

MTH4108 Probability 1 2009/10 Exam
Numerical Solutions

Q1 (b) (i) $\{(x, y, z) : 1 \leq x, y, z \leq 5, x \neq y \neq z \neq x\}$.
(ii) $\{(2, y, 4) : y \in \{1, 3, 5\}\}$.
(iii) $T^c \cap F$ is the event that 4 is chosen and 2 is not chosen.
 $\mathbb{P}(T \cup F^c) = 18/60 = 3/10$.

Q2 (c) $\mathbb{P}(A \cup B) = 1/2 + 1/2 - 1/4 = 3/4$.

Q3 (b) (i) F and H are independent.
(ii) $F \cap H$ and J are not independent.
(iii) F , H and J are not mutually independent.

Q4 (b) $\mathbb{E}(X) = 7/4$
 $\text{Var}(X) = 27/16$.

Q5 (c) (i) $\mathbb{P}(X \geq 2) = 5/32$
 $\mathbb{P}(X \geq 2 | X \geq 1) = 10/37$.

Q7 (c) (i) $7/36$
(ii) $3/7$

Q8 (b) (i)

$$\mathbb{P}(X = x \text{ and } Y = y) = \begin{cases} 0 & \text{if } x = y \\ 1/12 & \text{if } x \neq y \end{cases}$$

for all $x, y \in \{0, 1, 2, 3\}$.

(ii) $\mathbb{E}(X) = 3/2 = \mathbb{E}(Y)$, $\mathbb{E}(XY) = 11/6$, $\text{Cov}(X, Y) = -5/12$.