Spring 2024 COP 4516 Team Final Contest Summary (by Arup Guha)

The first part of the summary will be a problem by problem analysis of how teams did in the contest and some observations about the problems. The second part will be an analysis of the teams and how they did.

Note that Meade's Minions started the contest 30 minutes early due to prior commitments but were unable to submit until 10:00 am, hence their submissions aren't included in the contest write up for first solves, and since it would be too difficult to compare scores, they agreed not to be eligible for trophies.

Here is the first, by problem:

Problem A: Advertising UCF
Solved by: 10 out of 20 teams
First Solve: 28 minutes (Heinrich's Hunks)

The judges thought this would be one of the hardest problems in the set, but they were wrong. Quite a few teams immediately recognized the use of three binary index trees (one for each letter) and correctly implemented a solution. With Meade's Minions getting a head start and exposing the problem to the rest of the class extremely early, lots of teams read it and half the teams solved it! Six solves in the first hour is particularly impressive for what seemed to be one of the hardest problems in the set. Four more teams would later solve it including the very last solve of the whole contest, when Lobo's Robots correctly submitted at 179 minutes, with less than a minute to spare!

Problem B: Divisibility
Solved by: 1 out of 20 teams
First Solve: 168 minutes (Meade's Minions)

The only team to solve this problem, Meade's Minions, solved the problem 12 minutes before the end of their contest (they ended at 12:30 pm). Their initial solution used brute force to do through the 10^6 potential integers, but then ran 10^3 steps to evaluate the remainder when each integer was divided by d. 10^9 operations received a time limit exceeded. But, the modulus value can be calculated within the recursion, reducing the run time closer to 10^6, since old partial mod evaluations are saved as a parameter in the recursion. Meade's Minions took 5 minutes after their TLE submission to put in this 1,000 times speed up and then submitted a correct solution.

Problem C: Eden Math
Solved by: 20 out of 20 teams
First Solve: 9 minutes (League of Leavens)

This was clearly the second easiest problem in the set, following problem D. All teams solved this problem within the first 54 minutes of the contest, signifying the first time in class history that all teams in the team final contest had solved two or more problems before the end of the first hour.

Problem D: How Many Students in the Class?
Solved by: 20 out of 20 teams
First Solve: 3 minutes (Guha's Goons)

This was the easiest problem in the set! All teams solve the problem within the first 24 minutes of the contest in spite of the extremely rocky start due to losing both of our initial classrooms. So, hopefully teams were able to calm down quickly with a solve in their pocket.

Problem E: How Many Integers in Range?
Solved by: 4 out of 20 teams
First Solve: 90 minutes (Mell's Meat Heads)

This problem has the dubious distinction of having the most incorrect submissions. Viewed correctly, there aren't too many cases to consider, but negative numbers and not correctly dealing with integer division threw many teams for a loop. Even three of the teams that solved it (Aedo's Tornados, Markle's Monkeys and Charlie's Angles) took seven or more submissions to do so. It's likely that many teams spent a great deal of time on this problem and might have solved other problems if they looked at them earlier.

Problem F: Sokka's Market Math
Solved by: 0 out of 20 teams

This was one of two problems that went unsolved during the contest. As the class had trouble with dynamic programming, it's not quite as surprising that this problem didn't have any solves. First, the knapsack pattern must be recognized, and then, perhaps the most difficult twist in the problem is that the cents must be parsed out, and this must be done with string operations instead of a numeric one since doubles wouldn't allow for enough precision. Finally a slight modification must be made to the knapsack algorithm since it must be run under modulus, and instead of maximizing a value, the total number of subsets must be counted (so this means adding instead of maximizing).

Problem G: PeekQueue
Solved by: 15 out of 20 teams
First Solve: 51 minutes (Mell's Meat Heads)

For the class, this turned out to be the third easiest problem. Although it took a while for the problem to be discovered, as the contest wore on, this was the next problem that many teams figured out. There are multiple solutions that work in time. It seems like most of the students swept through the data from the back of the line to the front, updating the tallest person doing the "looking" so to speak, when necessary. Overall, four teams solved the problem in the first hour, another 6 teams in the second hour and 5 teams in the last hour. The most exciting solve was that by team Szum Szum, with 8 minutes left in contest, which gave them their 6th problem and the outright victory!

