

Course Name	Covered Topics	Learning Time
<b>Get Ready</b>	Course Introduction Video, Prerequisite Check, Who Should Take This Course, Help Us Know More about You, How to Use This Course	10 - 20 mins
Day 1 Challenge	Permutations; Counting with Restrictions; Counting with Symmetry; Tree diagram for representing outcomes; Casework; Counting pairs of objects; Correction for overcounting	50 - 60 min
Day 2 Challenge	Venn Diagram; Combinations; Number of subsets; Patterns in counting; Sum of consecutive powers of 2; Multiplication Principle; Complementary counting; Counting lists of numbers with restrictions; Overlapping groups	40 - 50 min
Day 3 Challenge	Variation on Venn Diagram; Union and intersection of sets; Set notation; Inclusion-Exclusion Principle; Prime factors; Application of counting techniques to number theory; Divisibility	40 - 50 min
Day 4 Challenge	Counting on a grid; Casework; Patterns in counting; Rotation and reflection; Rotational symmetry and reflective symmetry; Factorials; Permutations and combinations; Correcting for overcounting	45 - 55 min
<b>Week 1 Challenge</b>	40-minute-20 practice problem assessment of Day 1 to Day 4 materials	60 minutes (up to 4 tries in total)
Day 5 Challenge	Permutations with repeated elements; Multiplication Principle; Factorials; Correction for overcounting; Casework; Binomial Coefficients; "Choose" notation; Rotational and reflective symmetry	45 - 55 min
Day 6 Challenge	Binomial coefficients; Pascal's Triangle; Symmetry of Binomial Coefficients; Patterns in Pascal's Triangle; Pascal's Identity; Comparing Binomial Coefficients; Hockey Stick Identity; Combinations; Casework	45 - 55 min
Day 7 Challenge	Binomial Thm; Pascal's Triangle, row sum of and relation to powers of 2; Symmetry of Binomial Coefficients; Number of subsets; Powers of 11; Applications of Binomial Thm	45 - 55 min
Day 8 Challenge	Casework; Allocation-of-resource problems and arrangements; Complementary Counting; Permutations with repeated elements; Application of binomial coefficients	40 - 50 min
<b>Week 2 Challenge</b>	40-minute-20 practice problem assessment of Day 5 to Day 8 materials	60 minutes (up to 4 tries in total)
Day 9 Challenge	Paths on a grid; Using diagrams; Permutations with repeated elements; Factorials; Binomial coefficients; Complementary counting; Reduction of a problem into subproblems; Symmetry; Difference of Squares	40 - 50 min
Day 10 Challenge	Tiling problems; Recursive sequences; Permutations with repeated elements; $a_n$ notation for elements of a sequence; Binomial coefficients and choose notation; Case analysis; Fibonacci sequences	40 - 50 min
Day 11 Challenge	Correction for overcounting; Patterns in counting; Case analysis; Counting with restrictions; Multiple recursions; Applications to recursion and tiling problems; General form of a recursive formula	50 - 60 min
Day 12 Challenge	Graph theory basics; Coloring problems; Node, vertex, and graph; Case analysis; Symmetry; Pigeonhole Principle; Four-Color Theorem; Complementary counting; Permutations; Tree diagrams	50 - 60 min
<b>Week 3 Challenge</b>	40-minute-20 practice problem assessment of Day 5 to Day 8 materials	60 minutes (up to 4 tries in total)
Day 13 Challenge	Counting ordered lists; Case analysis; Triangular numbers and their relationship to binomial coefficients; Hockey Stick Identity; Pascal's Triangle; Ways to partition $n$ objects (stars and bars); Number of subsets	50 - 60 min
Day 14 Challenge	Committee-type problems and ways to form pairs; Correction for overcounting; Permutations; Factorials; Multiplication principle; Double factorial notation; Applications of tiling techniques to word problems	40 - 50 min
Day 15 Challenge	Application of counting techniques to word problems; Shortest path problems; Representing states using diagrams; Breadth-First Search technique;	40 - 50 min
Day 16 Challenge	Polyhedra vertices, edges and faces; Euler's Polyhedral Formula and motivation for; Correction for overcounting; Platonic solids; Stellated Dodecahedron	40 - 50 min
<b>Week 4 Challenge</b>	40-minute-20 practice problem assessment of Day 1 to Day 4 materials	60 minutes (up to 4 tries in total)