The ProbLemma's Channel Season 2 Guide

[Season 2 Episode 1: Seven Gallons Of Water On The Wall (Reinterpret And Conquer)]

- Problem S2M1 solved:
  - Mathematical Billiard
- Problem S2M2 formulated:
  - Problem S2M2: an alternative expression for a finite sum of squares of consecutive whole positive numbers

[Season 2 Episode 2: A Weighty Question (Reinterpret And Conquer)]

- Problem S2M2 solved:
  - Center Of Mass
- Problem S2M3 , Swan Lakes, formulated:
  - Problem S2M3: swans landing on lakes via the half of all swans plus half-a-swan rule

The above 2 episodes with S1E8 and S1E9 form the ["Reinterpret And Conquer" play list].

[Season 2 Episode 3: Swan Lakes (Reverse Order)]

- The mechanics of the "Reverse Order" problem-solving approach explained
- Problem S2M3 solved
- Problem S2M4, The Devil And A Loiterer, formulated:
  - S2M4: a loiterer crossing a bridge

[Season 2 Episode 4: The Devil And A Loiter (Reverse Order)]

- The mechanics of the "Reverse Order" problem-solving approach explained again
- Problem S2M4 solved
- Problem S2M5 formulated:
  - S2M5: magic apples gathered by a peasant
- Problem S2M6 formulated:
  - S2M6: apple injections
- Problem S2M7 formulated:
  - S2M7: an equilateral triangle in a square

[Season 2 Episode 5: Apples Of Discord (Reverse Order)]

- Problems S2M5, S2M6, S2M7 solved
- Problems S2M8 and S2M9 formulated
  - S2M8: an isosceles triangle in a trapezoid
  - S2M9: external and internal tangents to two circles

Season 2 Episode 6: On The Tangent (Reverse Order)
- Problems S2M8 and S2M9 solved
- Problem S2CS1 formulated:
  - S2CS1: 2 eggs versus 100-story building

Season 2 Episode 7: Two Eggs Versus One Building (Reverse Order)
- Problem S2CS1 solved
- Problem S2M10 formulated:
  - S2M10: horses and carrots, gamels and bananas

Season 2 Episode 8: Horses Eating Carrots, Discrete Rocket Propulsion (Reverse Order)
- Problem S2M10 solved
- Problem S2M11 formulated:
  - S2M11: An odd colony of infinitely excitable cells

Season 2 Episode 9: An Add Colony Of Infinitely Excitable Cells (Reverse Order)
- Problem S2M11 solved
- Problem S2M12 formulated:
  - S2M12: Zero in a recurrence relation

Season 2 Episode 10: Zero in a recurrence relation (Reverse Order)
- Problem S2M12 solved
- Problem S2M13 formulated:
  - S2M13: peasant, goat, cabbage, wolf crossing a river


The above eight episodes form the "Reverse Order" play list.

Season 2 Episode 11: Peasant. Goat. Cabbage. Wolf (Space-Time)
- The mechanics of "Space-Time" explained
- Problem S2M13 solved
- Problem S2M14 formulated:
  - S2M14: find a fake coin in a set 12 using 3 weighings on pan scales, an adaptive approach

Season 2 Episode 12: Not Blind Mathematical Justice (Space-Time)
- Problem S2M14 solved (via an adaptive approach)
- Problem S2M15 formulated:
  - S2M15: find a fake and heavy coin in a set of 18 using 3 non-adaptive weighings on pan scales

Season 2 Episode 13: Blind Mathematical Justice (Space-Time)
- Problem S2M15 solved (via a non-adaptive approach)

- Problem S2M16 formulated:
  - S2M16: put together at least one fake coin detection problem that admits at least one geometric solution

Season 2 Episode 14: Geometry In Fake Coin Detection Problems (Space-Time)
- Problem S2M16 solved (a geometry of a non-adaptive approach)
- Problem S2M17 formulated:
  - S2M17: decompose the $\log(\Gamma(x))$ function into its Fourier series over the interval $(0, 1]$


The above four episodes form the "Space Time" play list.

