ukuran komponen sz, $count_0$ yang kevisit di paritas 0, dan $count_1$ di paritas 1.
- Yang bisa disimpulkan?

Xor-or

- Odd-cycle ([x][0] dan [x][1] tervisit): ada C(sz, 2) pasangan yang bit sekarang menyala
- Selain itu: ada $count_0 * count_1$ pasangan
- O((N + M) log MAX_VAL)

Xor-or

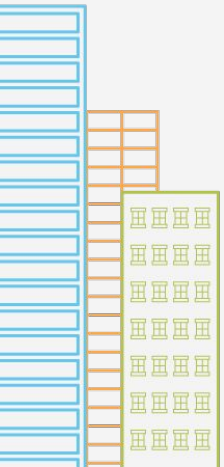
- Solusi alternatif
- Observasi ruang vektor dan gauss
- O((N + M) log MAX_VAL) juga, code-nya juga simple

Angka Ajaib

Author: Usama
Tag: DP, String

Angka Ajaib

Jumlah AC:	3
Jumlah WA:	38
Jumlah TLE:	4
Jumlah RTE:	4
Jumlah CE:	0



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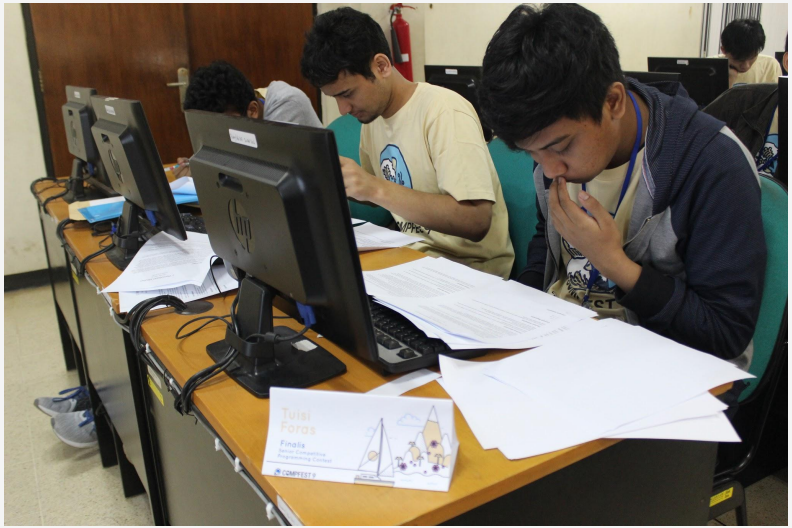
Angka Ajaib

First Solve: Tuisi Foras (75')



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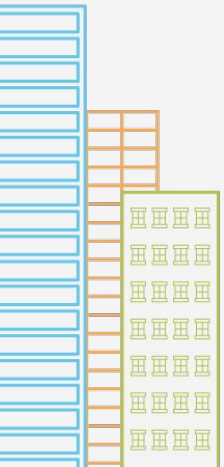
Angka Ajaib

- Observasi string terlarang: failure functionnya lucu
- Buat DP yang bisa dispeed-up dengan prefix sum dan perkalian



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Angka Ajaib

- $count_1$ <- banyak karakter yang sama dengan S_1
- DP[N][3]:
  - DP[*][0]: tepat sebelumnya, berbeda dengan S_1
  - DP[*][1]: tepat sebelumnya, ada setidaknya $count_1$ S_1
  - DP[*][2]: tepat sebelumya, ada 1 S_1

Angka Ajaib

- Tricky case: karakternya sama semua
- DP[*][1] = 0 untuk case itu

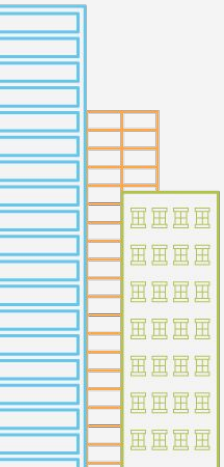
Angka Ajaib

- Perhitungan bisa pakai perkalian dan prefix sum dari DP.
- Kompleksitas: O(N)
- Ada setidaknya 3 solusi berbeda, semua O(N)

Percobaan Median

Author: M. Ayaz Dzulfikar

Tag: Binary Search, Sliding Window



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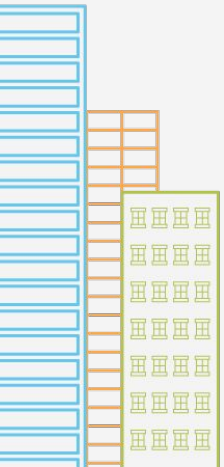
Percobaan Median

