Daily Challenge
with Po-Shen Loh

Workout 3A: Combinatorics Tools

Course Name	Covered Topics	Learning Time
Get Ready	Who Should Take This Course, Help Us Know More About You, How to Use This Course, Table of Content	
Day 1 Workout	**Q1.** Graphs, Simple Graph Theory **Q2.** Case Analysis, Sum of Powers of 3, Geometric Series, Base Conversion **Bonus:** 5 choose 10: Choose Notation, Pascal's Triangle	10 videos, 40 min
Day 2 Workout	**Q1.** Complementary Counting, Casework **Q2.** Triangles in a Pentagram: Bonus Using Computers to Solve Math Problems **Q3.** Recursion, Nodes in a Graph, Symmetry	11 videos, 43 min
Day 3 Workout	**Q1.** Stars and Bars **Q2.** Strictly Increasing Numbers, Choose Notation **Q3.** Proof: Pigeonhole Principle	7 videos, 33 min
Day 4 Workout	**Q1.** Simplifying a Problem, Recursion, Renumbering **Q2.** Arrangements in a Line (Permutations), Estimation **Q3.** Casework, Counting Rectangles on a Grid, Mental Math, Sum of First *n* Squares	10 videos, 33 min
Week 1 Challenge	Try your new skills!	10 questions, 60 min
Day 5 Workout	**Q1.** Sets and Subsets **Q2.** Counting Subsets **Q3.** Matchings, Complementary Counting	8 videos, 41 min
Day 6 Workout	**Q1.** Deriving Formula for Number of Diagonals in a Polygon **Q2.** Diagonals of a Regular Octagon, Symmetry, Overcounting, Casework **Bonus:** How Many Grids? : Commutativity, Powers of 2	11 videos, 38 min
Day 7 Workout	**Q1.** Divisibility Tricks **Q2.** Faces, Edges, Vertices of *n*-Dimensional Shapes **Bonus:** Conway's Game of Life: Puzzle, Cycles of Remainders	8 videos, 37 min
Day 8 Workout	**Q1.** Permutations With Repeated Objects **Q2.** Octahedron, Tetrahedron, Formula Relating Number of Faces, Edges, and Vertices **Q3.** Counting Digit: Casework **Q4.** Catalan Numbers: Special Arrangements With Constraints	11 videos, 37 min
Week 2 Challenge	Try your new skills!	10 questions, 60 min