Season 2 Episode 15: Fourier Series of $\log(\Gamma(x))$ over $(0, 1]$
- Problem S2M17 solved
- Problem S2M18 formulated:
  - S2M18: find the number of times a minute hand will rendezvous with the hour hand on the face of the standard analogue 12-hour clock in one 12-hour period starting from 12 o'clock

Season 2 Episode 16: A Chase Around The Clock (Equation)
- Problem S2M18 solved
- Problem S2M19 formulated:
  - S2M19: generate a proof of the Pythagorean Theorem based on the Equation problem-solving approach

Season 2 Episode 17: Pythagorean Theorem Via Equations (Equation)
- Problem S2M19 solved
- Problem S2M20 formulated:
  - S2M20: solve an equation of order 4

Season 2 Episode 18: Now You Know Me, Now You Don't (Equation)
- Problem S2M20 solved
- Problem S2M21 formulated:
  - S2M21: effectiveness of advertisement

Season 2 Episode 19: Effectiveness Of Advertisement (Equation)
- Problem S2M21 solved
- Problem S2M22 formulated:
  - S2M22: Fresnel Integrals Via Equations

Season 2 Episode 20: Fresnel Integrals Via Equations (Equation)
- Problem S2M22 solved
- Problem S2M23 formulated:

- S2M23: number of such 5-digit perfect squares that if each digit of that perfect square is increased by 1 then a new perfect square results (Scope Reduction)

The above six episodes form the "Equation" play list.

Season 2 Episode 21: Heavy perfect 5-digit squares (Scope Reduction)

- Problem S2M23 solved
- Problem S2M24 formulated:
  - S2M24: find the locus of points on a sphere each of which is equidistant from 3 given fixed distinct points on that sphere, no two of which are antipodal (Scope Reduction)

Season 2 Episode 22: Equidistant points on a sphere (Scope Reduction)

- Problem S2M24 solved
- Problem S2M25 formulated:
  - S2M25: explain how the Euclidean Greatest Common Divisor Algorithm from the perspective of the Scope Reduction problem-solving approach (Scope Reduction)

Season 2 Episode 23: the Euclidean GCD Algorithm via Scope Reduction (Scope Reduction)

- Problem S2M25 solved
- Problem S2M26 formulated:
  - S2M26: evaluate the following integral using the Scope Reduction problem-solving approach (Scope Reduction)

$$\int_c^{2c} \frac{x}{\sqrt{x^2+cx-2c^2}}\,dx$$

Season 2 Episode 24: Integral Evaluation via Scope Reduction (Scope Reduction)

- Problem S2M26 solved
- Problem S2M27 formulated:
  - S2M27: show that it is impossible to find the location of a circle using the Euclidean straightedge alone (Scope Expansion)

The above four episodes form the "Scope Reduction" play list.

Season 2 Episode 25: Circle. Center. Straightedge. Nope (Scope Expansion)

- Problem S2M27 solved
- Problem S2M28 formulated:

- S2M28: find an alternative expression for the finite sums of consecutive positive whole numbers raised to a fixed positive whole power (Scope Expansion)

Season 2 Episode 26: Finite Integer Sums (Scope Expansion)
- Problem S2M28 solved
- Problem S2M29 formulated:
  - S2M29: determine if the sum of areas of yellow triangles is equal to the sum of areas of blue triangles that live in a regular hexagon (Scope Expansion)

Season 2 Episode 27: Integer Power Sums Revisited (Scope Expansion)
- Problem S2M29 solved
- Problem S2M30 formulated:
  - S2M30: determine if the sum of areas of yellow triangles is equal to the sum of areas of blue triangles that live in a regular hexagon (Scope Expansion)

Season 2 Episode 28: Is It A Hexagon? Or Is It A Triangle? (Scope Expansion)
- Problem S2M30 solved
- Problem S2M31 formulated:
  - S2M31: find a mechanical way to construct arbitrary magic squares of odd orders (Scope Expansion)

Season 2 Episode 29: Odd Magic Squares (Scope Expansion)
- Problem S2M31 solved
- Problem S2M32 formulated:
  - S2M32: evaluate the following indefinite integral via the Scope Expansion problem-solving approach without using the integration by parts (Scope Expansion)

$$\int e^{ax} \sin(bx) \cos(cx)\, dx$$

Season 2 Episode 30: One Integral? Two Integrals! (Scope Expansion)
- Problem S2M32 solved
- Problem S2M33 formulated:
  - S2M33: find the radius of a largest circle that passes only through the black squares of a standard 8×8 chessboard (Eliminate And Conquer)


The above six episodes form the "Scope Expansion" play list.