Jumlah AC:	2
Jumlah WA:	0
Jumlah TLE:	2
Jumlah RTE:	0
Jumlah CE:	0



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Percobaan Median

First Solve: Ainge WF (39')

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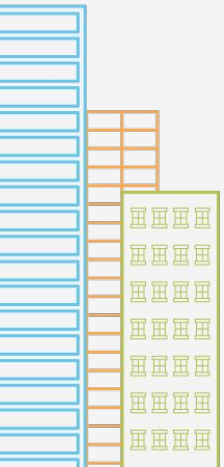
Percobaan Median

- check(array, x): cek apakah median array ≤ x
- Yang nilainya ≤ x ada ≥ floor(|array| / 2) + 1

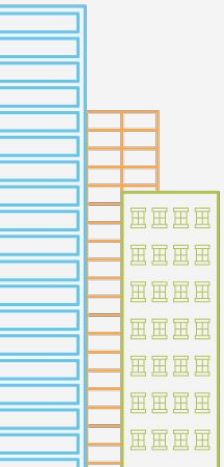


Percobaan Median

- Meriksa jawaban ≤ x?
- Hitung banyak pasangan subarray yang nilai ≤ x-nya > K.
- Sliding Window + (Sort / Prefix Sum)

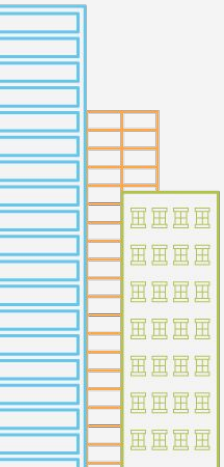
Percobaan Median

- Cari jawaban?
- Binary search the answer
- O(N log N log MAX_VAL)



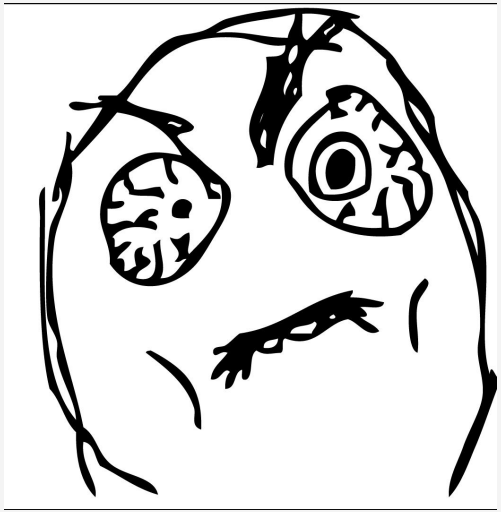
Percobaan Median

- Constraint asli soal: arraynya ada 3



“Hard”

- F. Pasti Menang!
- G. Pertukaran Chanek



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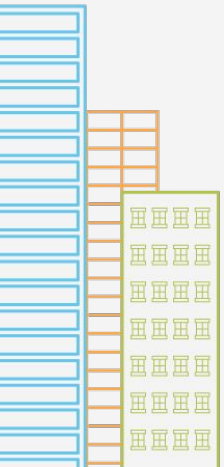
Pasti Menang!

Author: M. Ayaz Dzulfikar
Tag: Grundy, DP

COMPFEST 9

Pasti Menang!

Jumlah AC:	0
Jumlah WA:	0
Jumlah TLE:	1
Jumlah RTE:	0
Jumlah CE:	0



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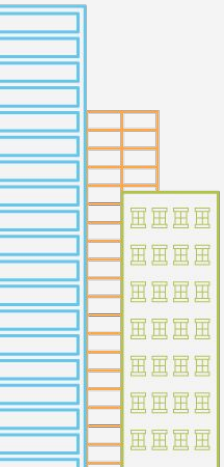
Pasti Menang!

First Solve: ???

COMPFEST 9

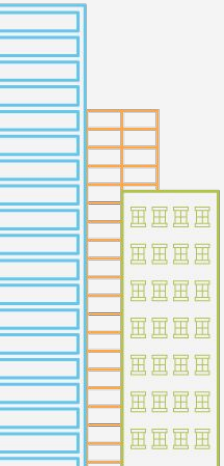
Pasti Menang!

- Pasti DAG
- Nim-game
- Cari grundy number



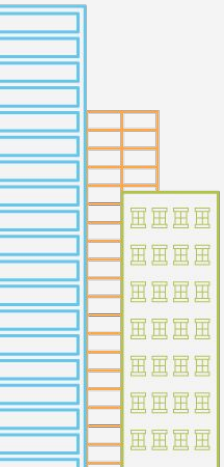
Pasti Menang!

- K gede
- Bisa dianeh-anehin
- Nilai grundy max. berapa?



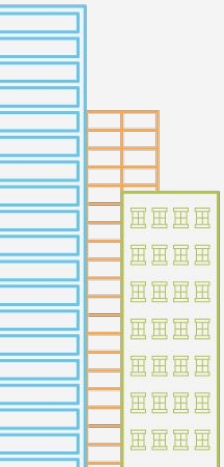
Pasti Menang!

- sqrt(2 * M) ≈ 400
- Grundy number terbesar untuk tiap state game: 511



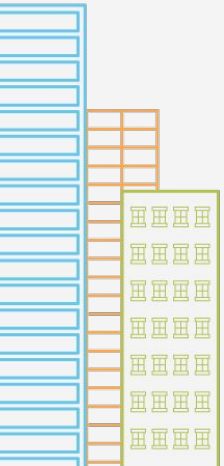
Pasti Menang!

- DP matrix?
- Terlalu lambat, $512^3 * \log(K)$



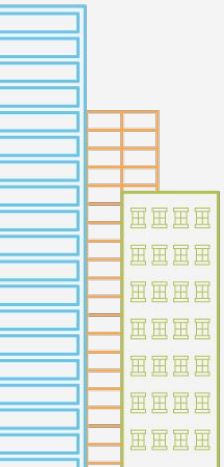
Pasti Menang!

- Kayak-dp-matrix-tapi-bukan-dp-matrix
- Definisi: dp[x][y] = banyak peletakan 2^x bidak yang hasil xor grundy numbernya = y
- dp[0][*] <- hitung dari input



Pasti Menang!

- dp[x][y] = jumlah dp[x-1][z] * dp[x-1][y ^ z] untuk tiap z
- Cara hitung jawaban?



Pasti Menang!

- result[512] <- [1, 0, 0, 0, ..., 0]
- Binary ascending (?)
- Kalikan dengan cara seperti nge-DP
- ???
- Profit!

Pasti Menang!

- Jawaban: banyak peletakan yang grundy numbernya tidak 0
- Kompleksitas: $O(MAX\_GRUNDY^2 \log K)$

Pertukaran Chanek

Author: M. Ayaz Dzulfikar
Tag: Greedy, DS

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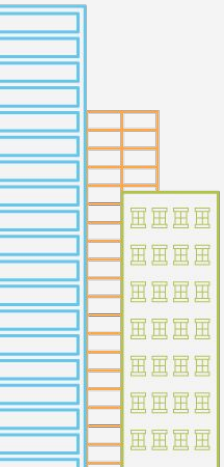
Pertukaran Chanek

Jumlah AC:	0
Jumlah WA:	0
Jumlah TLE:	0
Jumlah RTE:	0
Jumlah CE:	0



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Pertukaran Chanek

First Solve: ???

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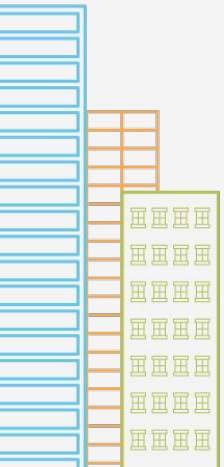
Pertukaran Chanek

1. Salah satu solusi optimal pasti pilih 2 indeks a dan b, dan gerakin salah satu sampai ketemu dan untuk sisanya, swap dua indeks itu
2. a dan b pasti maksimum di rentang [a, b]; tidak ada c sehingga $A_c > \min(A_a, A_b)$, atau tidak optimal

Pertukaran Chanek

- Banyaknya (a, b) ada O(N)
- Cari pakai stack

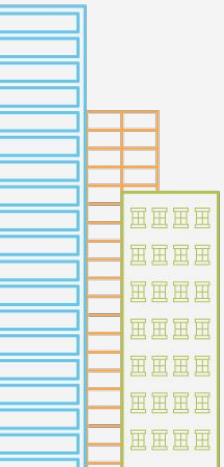


Pertukaran Chanek

- Kerjakan secara offline
- Reduksi soal jadi range-max-query
- O((N + Q) log N)

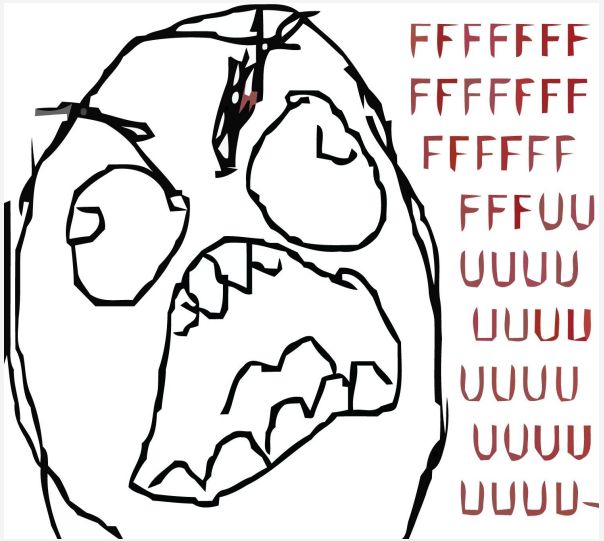
Pertukaran Chanek

- Beberapa lemma diskip agar tidak panjang



“Very Hard”

- B. Bersama Waifu

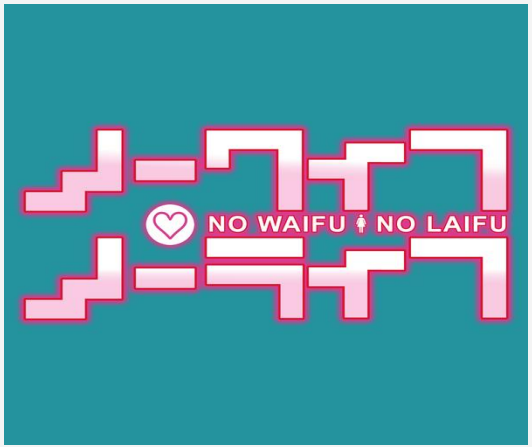


COMPFEST 9

Bersama Waifu

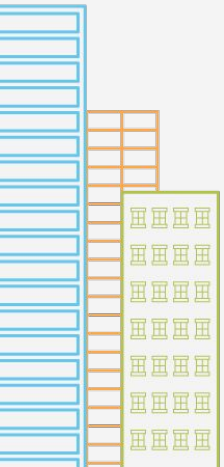
Author:
- Ammar Fathin S.
- M. Ayaz Dzulfikar

Tag: Geometry, Matching



Bersama Waifu

Jumlah AC:	0
Jumlah WA:	5
Jumlah TLE:	0
Jumlah RTE:	0
Jumlah CE:	0



COMPFEST 9

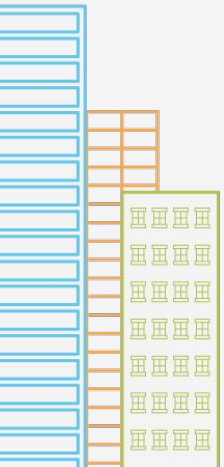
Bersama Waifu

First Solve: ???

