King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia
Department of Mathematics

STAT 501: Probability and Mathematical Statistics

Term 212, First Major Exam, Monday February 28, 2022, 03:30 PM

Name: _____ ID #: _____

Q1: If $P(A) = 0.81$ and $P(B) = 0.63$ then $P(A \cap B) \geq c$. Find c i.e. the minimum possible value of $P(A \cap B)$. Show your step by step solution.

Q2: A fast food shop owner was trying to verify the data on 476 orders on a particular day. 72 persons ordered only drinks, 59 only food, and 19 only sweets. 9 had drinks and sweets but no food, 169 had food and drinks but no sweet, and 114 had sweets and food but no drinks. 25 customers had all three. However, the owner has a feeling that one of the numbers is recorded incorrectly. To verify this, the owner collected the more precise data and found that the number of customers who chose drinks was 284, the number of customers who chose food was 376, and the number of customers who chose sweets was 167. Find the incorrect number. Show your step by step solution.

Note: There is only one incorrect number.

Q3: In any given year, a female automobile policyholder will make a claim with probability b_1 and a male policyholder will make a claim with probability b_2. The fraction of the policyholders that are female is ω. A policyholder is randomly chosen. Let B_1 denotes the event that this policyholder will make a claim in 1st year and B_2 denotes the event that this policyholder will make a claim in 2nd year. Mathematically, show that $P(B_2|B_1) \geq P(B_1)$. Show your step by step solution.

Q4: Find $P(B^c \mid A^c)$ if B is a subset of A. Show your step by step solution.

Q5: A and B play a series of games. Each game is independently won by A with probability p and by B with probability $1 - p$. They stop when the total number of wins of one of the players is two greater than that of the other player. The player with the greater number of total wins is declared the winner of the series. Find the probability that A is the winner of the series. Show your step by step solution.

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Good Luck