The ProbLemma's Channel Season 3 Guide

Season 3 Episode 1: The Index Of Tools

- All the problem-solving approaches studied so far, across seasons 1 and 2, are indexed by the episodes in which they were defined and practiced

Season 3 Episode 2: An Integral Transformation

- Problem S3M1 solved, show that for all θ, x real, with $x > 1$, and $n = 1, 2, 3, 4, 5 \ldots$ it is the case that:

$$\int_0^\pi \left(x + \sqrt{x^2 - 1}\cos(\theta)\right)^n \, \mathrm{d}\theta = \int_0^\pi \frac{\mathrm{d}\theta}{\left(x - \sqrt{x^2 - 1}\cos(\theta)\right)^{n+1}}$$

- Problems S3M2/3/4 formulated:
  - Problems S3M2/3/4: deduce in at least 3 distinct ways an alternative expression (a product) for the following finite sum:

$$\sum_{k=0}^{n} \cos(a + k\theta)$$

Season 3 Episode 3: One Telescope, Two Telescopes

- Problem S3M2 solved

Season 3 Episode 4: A Complex Approach

- Problem S3M3 solved

Season 3 Episode 5: Euclid Says

- Problems S3M4 solved
- Problem S3P1 formulated:
  - S3P1: find the period of oscillation of a triangular spring oscillator

Season 3 Episode 6: Triangular Spring Oscillator

- Problem S3P1 solved
- Problem S3CS1 formulated:
  - S3CS1: sort 3 integers creatively, without the popular containers and/or industrial strength algorithms

Season 3 Episode 7: 3-Integer Sort, A Discovery

- Problem S3CS1 solved

- Problem S3M5 formulated:
  - S3M5: construct a point, N, inside of a right triangle, ABC, such that the magnitudes of all the angles NAB, NBC and NCA are all equal one another

Season 3 Episode 8: Brocard Points Introduction
- Problem S3M5 solved
- Problem S3M6 formulated:
  - S3M6: invent a way to evaluate finite sums based on a popular approach that is used in combinatorial analysis to prove binomial identities

Season 3 Episode 9: Summation By Double-Counting
- Problem S3M6 solved
- Problem S3P2 formulated:
  - S3P2: find the distance covered by a bouncing material point

Season 3 Episode 10: Infinity In Physics
- Problem S3P2 solved
- Problem S3CS2 formulated:
  - S3CS2: suggest a Turing Machine-friendly algorithm for testing if a given point is located outside or inside of a given triangle

Season 3 Episode 11: A Point-in-triangle Detection Algorithm
- Problem S3CS2 solved
- Problem S3M7 formulated:
  - S3M7: find a way to integrate a binomial differential $x^m(a+bx^n)^p\,dx$

Season 3 Episode 12: Integration Of Binomial Differentials
- Problem S3M7 solved
- Problem S3M8 formulated:
  - S3M8: use the integration of binomial differentials machinery developed in the previous problem in order to evaluate the following infinite sum:

$$\sum_{n=1}^{+\infty} \frac{1}{n(n+1)(n+2)\dots(n+p)}, \quad p \geqslant 2$$

Season 3 Episode 13: Binomial Differentials Slay Infinite Sums Before Breakfast
- Problem S3M8 solved
- Problem S3P3 formulated:
  - S3P3: distinguish a sphere from an identical ball of same radius and mass

Season 3 Episode 14: Sisyphus Versus Spherical Chickens Of Uniform Density
- Problem S3P3 solved
- Problem S3CS3 formulated:
  - S3CS3: construct a single-pass algorithm for sorting **0**s and **1**s

Season 3 Episode 15: Single-pass Janus Sort
- Problem S3CS3 solved
- Problem S3M9 formulated:
  - S3M9: construct an equilateral triangle on 3 parallel straight lines

Season 3 Episode 16: An Equilateral Triangle On 3 Parallel Straight Lines Construction
- Problem S3M9 solved
- Problem S3M10 formulated:
  - S3M10: reconstruct a square given 4 points that belong to one side of that square each

Season 3 Episode 17: 4-Point Square Reconstruction
- Problem S3M10 solved
- Problem S3P4 formulated:
  - S3P4: find the normal and the tangential accelerations as functions of time of a point that moves along a parabola with its acceleration vector staying parallel to the y-axis at all times

Season 3 Episode 18: A Parabolic Motion With Acceleration Staying Parallel To The y-axis
- Problem S3P4 solved
- Problem S3CS4 formulated:
  - S3CS4: creatively swap 2 sub-arrays

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S3CS1	Season 3 Episode 6	Season 3 Episode 7
S3M5	Season 3 Episode 7	Season 3 Episode 8
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S3CS2	Season 3 Episode 10	Season 3 Episode 11
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