ARCURVE

ACPC 2020

Solutions For All Problems
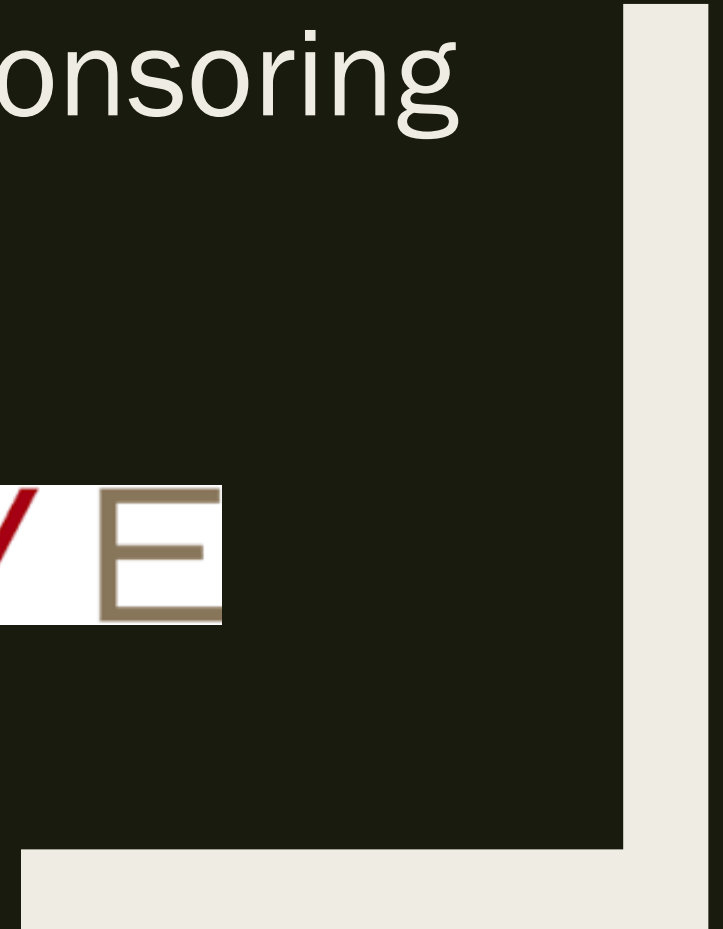
Nice job everyone! S/O to our Judges and Problem setters :)

You're all breathtaking!

