2024 Fall CSD3240/CSD3241/SEM4108 - Probability and Statistics Homework 1

---

1. An automobile manufacturer provides vehicles equipped with selected options as follows:

   - automatic or manual transmission
   - with or without sunroof
   - with one of three choices of a stereo system
   - four choices of exterior colors

   If the sample space consists of the set of all possible vehicles types, what is the number of outcomes in the sample space?

   A) 120 B) 11 C) 24 D) 48

2. A coin is tossed twice and the sample space of the outcomes is $\Omega = \{hh, ht, th, tt\}$, where "head" and "tail" are abbreviated as h and t, respectively. Given $A = \{hh, ht, th\}$ and $B = \{ht, th, tt\}$. Which of the following set operation is incorrect for $C = \{hh, tt\}$?

   A) $C = A^C \cap B^C$
   B) $C = (A \cap B)^C$
   C) $C = A^C \cup B^C$
   D) $C = (A \cap \Omega)^C \cup (B \cap \Omega)^C$

3. Let

   $$A = \{x : 10 \leq x < 12\} \quad \text{and} \quad B = \{x : 11 < x < 15\},$$

   determine $A^C \cap B$.

   A) $A^C \cap B = \{x : x < 11 \quad \text{or} \quad 12 < x\}$
   B) $A^C \cap B = \{x : 10 \leq x < 12\}$
   C) $A^C \cap B = \{x : 12 < x < 15\}$
   D) $A^C \cap B = \{x : 12 \leq x < 15\}$

4. A printed circuit board has 8 different locations in which a component can be placed. If 5 identical components are to be placed on the board, how many different designs are possible?

   A) 6720 B) 56 C) 336 D) 120

5. A hospital operating room needs to schedule 3 knee surgeries and 2 hip surgeries in a day. How many possible sequences of knee and hip surgeries in a day?

   A) 60 B) 20 C) 10 D) 120

6. If $P(A) = 0.4, P(B) = 0.2$ and $P(A \cap B) = 0.1$, determine $P(A \cap B^C)$.

   A) 0.1 B) 0.2 C) 0.3 D) 0.4

7. A bin of 50 manufactured parts contains 3 defective parts and 47 non-defective parts. A sample of 6 parts is selected from the 50 parts without replacement, that is, each part can be selected only once.

   i) What is the probability that no defective part is selected in the sample?

   A) 0.676 B) 0.034 C) 0.067 D) 0.138

   ii) What is the probability that contain exactly 2 defective parts in the sample?

   A) 0.676 B) 0.011 C) 0.034 D) 0.067

8. Table below shows an example of 400 parts classified by surface flaws and defective.

		Surface Flaws	
		Yes (F)	No (F')
Defective	Yes (D)	10	18
	No (D')	30	342

   i) What is the probability of the defective?

A) 0.25 B) 0.07 C) 0.05 D) 0.0526

ii) What is the probability of defective with surface flaws?

A) 0.07 B) 0.05 C) 0.0484 D) 0.25