IG EXAM

UCLA ID

LAST NA

FIRST N

(a) WRITE AND MARK YOUR NAME AND ID ON THE SCANTRON

(b) WRITE YOUR NAME ON BOTH SIDES OF THE CHEAT SHEET.

(c) DO NOT DETACH ANY PAGES FROM THIS EXAM. EXAM MUST STAY STAPLED DURING THE WHOLE EXAM.

Other important Instructions–Read. Points lost for not following directions.

- SILENCE AT ALL TIMES IN THE EXAM ROOM. Wait until you are out to talk and access your belongings in the backpack.

- Closed books, closed notes.

- Only scientific calculator allowed for computations. You may not use your phone or any other electronic device as calculator. Graphics calculators are not allowed. No exceptions. You get 0 points in the exam.

- Phones and other electronic devices must be disconnected before you enter the classroom and not turn on again until you are out of the room. While in the classroom, they must be in your backpack and your backpack on the floor. Phones in pockets will lead to 0 points in the exam. It is not worth the risk.

- Answer for multiple choice questions will be marked in scantron AND the exam. Work will not be read in multiple choice;Failure to mark your name, ID or some answers will result in point deduction from the exam grade.

- Left handed students will sit in a seat for left-handed students. The professor will tell students where to sit. Please, let the professor know that you are left handed ahead of time and she will move you.

- ID must be ready to show BEFORE and at all times during the exam. NO ID, no exam.

- This midterm must show your individual work. Talking to others during the midterm, not adhering to the above, sharing information or breaking any other aspect of the student code of conduct at UCLA will not be tolerated. You can not exchange papers or information. All your things must be on the floor. You may not use the empty seats next to you to put things. Close the tables. Honor code applies.

- Cheat sheet can have only formulas and definitions, no solved problems, no examples of any kind, no proofs, no numerical examples, no intermediate steps and no drawings or graphs of any kind. YOUR NAME MUST BE ON CHEAT SHEET AT ALL TIMES. Be ready to show your cheat sheet when the instructor requests it. The cheat sheet must be written all in English. Cheat sheets that do not comply will result in lower grade in the exam.

- Failure to follow instructions given here will result in loss of points in the exam in a first warning and more severe consequences on a second warning. Honor code applies. Familiarize yourself with student code of conduct by visiting the links provided in the course syllabus.

You may use this page for scratch work

MULTIPLE CHOICE QUESTIONS. ONLY ONE ANSWER IS CORRECT. CHOICE MUST BE MARKED ON THE SCANTRON, AND ALSO HERE ON THE EXAM. ONLY THE SCANTRON WILL BE GRADED. NO MARKS ON SCANTRON OR MORE THAN ONE MARK WILL RESULT IN 0 POINTS FOR THE QUESTION NOT MARKED, EVEN IF IT IS MARKED ON THE EXAM. You may use the space near the question for scratch work, but scratch work will not be read.

Question 1. Suppose a sample space S consists of 4 outcomes: $S = \{ a_1, a_2, a_3, a_4 \}$. Which functions define a probability function?

(a) $P(a_1) = \frac{1}{2}, P(a_2) = \frac{1}{4}, P(a_3) = \frac{-1}{4}, P(a_4) = \frac{1}{2}$

(b) $P(a_1) = \frac{1}{2}, P(a_2) = \frac{1}{4}, P(a_3) = \frac{1}{8}, P(a_4) = \frac{2}{8}$

(c) $P(a_1) = \frac{1}{2}, P(a_2) = \frac{1}{4}, P(a_3) = \frac{1}{8}, P(a_4) = \frac{1}{8}$

(d) $P(a_1) = \frac{1}{2}, P(a_2) = \frac{1}{4}, P(a_3) = \frac{1}{8}, P(a_4) = \frac{1}{2}$

(e) $P(a_1) = \frac{1}{2}, P(a_2) = \frac{1}{3}, P(a_3) = \frac{1}{4}, P(a_4) = \frac{1}{5}$

Question 2. A doctor gives a female patient a test for a particular cancer. Before the results of the test, the only evidence the doctor has to go on is that 1 woman in 1000 has this cancer. Experience has shown that, in 99 percent of the cases in which cancer is present, the test is positive; and in 95 percent of the cases in which cancer is not present, the test is negative. What is the probability that the test is positive?

