



Knights of Pi Math Tournament – Jan. 7, 2017  
Probability & Potpourri 7th/8th

1	On a gameshow, to win a prize, I must pull twice with replacement from a bag containing 15 balls: 5 black, 5 white, and 5 striped. A striped ball counts as half a win, while a black ball counts as one win. What is the chance that I win at least once?
2	My friend Mike and I live 35 miles apart. We depart from our houses at the same time to meet each other. I drive at 30 miles per hour; Mike, being more reckless, drives at 40 miles per hour. My pet hawk flies between us with a constant speed of 10 miles per hour as soon as I start. When it reaches Mike's car, it immediately turns back towards my car. When it reaches my car, it immediately turns the other direction towards Mike's car. It continues flying between us until we meet. By the time we meet, how far in miles has my pet hawk flown?
3	Pirates and Marines are engaged in a naval battle. The marines must hit the Pirates once to defeat them. The Marines have $\frac{3}{5}$ chance to hit, but only $\frac{1}{3}$ when the sun is out. There is a $\frac{4}{7}$ chance of the sun being out. What is the chance that the Marines hit the Pirates?
4	What is the probability of getting a perfect score on a 5-question multiple-choice test with 4 options per question, if you only guess randomly?
5	Six people are at a dinner party together and must sit down randomly around a circular table. What is the probability that three friends, A, B, and C, sit together in that specific order?
6	Let A denote the area in the first quadrant between the axis and the line $y = -x + 5$ . Let B denote the area in the first quadrant between the axis and the line $y = -2x + 10$ . If I randomly pick a point within B, what is the probability that the point is not in A?
7	There are 50 students in a class. 20 students are taking Chemistry, and 35 students are taking Physics. If 5 students are taking neither, how many students are taking both?
8	Find the first 3 digits after the decimal point when the Base-7 number 0.247 is written in decimal form. Your answer should be in the form $xyz$ .
9	Express the natural log of $e^{10}$ in binary.
10	There are three fair coins and one fake coin in a bag. The fake coin has two heads, rather than one heads and one tails. If I blindly pull out a coin and flip it to reveal heads, what is the probability that I picked the fake coin?