MS&E 220: Probabilistic Analysis

Quiz 1

Your solution is due on Gradescope by noon (CA time) on Sunday, October 15.
To get an extra 24 hours to complete it, please post a brief and reasonable explanation in a *private* Quiz Extensions request on Ed Discussion.
Submissions will not be accepted after noon on Monday, October 16.
Please allow yourself time to scan, submit, and tag your solution as a PDF file, as described at help.gradesope.com.
Students with OAE letters recommending extra time should submit those letters to Ed Discussion as a *private* Accommodation request.

Open book. You may use your textbook and any materials and videos on our course Canvas site.

This quiz tests your individual knowledge.
No collaboration with anyone else is permitted.
You may not submit any of the questions to websites or AI tools.
If you do not understand what a question is asking, then please post a *private* Quizzes question on Ed Discussion requesting clarification, ideally before noon on October 14.

You can submit your answers on a copy of this quiz or on your own paper.
Please put your answer to each question in a box labeled with the question letter.
When you submit to Gradescope be sure to tag the page corresponding to each answer.
That is what will be graded, and you will benefit by correctly tagging your pages.

Partial credit will be given whenever possible provided your solution is neat and clear.
If we derived a result in class, we do not want you to re-derive it on the quiz, but rather to apply it after briefly explaining why any necessary conditions are satisfied.

Assumptions made in the problem introduction apply to all questions, however assumptions made within a question only apply to that question unless stated otherwise.

Good Luck and Clear Insights!

By submitting your solution to Gradescope, you acknowledge and accept the Honor Code:
- **that you will not give or receive unpermitted aid,**
- **that the work you submit is solely your own, and**
- **that you will actively uphold the Honor Code.**

Printed Name _____ Signature _____

*Please answer each part of this problem with **both** an expression (such as 10! or 10 choose 3) as well as a number, which you can compute in Google using 10! or (10 choose 3).*
If a number is less than 0.01, please use exponential notation (such as 1.234×10^{-5}*).*

A deck of 52 playing cards is shuffled and then dealt into eight hands of five cards each.
(Note that 12 of the cards will not be dealt.)

a) Find the probability that exactly three of the aces are dealt.

b) Find the probability that four of the hands will each have one ace.

c) Find the probability that one of the hands will have all four aces.

d) Given that the ace of spades was among the cards dealt, find the probability that it is in a hand with at least one other spade.

e) Given that exactly two aces and two queens were dealt, find the probability that both aces are together in one hand and both queens are together in a different hand.

f) Given that exactly two aces and two queens were dealt with the two aces together in a hand and the two queens together in a hand, find the probability that all four of those cards are together in the same hand.