

# ECS 315: In-Class Exercise 4 Solution

## Sep 5, 2017

### Instructions

1. Separate into groups of no more than three persons.
2. The group cannot be the same as your former group.
3. Only one submission is needed for each group.
4. Write down all the steps that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
5. Do not panic.

Name	ID
Prapun	555

1. Consider a random experiment whose sample space is  $\{a, b, c, d, e\}$  with outcome probabilities 0.2, 0.1, 0.1, 0.3, and 0.3, respectively. Let  $A$  denote the event  $\{a, b, c\}$ , and let  $B$  denote the event  $\{c, d, e\}$ .

Find the following probabilities.

a.  $P(A) = P(\{a, b, c\}) = 0.2 + 0.1 + 0.1 = 0.4$

b.  $P(B) = P(\{c, d, e\}) = 0.1 + 0.3 + 0.3 = 0.7$

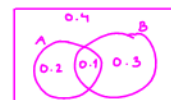
c.  $P(B^c) = 1 - P(B) = 1 - 0.7 = 0.3$

d.  $P(A \cap B) = P(\{c\}) = 0.1$

e.  $P(A \cup B) = P(\Omega) = 1$

2. Suppose we know that  $P(A^c) = 0.7$ ,  $P(B^c) = 0.6$ ,  $P(A \cap B) = 0.1$ .  
= 0.4

$(0.2 + 0.1) - (0.2 + 0.1) - 0.1$



- a. Find  $P(A)$ .

Finite additivity

From  $A \cup A^c = \Omega$ , we have  $P(A) + P(A^c) = P(\Omega)$   
↑ disjoint union || ← Axiom P1  
1  
 $\Rightarrow P(A) = 1 - P(A^c) = 1 - 0.7 = 0.3$ .

- b. Find  $P(A \cap B^c)$



From  $A = (A \cap B^c) \cup (A \cap B)$ , we have  $P(A) = P(A \cap B^c) + P(A \cap B)$   
↑ disjoint union  $P(A \cap B^c) = P(A) - P(A \cap B)$   
 $= 0.3 - 0.1 = 0.2$ .

- c. Find  $P(A \cup B)$

Use the same reasoning as in (a) to get  $P(B) = 1 - P(B^c) = 1 - 0.6 = 0.4$   
 In class, we showed that  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ .  
 So,  $P(A \cup B) = 0.3 + 0.4 - 0.1 = 0.6$ .