Math 447 - Probability - Section 2 - Spring 2026

Selected Solutions for Spring 2026 Midterms

0.1 Midterm 1

Ver A #1; Ver B #4 (means problem 1 of Ver A which is problem 4 of Ver B):
1(a): $\boxed{\sigma\text{–algebra,} \quad \text{probability measure}}$ **2(b, c, d)**: See lecture notes.

Ver A #2; Ver B #5: $\boxed{h \geq 0}$ and $\boxed{\iint_{\mathbb{R}^3} h(\vec{y})d\vec{y} = 1}$

Ver A #3; Ver B #6:

3(a): $P\{\dots\} = P\{2\} + P\{3\} = \boxed{\frac{15}{64}}$ **3(b)**: $P_Y(\dots) = P\{1,2,3\} = \boxed{\frac{63}{64}}$

Ver A #4; Ver B #7: $\boxed{0.54}$

Ver A #5; Ver B #3: $1 = a \cdot \int_0^1 y_2^2 \Big[\int_0^{y_2} y_1 \, dy_1 \Big] dy_2 = (a/2)(1^5/5) \Rightarrow \boxed{a = 10}$.

Ver A #6; Ver B #8:
Solution for A:

	$\mathbf{Y_2}$		
$\mathbf{Y_1}$	0	1	2
0	1/9	2/9	1/9
1	2/9	2/9	0
2	1/9	0	0

Solution for B:
- $\vec{Y}^{-1}(\dots) = \boxed{\{(L,H),(H,L)\}}$

Solution for C:
- $P_{\vec{X}}(\dots) = P_{\vec{X}}\{(L,H),(H,L)\}$
  $= \boxed{2/9}$

Ver A #7; Ver B #1:
7(a): $P(A) = \boxed{1/2}$ $P(A \mid A) = \boxed{1}$ $P(A \mid B) = \boxed{1}$ $P(A \mid C) = \boxed{1/2}$ $P(A \mid D) = \boxed{0}$

7(a): A and A **False** A and B **False** A and C **True** A and D **False**

Ver A #8; Ver B #2:
8(a): $A :=$ { at least 1 stop in S_6} $\Rightarrow$ $A^{\complement} =$ { each stop in the other 17}

Use independence: $P(A^{\complement}) = (17/18)^8$. Thus, $P(A) = \boxed{1 - \left(\frac{17}{18}\right)^8}$

8(b): Since duplicates can happen and order matters, $|\Omega| = 18^8$. Since order matters, there are P_8^{18} distinct selections of size 8. Thus, $P\{\dots\} = \boxed{\frac{P_8^{18}}{18^8}}$

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