Season 2 Episode 31: Largest Circle On A Chessboard (Eliminate And Conquer)
- Problem S2M33 solved
- Problem S2M34 formulated:

    - S2M34: find two numbers given their LCM and the difference between them (Eliminate And Conquer)

Season 2 Episode 32: The LCM And The Difference (Eliminate And Conquer)
- Problem S2M34 solved
- Problem S2M35 formulated:
    - S2M35: show that no number of the form $111\ldots1$ is a perfect square (Eliminate And Conquer)

Season 2 Episode 33: A Non-Square Fence Of Ones (Eliminate And Conquer)
- Problem S2M35 solved
- Problem S2M36 formulated:
    - S2M36: construct a magic 3×3 square with a given constant (Eliminate And Conquer)

Season 2 Episode 34: A 3×3 Magic Square Construction (Eliminate And Conquer)
- Problem S2M36 solved
- Problem S2M37 formulated:
    - S2M37: recover the shape of a regular polygon given a relationship between the lengths of its sides and diagonals (Eliminate And Conquer)

Season 2 Episode 35: Regular Polygon Recognition (Eliminate And Conquer)
- Problem S2M37 solved
- Problem S2M38 formulated:
    - S2M38: find the magnitudes of the interior angles of a planar triangle given a relationship between the distances from the vertices of that triangle to the points chosen on its sides (Eliminate And Conquer)

Season 2 Episode 36: A Show Of Equal Distances (Eliminate And Conquer)
- Problem S2M38 solved
- Problem S2M39 formulated:
    - S2M39: cut an 8×3 piece of wood into two pieces that fit perfectly inside of a 12×2 whole (Divide And Conquer)


The above six episodes form the “Eliminate And Conquer” play list.

Season 2 Episode 37: East Or West Divide And Conquer (Divide And Conquer)
- Problem S2M39 solved
- Problem S2M40 formulated:
    - S2M40: find the area of a Reuleaux Triangle (Divide And Conquer)

Season 2 Episode 38: The Area of The Reuleaux Triangle (Divide And Conquer)
- Problem S2M40 solved
- Problem S2M41 formulated:
  - S2M41: invent at least two distinct proofs of the Heron's Formula (Divide And Conquer)

Season 2 Episode 39: Heron's Formula Divided And Conquered (Divide And Conquer)
- Problem S2M41 solved
- Problem S2M42 formulated:
  - S2M42: show that the areas of two triangles whose vertices are located on the different branches of the unit hyperbola $xy = 1$ are equal one another (Divide And Conquer)

Season 2 Episode 40: When Triangles Kiss A Hyperbola (Divide And Conquer)
- Problem S2M42 solved
- Problem S2M43 formulated:
  - S2M43: evaluate a finite product of cosines whose arguments are the whole positive numbers coprime with 100 and scaled by π and divided by 100 (Divide And Conquer)

Season 2 Episode 41: 5-Coprime Odd Numbers That Live On A Globe (Divide And Conquer)
- Problem S2M43 solved
- Problem S2M44 formulated:
  - S2M44: evaluate the following limit (Divide And Conquer)

$$\lim_{n\to+\infty} \frac{1}{n^3} \sum_{k=1}^{n} k\sqrt{n^2-k^2}$$

Season 2 Episode 42: How A Hoof Can Evaluate A Limit (Divide And Conquer)
- Problem S2M44 solved
- Problem S2M45 formulated:
  - S2M45: evaluate the Poisson Integral P_r by the book (Divide And Conquer)

$$\int_0^{\pi} \log\left(1 - 2r\cos(x) + r^2\right) dx, \ |r| \neq 1$$

Season 2 Episode 43: Poisson Integral Evaluation By The Book (Divide And Conquer)
- Problem S2M45 solved
- Problem S2M46 formulated:
  - S2M46: the watermelons transportation problem (Invariant)


The above seven episodes form the "Divide And Conquer" play list.

Season 2 Episode 44: Evaporating Watermelons (Invariant)

- Problem S2M46 solved
- Problem S2M47 formulated:
  - S2M47: (Invariant)

The ProbLemma's Channel Season 2 Index

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S2M6	Season 2 Episode 4	Season 2 Episode 5
S2M7	Season 2 Episode 4	Season 2 Episode 5
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