Practice questions

1. In how many ways can we pick 2 books from a collection of 3 mathematics books, 5 computer science books, and 7 programming books if
   (a) both books are to be on the same subject?
   (b) the books are to be on different subjects?
2. On any given week, Alice is 70% likely to attend Monday class, 80% likely to attend Thursday tutorial, and 60% likely to attend both. Given that she wasn't in class on Monday, what is the probability that she will show up to Thursday tutorial?
3. Alice draws cards one by one from a shuffled 52-card deck. Find the PMF of the turn T at which she has drawn the fourth (and last) ace.
4. Eight boys and eight girls are randomly seated at a round table. What is the expected number of boys that are seated between two girls?
5. You go to the casino with \$3 to play roulette. (Note: A roulette has 18 black slots, 18 red slots, and 1 green slot which is for the house only.) Calculate the expected value and standard deviation of the amount you lose under the following two gambling strategies:
   (a) You play for 3 rounds, where in every round you bet \$1 on red.
   (b) You bet all your money on red. If you win, you bet everything on red again. If you win again, you bet everything on red one last time.
6. Let X and Y be random variables that take values from the set $\{-1, 0, 1\}$.
   (a) Find a joint probability mass function for which X and Y are independent, and confirm that X^2 and Y^2 are also independent.
   (b) (Hard) Find a joint pmf for which X and Y are not independent, but X^2 and Y^2 are independent.