

CS444 Propositional Logic Exercises

1. Assume that A , B , and C , are three mutually independent random variables, and that $P(A = \text{true}) = .4$, $P(B = \text{true}) = .3$, $P(C = \text{true}) = .9$. Find the probabilities that:
- (a) All three are true.
 - (b) Exactly two of the three are true.
 - (c) None of the three is true.
 - (d) Fill in the full joint probability distribution for these three variables. (Make sure the rows sum to 1!)

A	B	C	Probability
T	T	T	
T	T	F	
T	F	T	
T	F	F	
F	T	T	
F	T	F	
F	F	T	
F	F	F	

2. Compute the quantities below by referring to the following joint probability distribution:

A	B	C	Probability
T	T	T	.1
T	T	F	.05
T	F	T	.01
T	F	F	.02
F	T	T	.3
F	T	F	.2
F	F	T	.2
F	F	F	.12

(a) $P(a \wedge b \wedge \neg c)$

(b) $P(\neg b)$

(c) $P(\neg b \vee c)$

(d) $P(c|\neg b)$

3. You work at the airport as a passenger screener. You know the following things:

- (a) One passenger in one hundred tries to sneak a bomb through screening.
- (b) The conditional probability that the alarm will go off, given that the passenger has a bomb is .5.
- (c) The conditional probability that the alarm will go off given that the passenger does not have a bomb is .1.

The alarm goes off. What is the probability that the passenger has a bomb?