# Questions

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This assignment is due in about one week from when the assignment opens. The exact deadline and full instructions for submission are provided in Coursera. To receive full credit all your answers should be carefully justified. Each solution must be written independently by yourself - **no collaboration is allowed**.

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**1.** **[10 pts]** Suppose Jeff has 5 cars; a Ferrari, an Audi, a Bugatti, a Bentley, and a Lamborghini. He wants to organize his garage consisting of these 5 cars. He does this by selecting a uniformly random permutation of the 5 cars. What is the probability that the first car is the Audi, and the last car is the Bentley?

**2.** **[10 pts]** Among $2 \leq k \leq 7$ randomly selected people, what is the probability that at least two of them were born on the same day of the week?

**3.** **[10 pts]** Suppose you roll three fair six-sided dice and add up the numbers you get. What is the probability that the sum is at most 5?

**4.** **[10 pts]** Sasha and Professor Tannen are planning the end of the semester dinner party for the CIT Staff. Answer the following questions. **You don't need to show your work.**

Questions (a)-(d) are based on the following scenario: Sasha and Professor Tannen decide to order 4 dishes for the team of TAs. For any meal, Laila feels like eating 29% of the time, Alex feels like eating 68% of the time, Francesca 54% of the time, and Rohan feels like eating 0% of the time (he's always eats before the dinner party!). All four dishes are independent of each other.

Questions (e)-(i) are based on the following scenario: after creating the planning and successfully running the dinner party, Sasha examines the dishes herself. She visits 5 dishes independently and gets one spoonful of food from each, which is equally likely to be either warm or cold.

(a) What is the probability that exactly 3 TAs eat at the dinner party?

(b) What is the probability that exactly 0 TAs eat at the dinner party?

(c) What is the probability that at least 1 TAs eat at the dinner party?

(d) What is the probability that exactly 1 TAs eat at the dinner party?

(e) What is the probability that every spoonful Belinda gets is of the same temperature type (warm or cold)?

(f) What is the probability that the first 3 spoonfuls of food she gets are warm and the other 2 are cold?

(g) What is the probability that she gets exactly 3 warm spoonfuls of food?

(h) What is the probability that the first 2 spoonfuls of food she gets are cold?

(i) What is the probability that she gets at least 1 cold spoonful of food?

**5. [10 pts]** It is spring break, and Alice wants to go on vacation for two weeks. She wants to go to either Cancun, the Bahamas, or Hawaii. She only has money to go to one place for the first week, and another for the second week, for a total of two locations (note that she can also pick the same place twice, going there for the entire two weeks). She puts $a$ tickets labeled "Cancun", $b$ tickets labeled "Bahamas", and $c$ tickets labeled "Hawaii" into a hat. She will pick a ticket from the hat uniformly at random to decide where to travel the first week, then return that ticket to the hat. She'll then pick another ticket from the hat uniformly at random and go to that location the second week. What is the probability that she goes to two different locations? Be sure to define the sample space and any relevant events. Assume that $a + b + c \geq 2$.