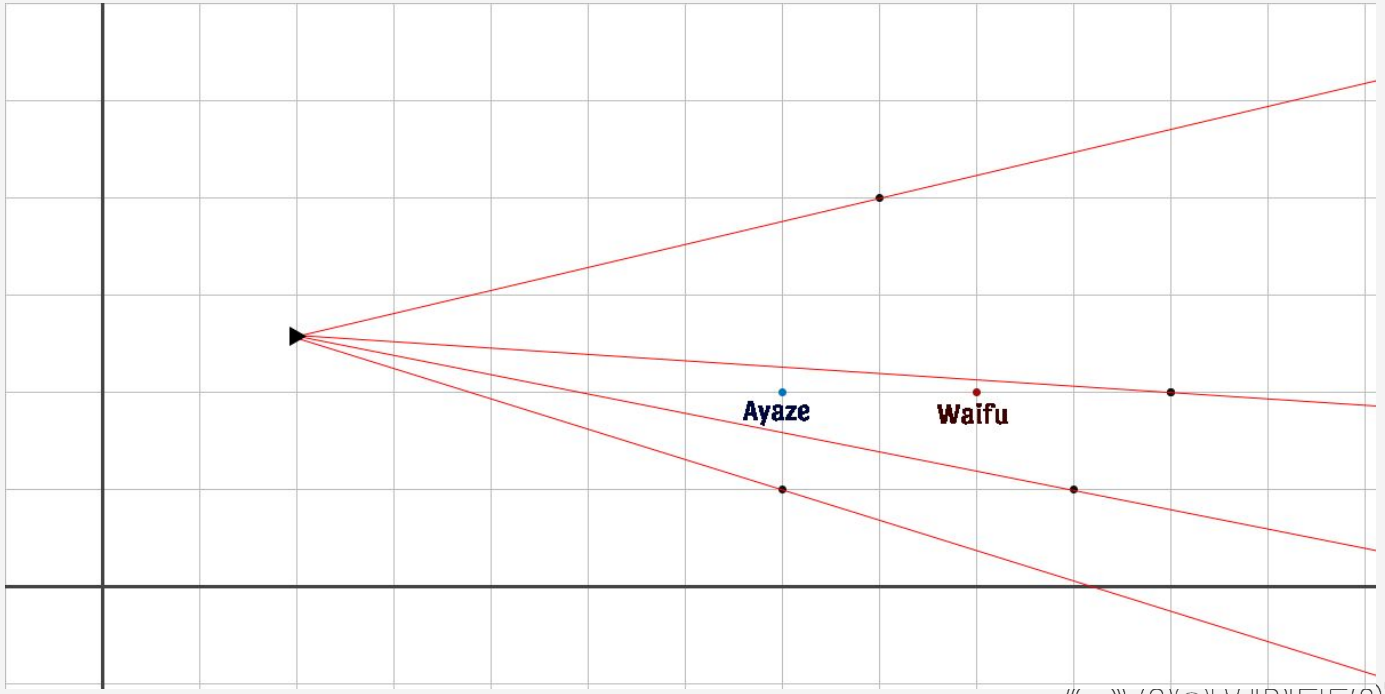
COMPFEST 9

Bersama Waifu

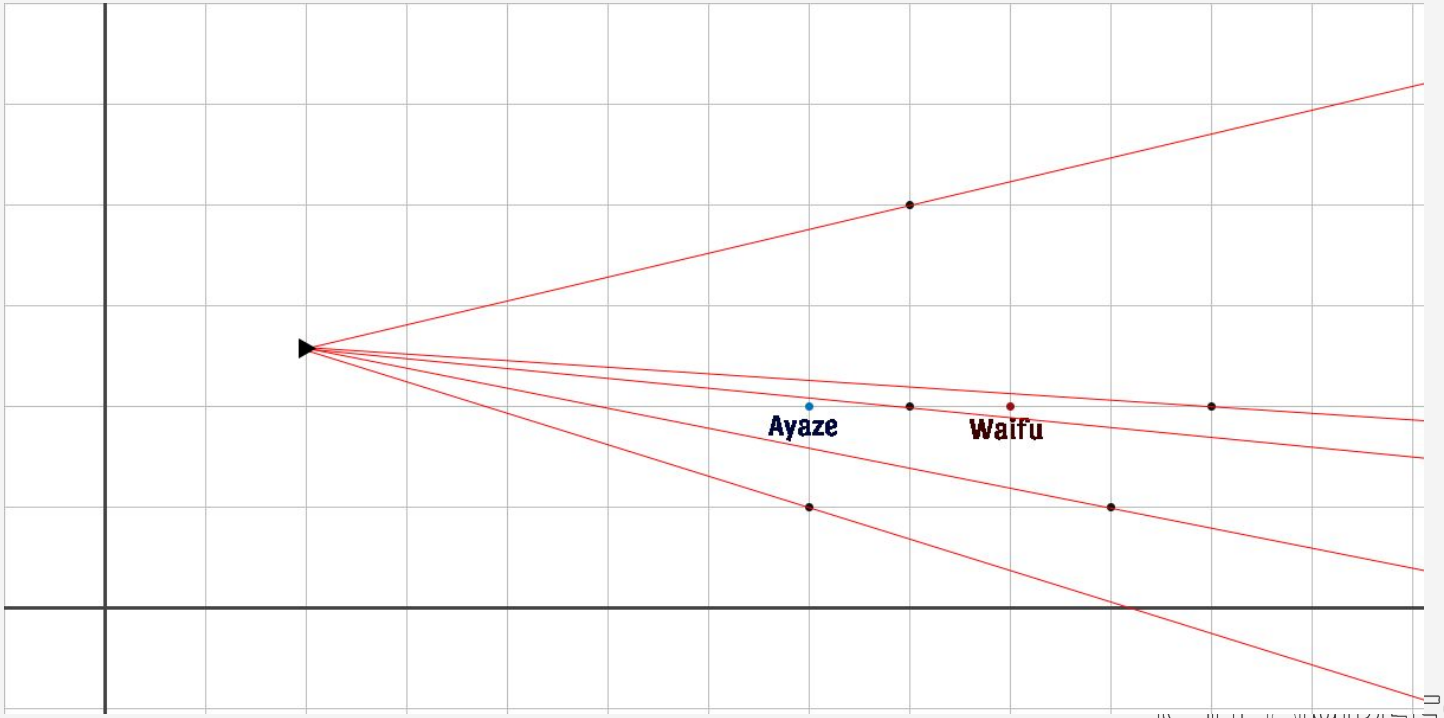
- Solve untuk soal yang lebih mudah: cari YES/NO