(a) 0.0196

(b) 0.00237

(c) 0.5

(d) 0.95

(e) 0.05094

$$\frac{1}{1000} \times 0.99 + \frac{999}{1000} \times 0.05$$

Question 3. A university reports that 78% of its graduate students own a bicycle, 36% own a car, and 30% own both a car and a bicycle . What is the probability that a randomly selected graduate student owns a bicycle or a car, but not both?

$$0.78 + 0.36 - 2 \times 0.3$$

(a) 0.08

(b) 0.84

(c) 0.7

(d) 0.54

(e) 0.3

Question 4. A manufacturing company has two retail outlets. It is known that 30% of all potential customers buy products from outlet 1 alone, 50% buy from outlet 2 alone, 10% buy from both 1 and 2, and 10% buy from neither. Let A denote the event that a potential customer, randomly chosen, buys from outlet 1, and let B denote the event that the customer buys from outlet 2. Which of the following statements is true?

(a) $P(A \cup B) = 0.7$

(b) $P(A^c \cup B^c) = 0.6$

(c) $P(A \cup B)^c = 0.9$

(d) $P(B) = 0.9$

(e) $P(A) = 0.4$

$P(AB^c) = 0.3$　　　　A (outlet 1)
$P(BA^c) = 0.5$　　　　B (outlet 2)
$P(AB) = 0.1$
$P(A^cB^c) = 0.1$

$P(A) = P(AB^c) + P(AB) = 0.3 + 0.1$

Question 5. Electric motors coming off two assembly lines are pooled for storage in a common stockroom, which contains an equal number of motors from each line. Motors from that room are periodically sampled and tested. It is known that 30% of the motors from line I are defective and that 10% of the motors from line II are defective. If a motor is randomly selected from the stock room and found to be defective, what is the probability it came from line I?

(a) 0.4

(b) 0.75

(c) 0.5

(d) 0.9

(e) 0.1

$$\frac{\frac{1}{2} \times 30\%}{\frac{1}{2} \times 30\% + \frac{1}{2} \times 10\%}$$

Question 6. An insurance company examines its pool of auto insurance customers and gathers the following information: (i) All customers insure at least one car.
　　(ii) 64% of the customers insure more than one car (event A)　　　　$P(A) = 0.64$
　　(iii) 20% of the customers insure a sports car. (event B)　　　　$P(B) = 0.20$
　　(iv) Of those customers who insure more than one car, 15% insure a sports car.　　$P(B|A) = 0.15$
　　The probability of the event in part (iv) is

(a) $P(A \mid B)$

(b) $P(B \mid A)$

(c) $P(B \cap A^c)$
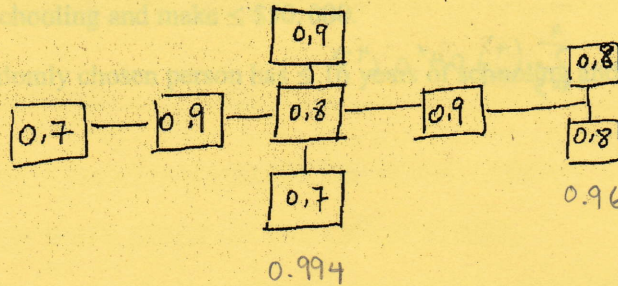
(d) $P(B \cup A)$

(e) $P(B \cap A)$

Figure 1: System

Question 7. Figure 1 displays a system with 8 independent components (represented by the boxes). The probability that each component works is indicated by the number inside that component's box. The reliability of the system is closest to

(a) 0.000272

(b) 0.18289

(c) 0.998

(d) 0.3891

(e) 0.5377

$$0.7 \times 0.9 \times \left[1 - (1-0.9)(1-0.8)(1-0.7)\right] \times 0.9 \times \left[1 - (1-0.8)^2\right]$$

Question 8. An inspector for a pharmaceutical firm is inspecting a box containing five pills, denoted by a,b,c,d,e. Underfilled pills, that is pills with a lesser amount of medication than they should contain, pose an unwanted risk to the patient consuming them. Unknown to the inspector, pills a,b,c, contain the proper amount of medication while pills d and e are underfilled. The inspector selects two pills at random without replacement. What is the probability that at least one of the pills selected by the inspector contains the proper level of medication?

(a) 0.10

(b) 0.9

(c) 0.6

(d) 0.5

(e) 0.0001

$$1 - \frac{1}{\binom{5}{2}}$$

Question 9. Observers noted that 40 percent of the vehicles crossing a certain toll bridge are commercial trucks. Four vehicles will cross the bridge in the next minute. Asume that the four vehicles are independent of each other. Determine the probability that more than 2 of the vehicles are commercial trucks.

(a) 0.25

(b) 0.1792

(c) 0.561

(d) 0.6115

(e) 0.84

$$\sum_{x=3}^{4} \binom{4}{x} 0.4^x 0.6^{4-x}$$

Question 10. An insurance company examines its pool of auto insurance customers and gathers the following information: (i) All customers insure at least one car.
   (ii) 64% of the customers insure more than one car
   (iii) 20% of the customers insure a sports car.
   (iv) Of those customers who insure more than one car, 15% insure a sports car.
   What is the probability that a randomly selected customer insures exactly one car, and that car is not a sports car?

$P(A) = 0.64$
$P(B) = 0.20$
$P(B|A) = 0.15$

(a) 0.096

(b) 0.744

(c) 0

(d) 0.256

(e) 0.55

$P(A^c B^c) = P((A \cup B)^c) = 1 - P(A \cup B) = 1 - [P(A) + P(B) - P(AB)]$

$= 1 - [P(A) + P(B) - P(A)P(B|A)] = 1 - [0.64 + 0.20 - 0.64 \times 0.15]$

Question 11. A system with 3 independent components is such that the system fails if exactly two of the individual components fail. The probability that a component fails is 0.02. Let A be the event that the system fails. What is the Probability of A?

(a) 0.064

(b) 0.0087

(c) 0.001176

(d) 0.1

(e) 6

$\binom{3}{2} 0.02^2 \, 0.98^1$

Question 12. A town has 1000 people. These people can be classified by their income level and their education, with the following information:

- 100 have $\leq$ 16 years of schooling and make > $50,000

- 300 have > 16 years of schooling and make > $50,000

- 400 have $\leq$ 16 years of schooling and make $\leq$ $50,000.

The joint probability that a randomly chosen person has $\leq$ 16 years of schooling and makes > $50,000 is

(a) 0.1 $\dfrac{100}{1000}$

(b) 0.87

(c) 0.5

(d) 0.2

(e) 0.62

Question 13. A survey of 500 students taking one or more courses in algebra, physics and statistics during one semester revealed the following numbers of students in the indicated subjects.

Algebra 329; physics 186; statistics 295; algebra and physics 83; algebra and statistics 217; physics and statistics 63.

How many students were taking all three subjects?

(a) 25

(b) 6

(c) 15

(d) 9

(e) 53
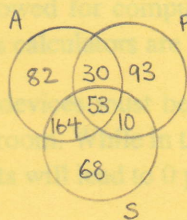
$P(A) = \dfrac{329}{500}$ $P(AP) = \dfrac{83}{500}$

$P(P) = \dfrac{186}{500}$ $P(AS) = \dfrac{217}{500}$

$P(S) = \dfrac{295}{500}$ $P(PS) = \dfrac{63}{500}$

NOW THAT YOU ARE DONE, CHECK

(a) Have you marked your name and ID in the scantron?

(b) Have you entered all the answers in the scantron and this exam booklet?

(c) Have you written your name and id in your cheat sheet?

(d) Have you written your name and id on the first page of the exam?

If so, then insert cheat sheet and scantron between the pages of the exam. Closed the exam and wait until we collect it from you. Remain seated until every student has turned in the exam.