

# ECS 315: In-Class Exercise # 4

## Instructions

1. Separate into groups of no more than three persons. **The group cannot be the same as any of your former groups.**
2. **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.
3. **Do not panic.**

Date: <b>30 / 08 / 2018</b>		
Name	ID (last 3 digits)	
<b>Prapun</b>	<b>5</b>	<b>5</b>

In each of the parts below, find  $P(A)$ ,  $P(B)$ , and  $P(A \cap B)$ .

(a)  $P(A^c) = 0.5$ ,  $P(B^c) = 0.7$ , and  $P(A \cup B) = 0.6$ .

$$P(A) = 1 - P(A^c) = 1 - 0.5 = 0.5$$

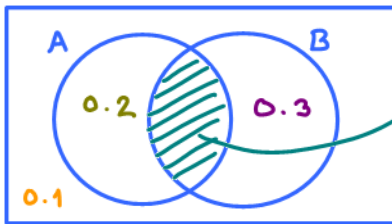
$$P(B) = 1 - P(B^c) = 1 - 0.7 = 0.3$$

From (5.16),  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Therefore,  $P(A \cap B) = P(A) + P(B) - P(A \cup B) = 0.5 + 0.3 - 0.6 = 0.2$

$P(A) = \underline{0.5}$ ,  $P(B) = \underline{0.3}$ , and  $P(A \cap B) = \underline{0.2}$ .

(b)  $P(A^c \cap B^c) = 0.1$ ,  $P(A \cap B^c) = 0.2$ , and  $P(A^c \cap B) = 0.3$ .



We know that  $P(\Omega) = 1$

Here, we must have

$$0.1 + 0.2 + P(A \cap B) + 0.3 = 1.$$

Therefore,  $P(A \cap B) = 0.4$

$$P(A) = P(A \cap B^c) + P(A \cap B)$$

$$= 0.2 + 0.4$$

$$= 0.6$$

$$P(B) = P(A \cap B) + P(A^c \cap B)$$

$$= 0.4 + 0.3$$

$$= 0.7$$

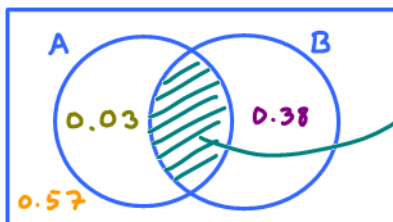
$P(A) = \underline{0.6}$ ,  $P(B) = \underline{0.7}$ , and  $P(A \cap B) = \underline{0.4}$ .

(c)  $P(A \cup B) = 0.43$ ,  $P(A \cup B^c) = 0.62$ ,  $P(A^c \cup B) = 0.97$ .

$$P(A^c \cap B^c) = 1 - P(A \cup B) = 1 - 0.43 = 0.57$$

$$P(A^c \cap B) = 1 - P(A \cup B^c) = 1 - 0.62 = 0.38$$

$$P(A \cap B^c) = 1 - P(A^c \cup B) = 1 - 0.97 = 0.03$$



We know that  $P(\Omega) = 1$

Here, we must have

$$0.57 + 0.03 + P(A \cap B) + 0.38 = 1.$$

Therefore,  $P(A \cap B) = 0.02$

$$P(A) = P(A \cap B^c) + P(A \cap B)$$

$$= 0.03 + 0.02$$

$$= 0.05$$

$$P(B) = P(A \cap B) + P(A^c \cap B)$$

$$= 0.02 + 0.38$$

$$= 0.4$$

$P(A) = \underline{0.05}$ ,  $P(B) = \underline{0.4}$ , and  $P(A \cap B) = \underline{0.02}$ .

# ECS 315: In-Class Exercise # 4 Alternative Solution

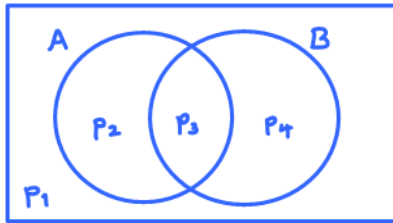
## Instructions

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Date: <b>30/08/2018</b>			
Name			ID (last 3 digits)
<b>Prapun</b>			<b>5 5 5</b>

In each of the parts below, find  $P(A)$ ,  $P(B)$ , and  $P(A \cap B)$ .

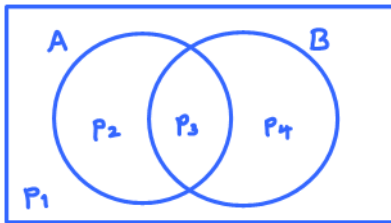
(a)  $P(A^c) = 0.5$ ,  $P(B^c) = 0.7$ , and  $P(A \cup B) = 0.6$ .



$$\left. \begin{aligned} P_1 + P_4 &= 0.5 \\ P_1 + P_2 &= 0.7 \\ P_2 + P_3 + P_4 &= 0.6 \\ P_1 + P_2 + P_3 + P_4 &= 1 \end{aligned} \right\} \Rightarrow \begin{aligned} P_1 &= 0.4 \\ P_2 &= 0.3 \\ P_3 &= 0.2 \\ P_4 &= 0.1 \end{aligned}$$

$P(A) = \underline{0.5}$ ,  $P(B) = \underline{0.3}$ , and  $P(A \cap B) = \underline{0.2}$ .

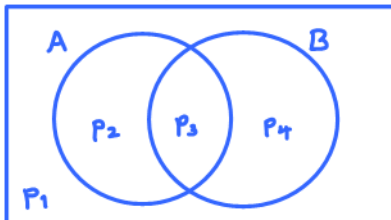
(b)  $P(A^c \cap B^c) = 0.1$ ,  $P(A \cap B^c) = 0.2$ , and  $P(A^c \cap B) = 0.3$ .



$$\begin{aligned} P_1 &= 0.1 \\ P_2 &= 0.2 \\ P_4 &= 0.3 \\ P_1 + P_2 + P_3 + P_4 &= 1 \Rightarrow P_3 = 1 - 0.1 - 0.2 - 0.3 = 0.4 \end{aligned}$$

$P(A) = \underline{0.6}$ ,  $P(B) = \underline{0.7}$ , and  $P(A \cap B) = \underline{0.4}$ .

(c)  $P(A \cup B) = 0.43$ ,  $P(A \cup B^c) = 0.62$ ,  $P(A^c \cup B) = 0.97$ .



$$\left. \begin{aligned} P_2 + P_3 + P_4 &= 0.43 \\ P_1 + P_2 + P_3 &= 0.62 \\ P_1 + P_3 + P_4 &= 0.97 \\ P_1 + P_2 + P_3 + P_4 &= 1 \end{aligned} \right\} \begin{aligned} P_1 &= 0.57 \\ P_2 &= 0.03 \\ P_3 &= 0.02 \\ P_4 &= 0.38 \end{aligned}$$

$P(A) = \underline{0.05}$ ,  $P(B) = \underline{0.40}$ , and  $P(A \cap B) = \underline{0.02}$ .