Competitive
Programming and
Mathematics
Society

Problem-Solving!!!

CPMSoc

Welcome

- Mathematics workshops will run every odd-numbered week (3, 5, 7, ...)
- Programming ones will run every even-numbered week (4, 6, 8, ...)
- We have lots of other events too (e.g. CPMSoc x KeebSoc Battle of the Boards)
- Slides will be uploaded on our website (unswcpmsoc.com)
- Hoodie sales are out rn!!!

Attendance form :D

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Workshop Overview

- Problem-solving tips
- Some example problems
- Discussing extra problems

Introduction

- **Problem-Solving**
  How should we approach a problem in a contest?

General Tips

- Understand problem and constraints
- Simplify with observations
- Solve reduced problem
- Using known algorithms

Let's get into some examples.

Medium difficulty - Bottleneck

- This is a dungeon with rooms in order from 1 to N. You enter from room 1, and you can enter each subsequent room in order. You want to reach room N, or get as close as possible. Each room also gives you a differently sized water bottle when you enter, that may either be full or empty.
- The problem is that each room has an electronic lock that can only be opened by having a certain number of full bottles of water. You can rearrange the water amongst your current water bottles. How far can you get?

Hard difficulty - Billiards

- W x H size billards table, with a lot of differently shaped balls on the table (each ball has an x, y for the centre and an r for the radius). What is the biggest size ball that you can send from the left side of the table to the right side?

Impossible difficulty - Game

- IOI 2014 Problem
- There is a game show with a host and a contestant. There are N cities, and the contestant is trying to figure out if the N cities are connected. The contestant will ask R questions (where $R = N(N+1)/2$), checking if every pair of cities has an edge between them.
- The contestant wins if they can figure out if the graph is definitely connected or otherwise before asking all R questions. However, if they need to ask all R questions to find if the graph is connected or not, then the host wins.
- You are the host, and you are given the order of questions the contestant asks (which pair of cities is asked in each question). You can invent the graph as you go along. How should you answer to win?
- Problem statement
- Solution

Attendance form :D

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Feedback form :D

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Further events

Please join us for:

- Maths workshop Week 7
- Programming workshop Week 8
- CPMSoc x KeebSoc contest on Thursday next week 12-2pm (W7 Thurs)
- Hoodie sales are open for another week!!!