Teacher's & Workshop Guide: Ring 4 - The Predictor (Odds)

Polya Studio Discovery Series

Introduction to the Workshop

Welcome to Ring 4 of the Polya Studio. In previous rings, students dealt with certainty: a counted number (Ring 1), a fixed budget (Ring 2), or a physical law (Ring 3). Ring 4 introduces **Uncertainty**. This is the world of Prediction, Insurance, and Decision Making.

Your role as the Guide is to cure them of "Result-Based Thinking." Most people judge a decision by the outcome (if I won, it was smart; if I lost, it was stupid). You will teach them that a "Good Bet" is good even if you lose, and a "Bad Bet" is bad even if you win.

The goal of Ring 4 is for students to discover **The Law of Large Numbers**. They will learn that while you cannot predict one event, you can predict the pattern of many events.

Part 1: The Station Setup

You must prepare a physical environment where "Gut Feeling" fails and "Data" succeeds. You will need a hidden probability game.

First, prepare an **"Opaque Bag."** A cloth drawstring bag or a pillowcase works perfectly. You must not be able to see inside.

Second, load the bag with **"Weighted Data."** Place exactly **7 Blue Marbles** (Winning Tokens) and **3 Red Marbles** (Losing Tokens) inside. The ratio is 70% Win / 30% Loss, but *do not tell the students this number.*

Third, provide **"Betting Chips."** Give the team 10 poker chips or candies.

When the students arrive, the challenge is simple: They must bet their chips to pull a Blue Marble. If they pull Blue, they double their bet. If they pull Red, they lose their bet.

Part 2: The Workshop Dialogue

Stand back. Let them bet based on superstition or luck. Watch them cheer when they win and groan when they lose. Use this script to guide their discovery of the hidden math.

| **Teacher's Nudge (The Guide)** | **Student's Action (The Discovery)** | | "Here is the Mystery Bag. Blue pays double. Red takes your chips. You have 10 chips. Make your bets." | The team will start cautiously. They might bet 1 chip. They pull a Blue marble. "Yes! Easy money!" | | "Keep going. Make a bigger bet." | They might get confident and bet 5 chips. They pull a Red marble. "Oh no! We lost half our money!" | | (Wait for the Friction Point. They will start arguing. "This bag is unlucky!" or "I feel like a Blue is coming next!") | **The Friction Point.** Superstition takes over. They are trying to guess the *next* pull based on

feelings. They are scared to bet. | | "Stop betting. You are guessing. A Predictor does not guess; they measure. How can we find out what is in the bag without looking?" | They pause. "We could dump it out?" "No, that's cheating." "We could keep pulling and write it down?" | | "Yes. We need Data. Draw the Problem." (Hand them the whiteboard.) | The team stops gambling and starts testing. | | "Draw the Odds Triangle. Draw the Wins, the Losses, and the Total Pulls." | **The Visualization.** They agree to do 10 test pulls (returning the marble each time). They record the results: B, B, R, B, B, R, B, B, B, R. | | "What does your Triangle say?" | They count the tally marks. "We pulled 7 Blues and 3 Reds out of 10 tries." | | "So, is the bag 'lucky'? Or is it 'weighted'?" | **The Resolution.** They realize the bag is physically set up to win more than it loses. "It's a 7 out of 10 chance." | | "Now that you know the Odds (70%), how should you bet?" | They look at their chips. "We should bet big because we will win more often than we lose." They place a large bet with confidence, not fear. |

Part 3: The Visual Rule (The Odds Triangle)

Once they have "sampled" the bag and discovered the 70/30 ratio, gather them around the whiteboard. Draw the Odds Triangle diagram. This is the tool they will use to manage risk.

The top point of the triangle is **THE SIGNAL** (The Pattern).

- *What happened most often in our test? (7 Blues)*

The bottom left point of the triangle is **THE NOISE** (The Risk).

- *What happened less often, but still happened? (3 Reds)*

The bottom right point of the triangle is **THE BET**.

- *The Decision: If the Signal is stronger than the Noise, take the Bet. If the Noise is stronger, walk away.*

The Rule: You cannot control the Red Marble. It will happen sometimes. But if you know there are more Blue Marbles, you don't panic when you see Red. You stick to the plan because the Math is on your side.

Part 4: Teacher's Quiz (Pedagogy Check)

Question 1 Why do we ask the students to "Sample" the bag (pull 10 times) before betting big? A) To waste time. B) To move them from "Guessing" (Superstition) to "Measuring" (Probability). *Correct Answer: B*

Question 2 If a student bets big and pulls a Red Marble (Loss), was it a "Bad Bet"? A) Yes, because they lost money. B) No. If the odds were 70% in their favor, the bet was mathematically correct. The loss was just "Noise." *Correct Answer: B*

Question 3 What does the Odds Triangle help students distinguish? A) The difference between Blue and Red colors. B) The difference between the "Signal" (The likely outcome) and the "Noise" (The unlikely outcome). *Correct Answer: B*

Part 5: Student's Quiz (Concept Check)

Question 1 You are playing a game. You test it 10 times. You win 1 time and lose 9 times. Should you bet your lunch money on the next turn? A) Yes, I am due for a win! B) No, the Signal says I will probably lose (10% chance to win). *Correct Answer: B*

Question 2 If there is a 90% chance of rain, and it doesn't rain, was the weather report "wrong"? A) Yes, they lied. B) No. The 10% chance of sun just happened to occur today. That is probability. *Correct Answer: B*

Question 3 What is the Superpower of Ring 4? A) Knowing the future exactly. B) Knowing the *Odds* of the future so you can make smart choices. *Correct Answer: B*

Closing Note

By the end of this session, your students have practiced **Prediction**. They learned that "Bad Luck" is just a part of the math (Noise). By sampling the data first, they can act with confidence, knowing that over the long run, the Signal will win.