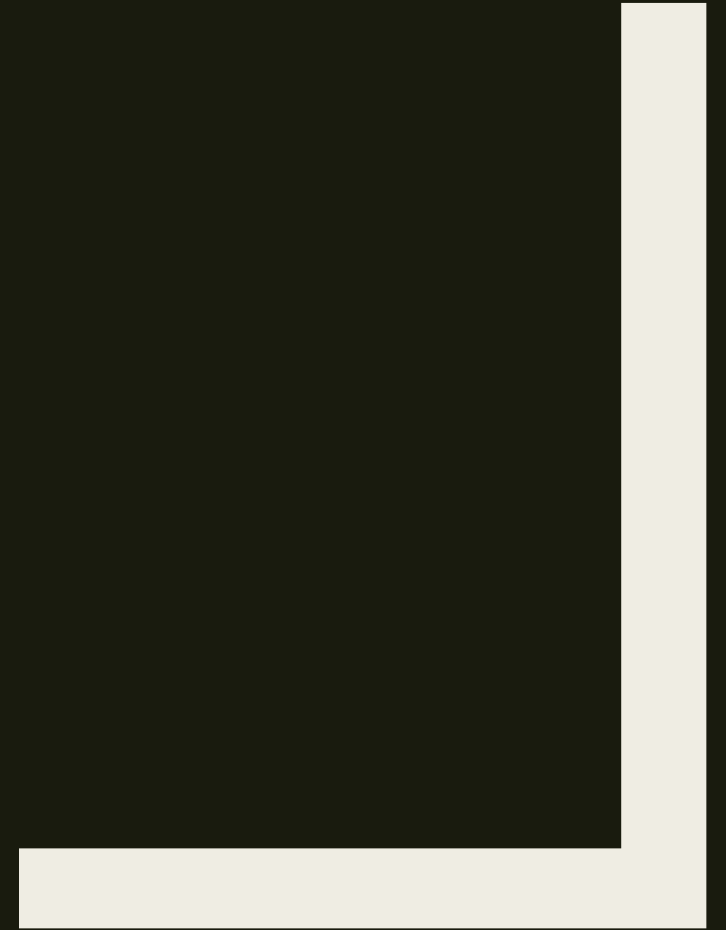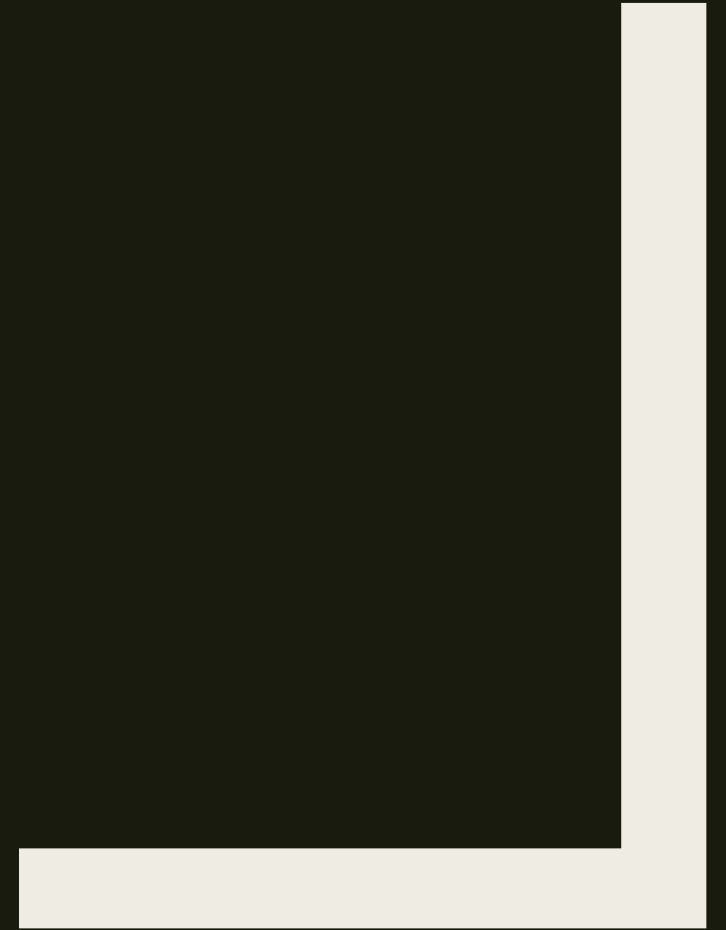# Thank you to Arcurve for sponsoring this event!

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Placements

Note: These are not confirmed, we still have to check over the submissions. For plagarism, validity, etc.

