

CS 333202: Probability and Statistics
HW1 part 2

1. Let A , B , C be events relating to the experiment of rolling a pair of dice.

(a) If

$$P(A | C) > P(B | C) \text{ and } P(A | C^c) > P(B | C^c)$$

either prove that $P(A) > P(B)$ or give a counterexample by defining events A , B , C for which it is not true.

(b) If

$$P(A | C) > P(A | C^c) \text{ and } P(B | C) > P(B | C^c)$$

either prove that $P(AB | C) > P(AB | C^c)$ or give a counterexample by defining events A , B , C for which it is not true.

Hint: Let C be the event that the sum of a pair of dice is 10; let A be the event that the first die lands on 6; let B be the event that the second die lands on 6.

2. A bin contains 3 different types of disposable flashlights. The probability that a type 1 flashlight will give over 100 hours of use is 0.7, with the corresponding probabilities for type 2 and type 3 flashlights being 0.4 and 0.3, respectively. Suppose that 20 percent of the flashlights in the bin are type 1, 30 percent are type 2, and 50 percent are type 3.

(a) What is the probability that a randomly chosen flashlight will give more than 100 hours of use?

(b) Given the flashlight lasted over 100 hours, what is the conditional probability that it was a type j flashlight, $j=1,2,3$?

3. A high school student is anxiously waiting to receive mail telling her whether she has been accepted to a certain college. She estimates that the conditional probabilities, given that she is accepted and that she is rejected, of receiving notification on each day of next week are as follows:

Day	$P(\text{mail} \text{accepted})$	$P(\text{mail} \text{rejected})$
Monday	0.15	0.05
Tuesday	0.20	0.10
Wednesday	0.25	0.10
Thursday	0.15	0.15
Friday	0.10	0.20

She estimates that her probability of being accepted is 0.6.

- (a) What is the probability that mail is received on Monday?
- (b) What is the conditional probability that mail is received on Tuesday given that it is not received on Monday?
- (c) If there is no mail through Wednesday, what is the conditional probability that she will be accepted?