ECS 315: In-Class Exercise # 3

Instructions

Name		ID (last 3 digits)		
Prapun		**5**	**5**	**5**

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.**

1) A random experiment has 24 **equiprobable** outcomes:

$$\Omega = \{a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x\}$$

Let A denote the event $\{a,b,c,d,e,f,g,h,i,j,k,l\}$, and let B denote the event $\{i,j,k,l,m,n,o,p\}$.

Determine the following:

a) $P(A) = \dfrac{|A|}{|\Omega|} = \dfrac{12}{24} = \dfrac{1}{2}$

b) $P(A \cup B^c) = \dfrac{|A \cup B^c|}{|\Omega|} = \dfrac{|\Omega| - |(A \cup B^c)^c|}{|\Omega|} = 1 - \dfrac{|A^c \cap B|}{|\Omega|} = 1 - \dfrac{|B \setminus A|}{|\Omega|} = 1 - \dfrac{|\{m,n,o,p\}|}{24}$

$= 1 - \dfrac{4}{24} = \dfrac{5}{6} \approx 0.8333$

Alternatively, $B^c = \{a,b,c,d,e,f,g,h,q,r,s,t,u,v,w,x\}$

$A \cup B^c = \{a,b,c,d,e,f,g,h, i,j,k,l, q,r,s,t,u,v,w,x\}$

8 outcomes   4 outcomes   8 outcomes

$|A \cup B^c| = 20$

$P(A \cup B^c) = \dfrac{|A \cup B^c|}{|\Omega|} = \dfrac{20}{24} = \dfrac{5}{6}$

2) Consider a random experiment whose sample space is $\{a,b,c,d\}$ with outcome probabilities 0.2, 0.2, 0.3, and 0.3, respectively.

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

Find the following probabilities.

a) $P(A) = P(\{a,b,c\}) = P(\{a\}) + P(\{b\}) + P(\{c\}) = 0.2 + 0.2 + 0.3 = \mathbf{0.7}$

b) $P(A \cap B) = P(\{c\}) = \mathbf{0.3}$

c) $P(B^c) = P(\{a,b\}) = P(\{a\}) + P(\{b\}) = 0.2 + 0.2 = \mathbf{0.4}$

d) $P(A \cup B) = P(\{a,b,c,d\}) = P(\{a\}) + P(\{b\}) + P(\{c\}) + P(\{d\}) = 0.2 + 0.2 + 0.3 + 0.3 = \mathbf{1}$