Division 2 Second Place:
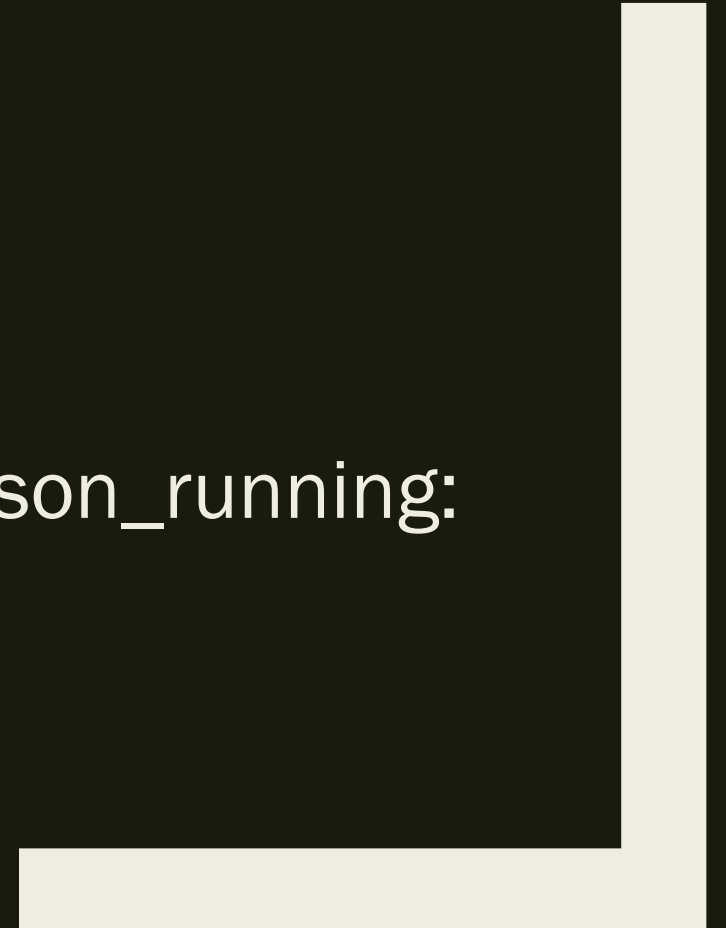# Leo Gao

Division 2
First Place:
Bad GNUs

Division 1

Third Place:
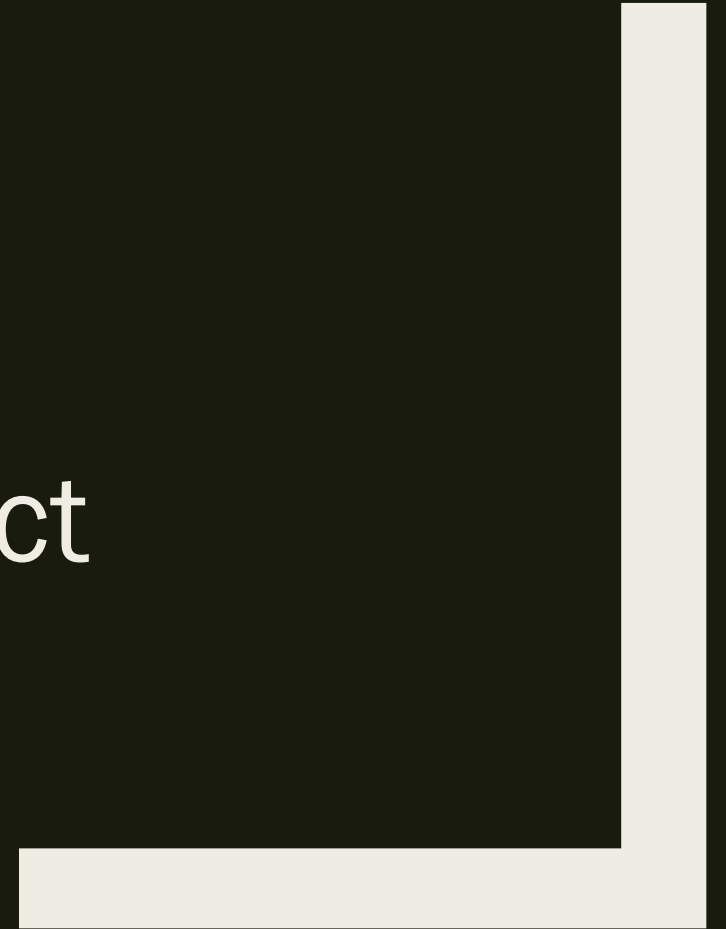
:person_running: :person_running: :person_running:

Division 1

Second Place:

