

Math 180A: Introduction to Probability

Quiz 1

Fall 2021

- You will have **50 minutes** to complete this quiz.
- Please have your student ID easily accessible to show to a proctor when asked.
- You may use one 8.5 x 11 inch sheet of handwritten notes, but no calculators, phones, or other study aids are permitted.
- Unless stated otherwise, if a question calls for a numerical answer, you don't need to multiply everything out. (*For example, it's okay to write something like $(0.9)7!/\binom{3}{2}$ as your answer.*)
- Please show your work and explain your answers for each problem unless otherwise specified—we will not award full credit for the correct numerical answer without proper explanation.
- Please write your final answer for each problem in the indicated area. If you do any work on the backs of the pages or on additional scratch paper that you would like to have graded, **please indicate that clearly; otherwise it will not be graded.**
- Don't forget to write your name on the top of every page.
- Good luck!

Name: _____

PID: _____

Seat Number: _____

Name: _____

Problem 1: (4 points) If A and B are disjoint events, which of the following are always true?
(You do not need to show your work or justify your answers for this problem.)

Choose ALL that apply:

- $P(A|B) = 0$
- $B = A^c$
- $P(A \cup B) = P(A) + P(B)$
- $P(A \cap B) = P(A) \cdot P(B)$

Problem 2: (2 points) Suppose A, B and C are events with

$$P(A) = P(B) = P(C) = .3$$

and

$$P(A \cap B) = P(A \cap C) = P(B \cap C) = .1$$

What is the value of $P(A \cup B \cup C)$?

(You do not need to show your work or justify your answer for this problem.)

Choose one:

- .6
- .7
- .8
- Not enough information

Name: _____

Problem 3: (8 points) Of the customers ordering burgers at In-N-Out, suppose that **30%** ask for their burger “animal style,” **15%** ask for their burger with chopped chilis, and **10%** ask for both (i.e. they ask for their burger “animal style with chopped chilis”).

(a) (4 points) What is the probability that a randomly chosen customer orders their burger neither animal style nor with chopped chilis?

Answer:

(b) (4 points) Given that a customer orders their burger with chopped chilis, what is the conditional probability that they also ask for it “animal style”?

Answer:

Name: _____

Problem 4: (10 points) You and your friend each choose a number between 1 and 10 uniformly at random (you choose the numbers without consulting each other). We define the following events:

$$A = \{\text{your number is equal to your friend's number}\}$$

$$B = \{\text{the sum of your number and your friend's number is 4}\}$$

(a) (3 points) Give a sample space Ω and a probability measure P for this experiment.

Sample space:

Probability measure:

Name: _____

Problem 4 (continued)

(b) (3 points) What is $P(A)$?

Answer:

(c) (4 points) What is $P(A|B)$?

Answer:

Name: _____

Problem 5: (6 points) Suppose that among the students in Math 180A, there are:

- 50 Sophomores
- 70 Juniors
- 30 Seniors

A committee of 10 students is chosen uniformly at random from among the students in the class.

(a) (3 points) What is the probability that exactly 5 sophomores, 3 juniors, and 2 seniors are chosen?

Answer:

(b) (3 points) What is the probability that at least one sophomore is chosen?

Answer: