

Problems in probability 2

A few warm up questions

Quiz

- Which of the following is NOT a possible probability?
 (a) 1 (b) 1.25 (c) 0 (d) 25/100
- Which of the following pairs of events are mutually exclusive?
 (a) A: negative numbers; B: odd numbers
 (b) A: the numbers above 100; B: the numbers less than -200
 (c) A: the even numbers; B: the numbers greater than 10
 (d) A: the odd numbers; B: the number 5
 (e) A: the numbers less than 5; B: all negative numbers
- One card is drawn from a standard 52 card deck. In describing the occurrence of two possible events, A. draw an Ace and B. draw a King, these two events are said to be:
 (a) independent (b) randomly independent
 (c) mutually exclusive (d) random variables

A few more open ended problems

- Let A and B be events such that:

- $p(A \cap B) = 1/4$
- $p(A^C) = 1/3$
- $p(B) = 1/2$

What is $p(A \cup B)$?

- A die is loaded in such a way that the probability of each face turning up is proportional to the number shown on that face (for example, a six is twice as likely as a three). What is the probability of getting an even number in one throw?
- What is the probability of getting the sequence $HHTT$ in four tosses of a fair coin?
- What is the probability of getting the sequence $HHTT$ for a bent (crooked, unfair...) coin, specially one where $Pr[Heads] = 0.1$?
- A baseball player has a 0.280 batting average. What is the probability that he will be successful the next three times at bat?
- Consider a fair die (dice), with faces 1, 2, 3, 4, 5, 6. Denote the score by f , what is the mean score of the die if you roll it once?

7. If you roll two fair die (as above, with faces 1, 2, 3, 4, 5, 6) and define the sum of both dice as $s = f_1 + f_2$. What is the mean of s ?
8. What is the probability that s is even?
9. A student must choose one subject as an elective: Computational Statistics (C), Multivariate Statistics (M), Survey Sampling (S).
If she is equally likely to choose C and M, but twice as likely to choose S, what is the probability she chooses to study Multivariate statistics?
10. Give possible sample spaces Ω for the following experiments:
- An election decides between two candidates A and B
 - A two sided coin is tossed
 - A student is chosen at random from a class of ten students
11. Describe in words the following subsets of $\Omega = \{HHH, HHT, HTH, THH, HTT, TTH, THT, TTT\}$
- $A = \{HHH, HHT, HTH, THH\}$
 - $B = \{HHH, TTT\}$
 - $C = \{HHT, HTH, THH\}$
 - $D = \{HHT, HTH, HTT, THH, THT, TTH, TTT\}$
12. Assuming fair coins, give the probabilities of each of the events in the previous exercise.
13. Two students had been getting straight A's in chemistry, all term. On the night before the final exam, they were partying in another city and didn't get home until after their exam was finished. Their excuse to their professor was that they had a flat tyre and they asked if they could have an immediate resit (take the exam again).
The professor agreed, and they were sent to separate rooms to take the test. On the first side of the paper was an easy question, worth 5 marks. On the other side was a single question, worth 95 marks:
"Which tyre was it"
What is the probability that they both gave the same answer?