Benyamin Bashari

Division 1

First Place:
Praxis Makes Perfect

% of teams solving a problem: estimated and actual

Problems:	Predicted % (from problem setters)	Actual	
		Division 1	Division 2
Best Investing	70%	4%	4%
Hired Help	30%	40%	12.5%
Laptop Stickers	70%	88%	54%
Listen To Your Boss	30%	28%	12.5%
Monochromatic Minesweeper	10%	4%	X
Password Rotation	10%	16%	4%
Path Crossings	60%	56%	12.5%
Straights	70%	96%	50%
Test Drive	95%	X	87.5%
Warring Scoring	95%	X	58%
Wormholes Extreme!!!	40%	24%	0%
Wrapping Trees	10%	4%	X

Quickest Time to Solve a Problem

*✗ = not part of set

Problems	Time (minutes)		
	Division 1	Division 2	Open Division
Best Investing	171	184	135
Hired Help	34	128	64
Laptop Stickers	3	18	6
Listen To Your Boss	83	186	10
Monochromatic Minesweeper	277	✗	137
Password Rotation	53	251	20
Path Crossings	53	229	10
Straights	14	27	10
Test Drive	✗	16	5
Warring Scoring	✗	20	17
Wormholes Extreme!!!	143	N/A	43
Wrapping Trees	286	✗	20

BEST INVESTING

- Within a loop:
  - Work backwards from end year withdrawing maximum amount

  - Work forward from zero years depositing the maximum amount

- When the years are equal, you'll have the maximum net gain

- Compound Interest
- Dante Bencivenga

HIRED HELP

- Sort all the deadlines in ascending order
- Use binary search to compute the solution OR solve in linear-time

- Greedy
- Zac Friggstad

LAPTOP STICKERS

- Painter's algorithm
  - Creates images by sorting the stickers within the image by their depth and placing each stickers in order from the farthest to the closest object.

- Ad-hoc
- Martin Tran

LISTEN TO YOUR BOSS

- Lowest Common Ancestor (LCA) in a tree algorithm

- Graph
- Wenli Looi

MONOCHROMATIC MINESWEEPER

- Brute force along smaller dimensions and bitset DP along larger dimensions
- Pruning of invalid partial solutions is required

- Dynamic Programming
- Noah Weninger

PASSWORD ROTATION

- Lexicographically minimal string rotation
  - Booth's algorithm

- String
- Wenli Looi

PATH CROSSINGS

- Check all pairs
  - Use sliding window technique to look at points in 10 second time window

- Geometry, ad-hoc
- Wenli Looi

STRAIGHTS

- Put inputs into an array
- Sort array
- Add array elements into hash map adding 1 every time subtract 1 if deemed necessary
- Add sum of Hash Map

- Greedy, hash map
- Jonathan Chong

TEST DRIVE

- Easy input comparisons

- Ad-hoc
- Dante Bencivenga

WARRING SCORE

- Check score system and compare results

- Ad-hoc
- Dante Bencivenga

WORMHOLE EXTREME!!!

- Find minimum initial velocity for each segment in reverse order
  - Can use binary search

- Math, iterative
- Zac Friggstad

WRAPPING TREES

- For each '1' pixel at coordinates (x,y) add the point (x/(n-1)*n,y/(n-1)*n) to the covex hull

- At the last step, compute the perimeter of the convex hull

- Geometry
- Noah Weninger

Conclusion

- We will be going over some of the problems IN-DEPTH on our next weekly Wednesday lecture.

- There will be a poll on discord for what problems you would like us to go over.

- If you haven't already join our discord it's our main source of communication:

- https://discord.com/invite/MEXwfze

Website:
http://cpc.cpsc.ucalgary.ca/

Twitter:
https://twitter.com/UCalgary_CPC

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https://www.facebook.com/CompetitiveProgrammingClub/

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https://www.youtube.com/channel/UCsHDGhuTe2iwt2SKh5pBpKw/about?view_as=subscriber (edited)