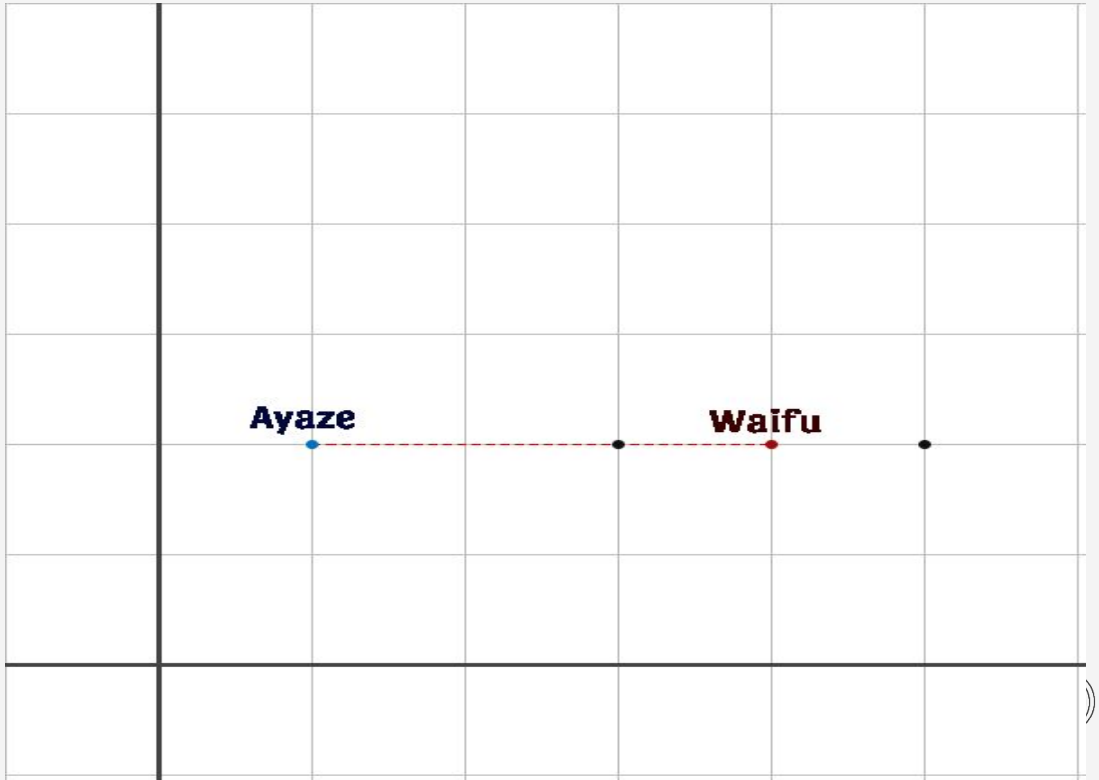
Bersama Waifu



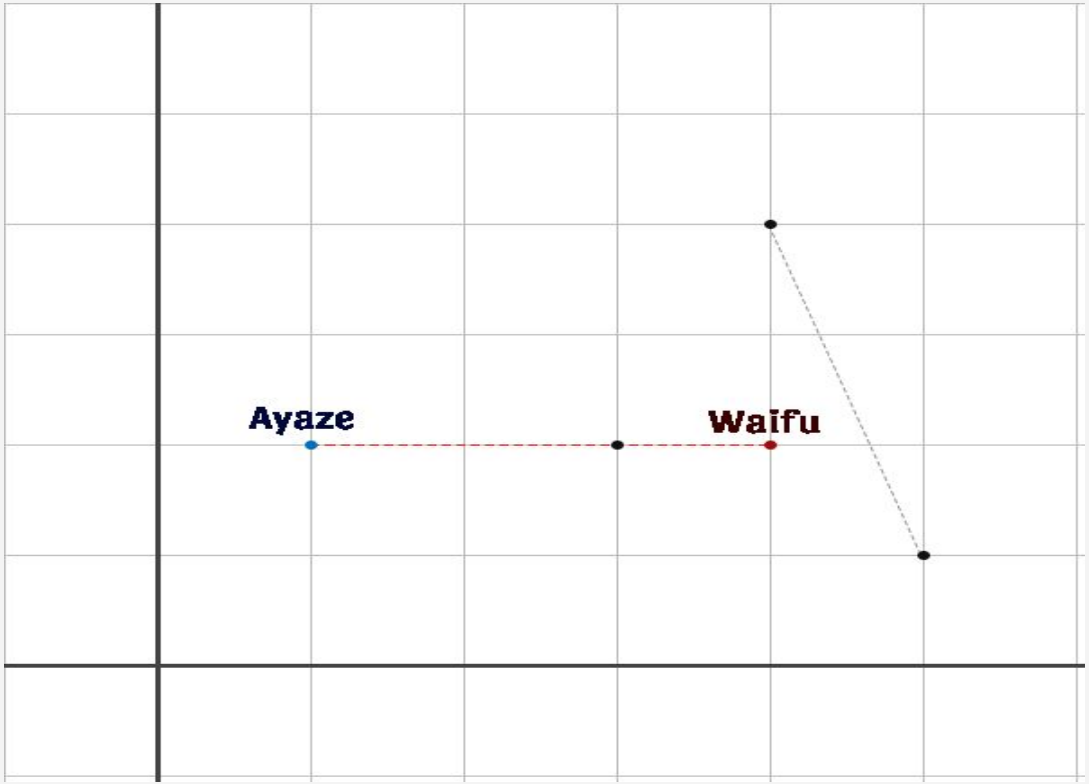
Bersama Waifu



Bersama Waifu

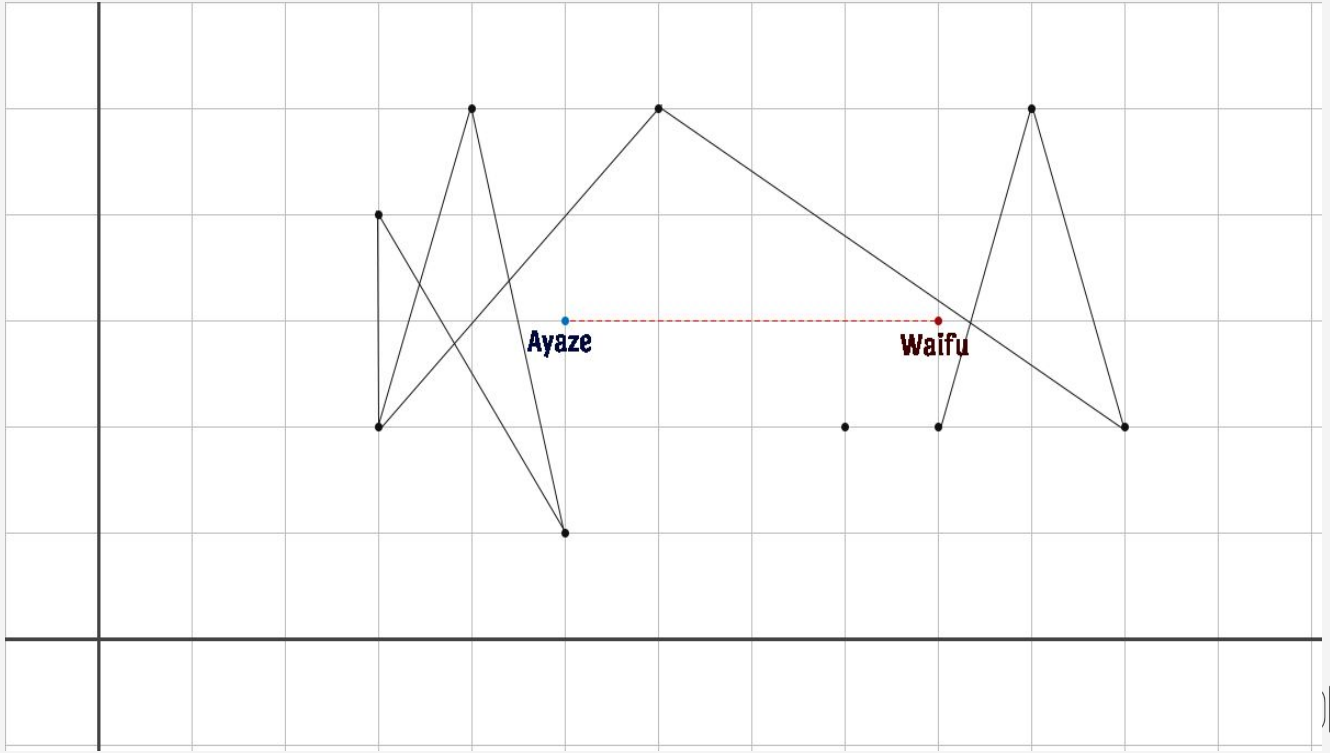


Bersama Waifu

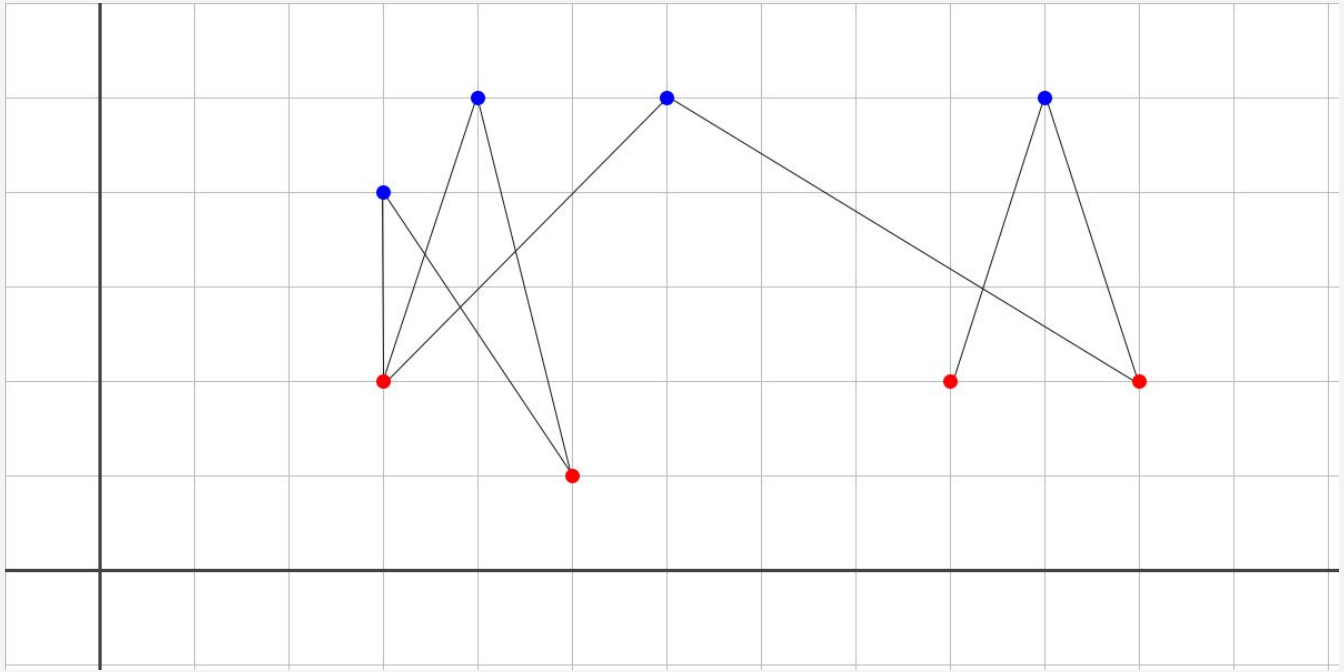


COMPFEST 9

Bersama Waifu

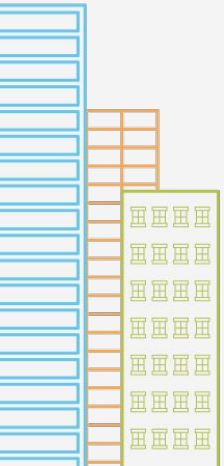


Bersama Waifu



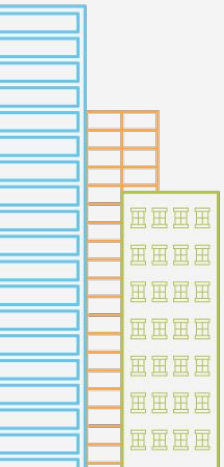
Bersama Waifu

- Jawaban: min(in_segment, out_segment + MCBM)
- Kompleksitas: $O(N^3)$



COMPFEST 9

Awards



COMPFEST 9

Awards - First Blood

GantengGantengKoder

COMPFEST 9

Awards - Try Harder

ps: lomba 5 jam, penalti {{kalo ac}} 12 jam ++

oathkeeper

COMPFEST 9

Awards - SC yang kepake selain Ayaz

Usama

COMPFEST 9