

MBMT Counting and Probability Round — Jacobi

March 8, 2026

Full Name _____

Student ID Number _____

**DO NOT BEGIN UNTIL YOU ARE
INSTRUCTED TO DO SO.**

This round consists of **8** questions. You will have **30** minutes to complete the round. Each question is *not* worth the same number of points. Questions answered correctly by fewer competitors will be weighted more heavily. Please write your answers in a reasonably simplified form.

- _____ 1. Sam has 2 identical red coins, 2 identical blue coins, and 2 identical yellow coins. He picks 2 of the 6 coins to go shopping. If he can pick them in any order, how many combinations of colored coins can Sam pick?
- _____ 2. Evan is playing a game that has easy levels and hard levels. He has a 50% chance to pass an easy level and a 10% chance to pass a hard level. What is the probability he passes 2 easy levels and 1 hard level, in that order, on his first try?
- _____ 3. The number 4167 is written on the board. Chris goes up to the board and erases two digits at random, leaving a two-digit number. What is the probability the remaining number is even?
- _____ 4. 5 left-handed students and 3 right-handed students randomly choose seats from a row of 8 front-facing desks to take a test. What is the probability that no left-handed person sits directly to the right of a right-handed person?
- _____ 5. Thomas rolls a six-sided die 3 times and records the 3 numbers that he rolls. Given that the sum of the 3 numbers is 15, what is the probability he rolled at least one 6?
- _____ 6. Three girls, Alice, Allison, and Avery, and three boys, Ben, Bill, and Yixuan, are sitting at a round table with six seats. If rotations are considered the same, how many distinct ways are there for the six people to sit around the table such that every boy sits next to at least one girl and every girl sits next to at least one boy?
- _____ 7. Bo and Man are practicing archery, and can hit the target $\frac{2}{3}$ of the time and $\frac{1}{3}$ of the time, respectively. Each turn, they both shoot one arrow at the same time, playing until one player has hit the target two more times than the other. What is the expected number of turns until the game ends?
- _____ 8. A 5×5 square grid has each cell filled with either 1 or -1 . A *move* consists of choosing one of the rows or columns and multiplying -1 to all the numbers in that row/column. From how many distinct starting grids is it possible to apply a finite number of *moves* so that all the cells in the board are filled with 1?