Computer Science

Contest Introduction
Dr. Shyamal Mitra
State Contest Advisor

For new coaches and contestants.
In This Session

• Contest introduction, including
  – general rules
  – contest structure and scoring
  – the hands on contest
• State written test
• Sample hands on questions
Contest Directors & Test Writers

• Rich Brozovic
• Scotty Johnson
• Arnav Sastry
• Grant Wilde
• Darrin Wiley
• Dr. Shyamal Mitra
• David Trussell
What is the Computer Science Contest?

• A competition that challenges students to apply computing and algorithmic concepts and skills
• Tests knowledge of algorithms, computation, and object oriented programming
  – using the Java programming language
• Allow students to expand their knowledge of computer science beyond what they learn in the classroom and to foster their interest in the field
Background

• Contest established in the 1990 – 91 school year
• Modeled on the College Board's Advanced Placement Curriculum for computer science
  – plus some additional topics
• Brought computers into UIL competition for the first time with State Meet hands-on programming
  – Modeled on ACM programming contest
  – Programming was later added to regional and district and is also now included with UIL invitational materials
Programming Language

• UIL - same language as the AP curriculum
  – if AP changes, we will too

• Pascal for 8 years. C++ for 5 years. And now several years in Java.
  – language just a tool to test concepts
  – example: sorts are essentially the same

• What version of Java?
  – the most recent version as of September of each school year
General Rules

• As with other UIL academic contests
  – Participants must meet eligibility requirements
  – A school may enter up to four contestants in the district competition
Contest Structure

• Two components: individual and team
  – The same contestants from a school compete in both components

• District, Regional and State competitions consist of:
  – a 45 minute, 40-question written exam, for the individual competition and the team competition (counts for half of team score)
  – a two hour, 12-problem hands on programming contest for teams
The Individual Component

- At all levels of competition, individual places are determined solely by written exam scores.
- All contestants compete for individual honors at all levels of competition.
- Individuals placing first, second, and third advance to the next level of competition.
The Team Component

• ALL team members MUST take the written exam
  – Three members participate in programming
• At all levels of competition team placement is determined as follows:
  top three team member written scores + programming score = overall team score
• First-place and wild card teams advance to the next level of competition
Team Entries and Scoring

- A school may enter up to four contestants.
- The same contestants compete for both individual and team awards.
- A school must enter at least three contestants to participate in the team competition.
- The top three written exam scores from a school are counted towards the team score plus the score from programming.
- All four members of first place teams advance to the next level of competition.
Participation Requirements

• ALL contestants MUST take the written exam at all levels of competition
• Teams MUST participate in programming in order to qualify for team placement or advancement
  – Exception – if only one team is entered in the district contest, conducting the programming session is encouraged but not required (if two or more are entered, programming is mandatory)
Scoring Rules – Written Exam

- 40 questions
- SIX points awarded for correct answer
- TWO point deduction for each incorrect
- No points given or deducted for unanswered questions
- Questions may be skipped
- A 15 minute verification period is held prior to announcing official results
- Verification is your chance to ensure that grading and tabulation are correct
Scoring Rules – Programming

• 12 programming problems
• 60 points awarded for a correct answer
• 5 points subtracted for each incorrect answer only if a team eventually gets a correct answer
• Incorrect solutions will be returned and may be reworked and resubmitted
  – judges do not provide a detailed explanation of why a solution is incorrect
What About Ties?

• In individual competition ties are broken by determining the highest percentage of correct answers
  – Example:
  – attempting 30 questions with 20 correct
    \[= 20 \times 6 - 10 \times 2 = 100\]
    percent correct = \(\frac{20}{30} = 66.7\%\)
  – attempting 22 questions with 18 correct
    \[= 18 \times 6 - 4 \times 2 = 100\]
    percent correct = \(\frac{18}{22} = 81.8\%\) (wins the tie break)
• If a tie still exists it will not be broken
Ties, continued

• In team competition, ties are broken by the team that has a higher score on the programming portion
  – if a tie still exists the total team score on the written exam is considered
  – if a tie still exists it will not be broken
Wild Cards

• The highest scoring second place team among all districts in a given region advances to the regional meet
  – one wild card per region
• The highest scoring second place team among all regions advances to state
  – one wild card per conference
• Districts must report their team scores with contest results on time to be eligible for the wild card
Written Contest Materials

• Pencils and erasers
• Scratch paper is provided
• No calculators
Written Contest Format

• A 45-minute exam consisting of 40 questions
  – Questions 1-38 are multiple choice
  – Last two questions are free response
    • These will have discrete short answers
• Answers are recorded on the answer sheet
• Topic list provides areas covered
  – Specifies topics for first 15 questions
• Old exams are very useful for practice
Programming - Materials

• In programming three members of a team participate
  – coach's choice
• Each team may bring two published reference texts
  – includes textbooks and language manuals
  – books should be reasonably free of written notes
• For “sneaker net” contests, each team must bring media for submitting solutions to judges, typically USB flash drives.
  – Bring several flash drives (at least 3 or 4), since some drives may still be in the judging room when a team has another solution ready to submit
  – Smaller capacity drives are fine – better to have more drives than larger capacity
Programming - Computers

• Each team shall be prepared to bring one computer to use for competitions
  – some sites may provide computers but check with local contest director
  – most district sites, regional sites and state require teams to bring their own computers
  – Mac users may need to bring an additional computer for the judging station

