Math 1020Q – UConn at Stamford - Fall 2026 – Problem Solving, Tuesdays and Thursdays 3:30 pm – 4:45 pm – Room DWTB 108

Instructor: Cristiano Husu, cristianohusu@sbcglobal.net, 203 329 0489, cristiano.husu@uconn.edu, Office Number 334, Webex room crh02006.

OFFICE HOURS at the end of each class

on Mondays, from 3:05 pm to 3:35 pm, room DWTN 132,

on Tuesdays, from 4:45 pm to 5:30 pm, room DWTN 108 and/or room 134,

on Wednesdays, from 3:05 pm to 3:35 pm, room DWTN 132,

on Thursdays, from 4:45 pm to 5:30 pm, room DWTN 108 and/or room 134,

Additional office hours by appointment schedule at the end of classes.

Suggested readings and textbooks: Detailed lecture notes written by the instructor will be available before each class on huskyct.uconn.edu.

Classwork, homework and review files for the three examinations also written by the instructor will also be available.

The following books, **[ALNC]**, **[DFV]** and **[L]** below and at the top of the following page, are the main references for lecture notes 8 through 20.

[ALNC] Aufmann, R. N., Lockwood, J.S., Notion, R.D. and Clegg, D.K., *Mathematics Excursions*, 4th ed.

[DFV] M. DeFranco, T. Vinsonhaler and C. Naigles, *PProblem SSSolving*, 3-rd edition, Cengage; 3rd edition (2013).

[F] The Pleasure of Finding Things Out: The Best Short Works of Richard P. Feynman, Basic Books.

[L] M. Levine, *Effective Problem Solving*, 2-rd edition, Prentice Hall; Second edition (1994).

[PC] G. Polya and J. H. Conway, *How to Solve it: a New Aspect of Mathematical Method*, Princeton University Press (2014). (This is not a textbook.)

Prerequisites: MATH 1010 or equivalent.

Course description: An introduction to the techniques used by mathematicians to solve problems.

Skills such as Externalization (pictures and charts), Visualization (associated mental images), Simplification, Trial and Error, and Lateral Thinking learned through the study of mathematical problems.

To match individual expectations with the instructor's teaching tools and methods, a preliminary form on the goals, objectives, mathematics background and learning skills of each students will be completed by each students and collected by the instructor.

Classwork and Homework: Classwork on topics covered in previous lectures will begin on September 7, and continue (approximately) every two weeks.

Homework will also be assigned approximately every two weeks and a written sample of each student homework will be collected (approximately a week after the assignment) to monitor each student progress toward the objectives of the course.

Extra credit projects will be available during the semester for students who wish to understand further ramifications of mathematics problem solving.

Grading Procedure: The course grade of each student will be determined by the sum of the following four numbers.

1) The number of points of the student's first examination, a number between zero and 20 points (as the first 20% of the course grade),

2) The number of points of the student's second examination, another number between zero and 20 points (as the second 20% of the course grade),

3) The number of points of the student's for classwork (class participation, speaking, reading and writing about number skills, algebraic display of information, visual, geometric and analytical reasoning) and homework, another number between zero and 20 points (as the third 20% of the course grade),

4) The number of points of the student's comprehensive final examination, on a date TBA, the remaining 40 points (as the remaining 40%. of the course grade).

Letter grades, A, B, C, D, F, will be the result of the following standard grading calculation:

grade A *corresponding to a total above 90 points,*

grade B *corresponding to a total between 81 and 90 points,*

grade C *corresponding to a total between 71 and 80 points,*

grade D *corresponding to a total between 61 and 70 points,*

grade F *corresponding to a total below 61 points*

No make-up examinations without proof of extenuating circumstances. (If you miss an examination, you will have to prove extenuating circumstances to the Office of the Dean of Students. If approved by the Office of the Dean of Students, you can be rescheduled the examination and/or extra work that will take the place of the missed examination.)

Note that, if you miss the final examination without a timely proof of extenuating circumstances, you will not reach the minimum number of points, 61, to receive a D grade, and, consequently, your course grade will be an F.

A daily description of the course follows in the rest of the syllabus.

Week 1. September 1, 2026. Lecture notes 1: Introduction to problem solving. Inductive and deductive reasoning. Introduction to the game of NIM.

September 3, 2026. Lecture notes 2: Problem solving with patterns. The 'how many regions problem".

Homework A (due September 16+1): *The strategy to win the game of NIM. Visualizations of the how many regions problems.*

Week 2. September 2, 2026. Lecture notes 3: Polya's method.

September 8, 2026. Lecture notes 4: Logic statements and quantifiers. Introduction to polyominos and tilings with polyominos.

September 10, 2026. *First classwork assessment on how proactive we are.*

Homework B (due September 24): Tilings with polyominos.

Week 3. September 15, 2026. Lecture notes 5: Truth tables, equivalent statements and tautologies. Introduction to logic puzzles.

September 16+1, 2026. Lecture notes 6: The P.S.S.S.P. method. **The first P of the P.S.S.S.P. procedure: Be Proactive**. The principle of intimate engagement of the problems that we wish to solve.

Homework C (due October 1): *Logic puzzles*. *Visualizations of "commuter".*

Week 4. September 22, 2026: Lecture notes 7: The first S of P.S.S.S.P. See it. Externalize. Do not display and manipulate information at the same time.