Problem H: Red-Black Tree
Solved by: 6 out of 20 teams
First Solve: 74 minutes (Mell's Meat Heads)

This problem was exposed early by Meade's Minions, but it took a while for the rest of the contestants to discover that the problem was much more straight-forward than the name implies. (Coding red-black trees is very difficult, but the problem required no such task. Rather, a single BFS had to be run, paired with one greedy assignment of colors.) Two teams followed and solved this problem in the second hour and three more teams solved the problem in the last hour. All teams that solved this problem had at least five problems solved during the contest, so it was a consistent solve amongst the top teams that other teams didn't get.

Problem I: The Grandest Social Gathering
Solved by: 2 out of 20 teams
First Solve: 107 minutes (Szum Szum)

The first correct submission came from Szum Szum towards the end of the second hour. Sixteen minutes later, Lobo's Robots solved the problem. Both teams employed a strategy with both a TreeSet and TreeMap, similar to the judge solution.

Problem J: Triangle: Acute, SKalene
Solved by: 0 out of 20 teams

This was the other unsolved problem during the contest. In fact, there was only one submission to the problem from Orooji's Owls. The submission did indeed check if each triangle it tested was acute, but it didn't test if each triangle was scalene or not. All that was needed was a distance square check for equality for that submission. It was a bit of a surprise to the judges that no team solved this problem as mostly, it just required knowledge of the Pythagorean Theorem and an observation based on it about acute triangles.

Contest Summary

The contest had a very chaotic start as teams had to vacate both HEC-117 and HEC-103 and quickly move to HEC-202 and BA1-116. But even within the chaos, all teams quickly discovered the two easiest problems: "How Many Students in the Class?" and "Eden Math." All teams solved these two problems by the end of the first hour.

At the conclusion of the first hour, two teams, Meade's Minions and League of Leavens had solved four problems (though technically, Meade's Minions had been competing for 90 minutes at this point in time). Six teams had three problems, and the other twelve teams had solved 2 problems. Except for "How Many Students in the Class?" and "Eden Math," the other three problems solved within the first hour were: Advertising UCF, Red-Black Tree and PeekQueue. The biggest surprise here was Advertising UCF, which was rated as the second or third hardest problem by the judges. Perhaps what made it easier is that the problem contained no problem obfuscation and students had very recently solved binary index tree problems. Six teams solved this problem in the first hour, four teams had solved PeekQueue and one team, Meade's Minions had solved Red-Black Tree.

As the second hour embarked, the progress of most teams slowed down and progress was mainly iterative. By the end of the second hour, three teams had 5 problems, three teams had 4 problems, 8 teams had three problems and 6 teams still had 2 problems. League of Leavens was in the lead, solving their fifth problem, Red-Black Tree, at the 1:29 mark. Mell's Meat Heads solved both Red-Black Tree at the 1:14 mark and "How Many Integers in a Range?" at the 1:30 mark to get to 5 problems solved and second place. Right at the end of the hour, Markle's Monkeys made a big surge, solving How Many Integers in a Range? after 14 submissions at the 1:49 mark. The followed that up nine minutes later with a correct submission on PeekQueue at the 1:58 mark. So, at the two hour mark, the contest was anyone's to win as there were still several doable problems on the table for many teams.

There was quite a lot of action in the last hour. Both Last in Lein and Guha's Goons were able to solve a third problem with only a few minutes to spare, leaving only 3 teams with 2 solves. Dencker's Dudes solved both Advertising (in 6 attempts) and PeekQueue in the last hour to get to four problems. In addition, Charlie's Angels solved How Many Integers in a Range after 7 attempts to get to four problems. The rest of the action was at the top half of the scoreboard which had several teams with five problems. At the start of the last hour, only 3 teams had five problems, but in that last hour, 6 more teams would join them to have five or more problems. First Szum Szum got their fifth solve at the 127 minute mark. The Aedo's Tornadoes solved How Many Integers in a Range? at the 142 minute mark to get to 5 solves. Next, Heinrich's Hunks got both PeekQueue at 126 minutes and Red-Black Tree at the 158 minute mark to get to five problems. Then, Orooji's Owls got both PeekQueue at the 136 minute mark and Red-Black Tree at the 161 minute mark to get to 5 solves. The scoring was rounded out by Meade's Minions who got their fifth solve, the only team to solve Divisibility, 12 minutes before the end of their contest, followed by Szum Szum, which solved their sixth problem, PeekQueue, with 8 minutes left, winning the contest outright. And the last solve of the entire contest was Advertising by Lobo's Robots, which got them to five problems with less than a minute left in the contest. The final top three (without Meade's Minions) was:

1. Szum Szum	6 solved 694 penalty
2. League of Leavens	5 solved 235 penalty
3. Heinrich's Hunks	5 solved 333 penalty