• printers are allowed, but not required
Programming - Computers

• Each team may use ONLY ONE computer
  – one monitor, one keyboard, one mouse
  – no dual monitor or dual keyboard/mouse systems
  – you can bring a backup computer
  – NOTE: The allowance for multiple computers in spring 2021 contests was part of a group of temporary modifications to UIL rules due to COVID-19. That authorization has expired, so the contest reverts to the one computer rule as specified in the UIL C&CR.
Programming - Computers

• What software can be on the computer
  – operating system
  – standard software preloaded on new computers: office, explorer, anti-virus
  – A Java compiler and IDE
  – Built in libraries, library documentation, and help functions may be used during the contest
Programming - Computers

• What CANNOT be on your drives:
  – Solutions, data files, templates, from previous UIL competitions or any other programming competitions
  – Programs written for class
  – Any other program written by contestants or coaches
Programming - Judging

• Computer setup for judging will vary from site to site
  – Most sites will have judging stations in a room separate from the contest room
  – other arrangements possible
  – Most regional sites and the state contest use a networked contest system
• Check with your host site ahead of time to find out what procedures will be used
Programming - Judging

- Contestants submit Java source code
- Judges recompile and run on test cases
- No major problems with using Java thus far
Programming Contest Format

• A two hour programming contest consisting of 12 problems
  – varying degrees of difficulty, but all worth 60 points
  – finding the easy ones is part of the competition
• Plan to arrive early to allow time to set up equipment and have systems verified
• Prior to the beginning of the contest teams will work a simple dry run problem
  – a system check for contestants and judges
  – not necessary for all teams to complete the dry run successfully before beginning the contest
Programming Contest Format

• Typically, contestants work in one room while judges work in another nearby room

• Teams submit solutions as they finish them over the contest network or on a flash drive (along with a run sheet)
  – for “sneaker net” contests, runners transport materials between contestants and judges

• For a correct solution, judges return an acceptance notice over the network, or return the flash drive and an acceptance form
Programming Contest Format

• When a team submits an incorrect solution, the judges respond over the network or return the flash drive and run sheet
  – general comment on problem
    • syntax error
    • runtime error
    • failed test case
    • exceeded time limit
    • NO information on why solution is incorrect
  – teams may rework the solution and resubmit it
Programming Contest Format

• Teams can submit a clarification request if they believe the problem is unclear
  – many times the response from judges will be to read the question more carefully
  – judges will not explain unfamiliar concepts during the competition

• Standings may be posted periodically during the course of the contest
Programming Contest Strategy

- Break up the problem pack
- Find the easy problems
- One person working on an easy problem on computer
- Two others working other problems on paper
- Problems may be worked in any order
- Know when to give up on a problem
  - computer time is a scarce resource
Returning Papers

• If there are no unresolved questions then at the district level entries may be returned no sooner than the end of the last contest day of the district week
• If there are no unresolved questions then at the regional level entries may be returned to contestants at the end of the day on Saturday of region weekend
Frequently Asked Questions

• Can team contestants receive individual awards if they did not place in the individual competition at the previous level competition?
  − Yes. Team contestants are in the mix for individual honors, even if they did not place in the top three at the previous level of competition
Frequently Asked Questions

• Do contestants who advance only as individuals participate in programming?
  – No. Contestants who advance as individuals only take the written test at the next level of competition
Frequently Asked Questions

- If a team gets a solution correct on the second or third or later try do they still receive the 5 point deduction?
  – Yes
Frequently Asked Questions

• What if one of our team members is sick or otherwise unable to compete at regionals or state? May we substitute?
  – Yes. Advancing teams may insert a substitute for one and ONLY ONE team member who is unable to compete at the next level of competition.
  – If more than one member is unable to compete the alternate team will advance

• Can substitutes win individual awards?
  – Yes
Preparing for The Contest – Online Resources

• UIL
  – [www.uiltexas.org/academics/stem/computer-science](http://www.uiltexas.org/academics/stem/computer-science)

• Includes resource page with links to
  – java compiler and IDEs
  – second party materials
  – references
  – online programming problems
Preparing for the Contest - Books

- Building Java Programs
- Introduction to Java Programming
  - Y. Daniel Liang, Pearson, www.pearson.com
- Java Language Specification
  - https://docs.oracle.com/javase/specs/
- Your classroom textbook
Preparing for the Contest
Development Tools

- IDE (interactive development environments) are tools that allow you to write Java programs
- You don't have to use one
- You can use whichever one you want
- Demos of
  - command line
  - textpad
  - Eclipse
  - BlueJ
IDE Information

• Eclipse
  – http://www.eclipse.org

• BlueJ
  – http://www.bluej.org/
Preparing for the Contest Practice problems

- TopCoder
  - http://www.topcoder.com/
- Programming Challenges
  - https://uva.onlinejudge.org/
  - online problems and judge
- Coding Bat
  - http://codingbat.com/
Preparing for the Contest Practice problems

• USA Computing Olympiad
  – http://www.usaco.org/

• Project Euler
  – https://projecteuler.net/
Practice Test 2021

- Review Questions
- Reference Sheet
  - use this to help answer questions
- Topics List
  - check the CS page of the UIL website for the final 2021-2022 list
Questions

- www.uiltexas.org/academics/stem/computer-science