

CODES AND ALGORITHMS

1. **DESCRIPTION:** Competitors will use their programming skills to write algorithms in a spreadsheet.
A TEAM OF UP TO: 2 **TIME:** 50 min.

2. **EVENT PARAMETERS:** No resource materials may be used during the competition. Competitors may bring paper and writing instruments to assist them in organizing their thoughts, if desired. During the event, no access any www site, search engine, external communication is permitted with other individuals via e-mail, chat rooms, or other forms of collaboration; the penalty for an infraction of this nature will be immediate disqualifications.

3. **THE COMPETITION:**
 - a. Each team will be provided with one personal computer with excel capability. In the case that another spreadsheet software will be used, teams should be notified at least 30 days prior to the competition.
 - b. Teams will be given a test in either paper or electronic form (PDF preferred) with a series of problem statements, each of which will specify a problem to be solved with spreadsheet programming, so that an output must be generated in a cell based on inputs in other cells.
 - c. The input for each problem must fit in either a single cell or an array of cells, with width and length no larger than 10 cells each. Each question will specify the input cell(s).
 - d. Outputs must fit in a single cell for each problem. Each question will specify the output cell. The solution of the problem must not require plots, charts, and/or graphs.
 - e. Competitors may only use functions listed on <http://office.microsoft.com/en-us/excel-help/excel-functions-by-category-HP005204211.aspx> and must not use VBA (Visual Basic for Application). In the case that another spreadsheet software is used, supervisors should notify the teams with the allowed function list.
 - f. Each problem, work, and solution must be in a separate tab with the tab labeled with the number of the question.
 - g. Competitors may use any number of intermediate cells to organize their work and show intermediate steps.
 - h. Event Supervisors will provide 5 or more given test inputs and correct outputs for each problem in the test sheet so that the competitors can test their answers. Event Supervisors will also have 5 or more additional hidden test inputs and outputs not given to the competitors. Hidden test inputs must be different from the given test inputs.
 - i. Both given and hidden test inputs must be selected and have their correct answers calculated before the competition, and must be the same for all competitors.
 - j. The exact number of given and hidden test inputs will be determined by the Event Supervisors based on the difficulty and length of the solution.
 - k. Each spreadsheet file must have the team number and school name as the title of the file. Event Supervisors will only type in the test inputs into the cell(s) specified in the questions.

4. **SAMPLE QUESTION:** Determine if a set of three numbers would form a Pythagorean triples (ie. $a^2 + b^2 = c^2$)

Test Case	Input cell A1	Input cell B1	Input cell C1	Output cell A2
1	3	4	5	yes
2	5	3	4	yes
3	10	8	6	yes
4	5	4	6	no
5	14	2	5	no

5. **SCORING:**
 - a. For given test inputs, each correct output will receive 1 point
 - b. For hidden test inputs, each correct output will receive 5 points
 - c. Teams will be ranked based on the most number of total points
 - d. The tiebreakers will be: (Note: I'm expecting the test to be difficult enough that the competitors won't finish)
 - i. Highest points for predetermined questions
 - ii. Shortest time (rounded down to the nearest minute) used to complete the programs
 - iii. Fewest parenthesis used in the competitors' solution in preselected problems.

Additional Example Problems (This page can be posted on a web site)

1. You have been recently hired by a company to create a program which automates giving change with the fewest number of bills and coins combined. This change can be in the forms of \$10, \$5, \$1, \$0.25, \$0.10, \$0.05, \$0.01.

Test Case	Input cell A1	Output cell A8
1	\$22.01	2 \$10; 0 \$5; 2 \$1; 0 \$0.25; 0 \$0.10; 0 \$0.05; 1 \$0.01
2	\$0.26	0 \$10; 0 \$5; 0 \$1; 1 \$0.25; 0 \$0.10; 0 \$0.05; 0 \$0.01
3	\$1.35	0 \$10; 0 \$5; 1 \$1; 1 \$0.25; 1 \$0.10; 0 \$0.05; 0 \$0.01
4	\$4.52	0 \$10; 0 \$5; 4 \$1; 2 \$0.25; 0 \$0.10; 0 \$0.05; 2 \$0.01
5	\$43	4 \$10; 0 \$5; 3 \$1; 0 \$0.25; 0 \$0.10; 0 \$0.05; 0 \$0.01

2. Determine if a number is a multiple of 3 or 5

Test Case	Input cell A1	Output cell A2
1	15	Yes
2	34	No
3	39	Yes
4	25	Yes
5	12	No

3. Determine if a set of three numbers would form a Pythagorean triples (ie. $a^2 + b^2 = c^2$)

Test Case	Input cell A1	Input cell B1	Input cell C1	Output cell A2
1	3	4	5	yes
2	5	3	4	yes
3	10	8	6	yes
4	5	4	6	no
5	14	2	5	no

4. Given a Set of four numbers determine the best way to get the biggest number by the use of two addition signs and one division sign. You must use the division sign as well as both addition signs.

Test Case	Input cell A1	Input cell B1	Input cell C1	Input cell D1	Output cell A8
1	2	4	0.5	3	14
2	4	4	1	3	8
3	2	4	1.5	3	6
4	7	9	5	3	11.33333333
5	2	8	3	7	11.5

Solutions for these problems can be found [here](#) or downloaded as an excel file [here](#)