ECS 315: In-Class Exercise # 6 - Sol

Instructions

1. Separate into groups of no more than three students each. **The group cannot be the same as any of your former groups.**
2. **Unless specified otherwise, 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: 0 3 / 0 9 / 2019			
Name	ID (last 3 digits)		
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1. Consider a random experiment whose sample space is $\{a, b, c, d, e\}$ with probabilities 0.1, 0.2, 0.2, 0.2, 0.3, respectively.

Here, it is given that $P(\{a\}) = 0.1$, $P(\{b\}) = 0.2$, $P(\{c\}) = 0.2$, $P(\{d\}) = 0.2$, $P(\{e\}) = 0.3$.

Let $A = \{a, b, c\}$, $B = \{b, c, d\}$, and $C = \{c, d, e\}$.

Find the following probabilities.

$P(A) =$

$= P(\{a, b, c\})$
$= P(\{a\}) + P(\{b\}) + P(\{c\})$
$= 0.1 + 0.2 + 0.2 = 0.5$

$P(B) =$

$= P(\{b, c, d\})$
$= P(\{b\}) + P(\{c\}) + P(\{d\})$
$= 0.2 + 0.2 + 0.2 = 0.6$

$P(A \cap B) =$

$= P(\{b, c\})$
$= P(\{b\}) + P(\{c\})$
$= 0.2 + 0.2 = 0.4$

$P((A \cup B) \cap C) =$

$= P(\{a, b, c, d\} \cap \{c, d, e\})$
$= P(\{c, d\})$
$= P(\{c\}) + P(\{d\})$
$= 0.2 + 0.2 = 0.4$

$P(A|B) =$

$= \frac{P(A \cap B)}{P(B)}$
$= \frac{0.4}{0.6} = \frac{2}{3}$

$P(A^c|B) =$

$A^c \cap B = \{d, e\} \cap \{b, c, d\} = \{d\}$

$= \frac{P(A^c \cap B)}{P(B)} = \frac{P(\{d\})}{P(B)}$
$= \frac{0.2}{0.6} = \frac{1}{3}$

$P(A^c|B^c) =$

$A^c \cap B^c = \{d, e\} \cap \{a, e\} = \{e\}$

$= \frac{P(A^c \cap B^c)}{P(B^c)} = \frac{P(\{e\})}{1 - P(B)}$
$= \frac{0.3}{0.4} = \frac{3}{4}$

$P((A \cap C)|B) =$

$= \frac{P(A \cap B \cap C)}{P(B)} = \frac{P(\{c\})}{P(B)}$
$= \frac{0.2}{0.6} = \frac{1}{3}$