September 24, 2026. *Classwork to prepare the first examination on being proactive.*

Homework D (due October 8): *Erdos groups of friends and strangers.*

Week 5. September 29, 2026: Lecture notes 8: Ten default ways to externalize. Drawing pictures and sketches. Making Tables and Charts. Trial and error. Guessing and checking. Thinking backward. Inductive reasoning. Looking for patterns. Looking for formulas and using them. Constructing basic equations and solving them. *Introduction to the "desert delivery".*

October 1, 2026. *First examination on being proactive.*

Homework E (due October 15): *Visualizations of the "desert delivery" with 800 and 1000 liters extensions.*

Week 6. October 6, 2026: Lecture notes 9: Further refinements of our ten default ways to externalize. *Introduction to dinner parties.*

October 8, 2026. *Classwork on visualizations.*

Homework F (due October 22): *Visualizations of "Dinner parties" and "Seven elevators".* The relationship between *Dinner Parties* and *the seven elevators problem*.

Week 7. October 13, 2026. Lecture notes 10: Committing information to memory. *Introduction to the "patience disentanglement puzzle".*

October 15, 2026. Lecture notes 11: The second S of the P.S.S.S.P. procedure: Simplify. Introduction to simplifying: *Introduction to the game of hex (percolation).*

Homework G (due October 29): *Visualizations of the "patience disentanglement puzzle".*

Week 8. October 20, 2026: Lecture notes 12: Four ways to simplify – Four ways to find simpler (easier) problems related to a difficult problem that we cannot solve. Introduction to the game of hex (percolation) on 3x3, 4x4 and 5x5 hexagonal grids.

October 22, 2026. *Classwork on visualizations and simplifications.*

Homework H (due November 5): *Winning strategies at the game of hex on 6x6 and 7x7 hexagonal grids.*

Week 9. October 27, 2026: Lecture notes 13: Further simplifications. The sequence effect. Simplifying with integers. *Introduction to the "bouncing bishop".*

October 29, 2026. *Classwork to prepare the second examination on visualizations and simplifications.*

Homework I (due November 12): *The "bouncing bishop" visualizations on the 7xn rectangular boards and on any rectangular extension of the chessboard.*

Week 10. November 3, 2026. Lecture notes 13: Further simplifications. The sequence effect. Simplifying with integers. Introduction to polyiamonds, polyhexes and building with polycubes.

November 5, 2026. *Second examination on visualizations and simplifications.*

Homework J (due November 19): *Tiling with polyhexes. Tiling with polyiamonds*. Building with polycubes.

Week 11. November 10, 2026. Lecture notes 14: Further simplifications. Look to the extremes of the special features of the problem space. Introduction to the "eudaimonology" (finding happiness).

November 12, 2026. Lecture notes 15: The third S of the P.S.S.S.P. procedure: Stir It Up. Facilitate flexibility. *Avoid Group Thinking. (We do not wish to get stuck in our own ways.) Think laterally* (E. De Bono, 1964). *Classwork on simplifications.*

Homework K (due December 3): *The eudaimonology project, how do we visualize and find happiness (in memory of Charles Vinsonhaler). (The trivium project, how beauty relates to goodness and truth.)*

Week 12. November 16+1, 2026. Lecture notes 16: The third S of the P.S.S.S.P. procedure: Stir It Up. The Einstellung effect. *(Avoid being functionally fixated.) Brainstorm. How numbers put a "spell" on us.*

Week 12 continues. November 19, 2026: *Classwork on lateral thinking and on the sequence effect.*

Homework L (due December 2): "*The one hundred fowl problem. Additional Diophantine equations problems. How often does Friday the 13th occurs? (The case for understanding our Gregorian calendar.) Will the world end on a Sunday and at the beginning of a new century?*

Week 13. November 24 and November 26, 2026. *Thanksgiving recess.*

Week 14. December 1, 2026. Lecture notes 16: *Lecture notes 16+1 (extra credit) – Stir It Up – Part Three – On becoming a number person.*

December 3, 2026. Lecture notes 18. *Stir It Up – Introduction to cryptology.*

Week 15. December 8, 2026. *Classwork to review our skills for the comprehensive final examination.*

December 10, 2026. Lecture notes 19 and 20: The last P of the P.S.S.S.P. procedure: Pause and reflect. Lecture notes 21: *Finding beauty in our work (the "komorebi" effect).*

On a date and time announced by the Registrar Office during the month of October, the comprehensive Final Examination.

The Registrar Office has announced the final examination date:

Tuesday, December 9, 2025, from 3:30 pm to 5:30 pm in room 108.

Additional projects (available during the semester on demand)

Nine Men Morris. *Simplify* Nine Men Morris (Mill's Game). The first three-steps (placements) of a strategy to win Nine Men Morris.

The monkey and the coconuts (Ben Williams).

The Monty Hall puzzle and its four door extension.

"Change for a dollar" and "multiple locks" (both projects available in separate files).

Variations of "change for a dollar": Change for 75 cents. Change for one dollar and 25 cents.

Multiple locks with the following additional variation: *No two members of the club can open the treasure chest (in place of no single member can open the chest)*, but any