

Preparing exam and homework material with probsoln

José F. Apolinar

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Purpose

The following are some thought in using this packages:

- When defining problems you don't necessarily need to provide a solution
- Solution can be an image of written solution
- IMPORTANT? Provide three close answers (or two and one dummy answer) but not necessarily work for them. This will help build shuffle database or any MC assessment.
- If taken from a book, article, online, etc. provide citation! This is were superbib comes into play. For example
`\cite[p.~150]{reference}`
- This list will have the **absolute** number associated with the problem. Worksheet and assessments will have the **relative** number i.e. relative to the worksheet, etc.

1 Probability

1. A soccer lotto form consists of a table of 13 rows, corresponding to 13 games, and three columns headed 1, 2, and X . One predicts the outcomes of the soccer matches by marking one column in each row, with 1, 2, and X representing victory for team 1, victory for team 2, and a draw, respectively. A person who does not know a thing about soccer fills a lotto form by guessing, namely by putting down 1, 2 or X with equal probabilities for each of 13 games.
 - a. What is the probability that such a person correctly guesses the outcomes of all 13 games?
 - b. What is the probability that the person correctly guesses the outcomes of at least 12 games?

2. A school teacher is aware that she has problems remembering names. However, she cares about her pupils and she tries very hard to memorize all their names. One day four new girls are admitted to her class. Their names are Alice, Barbara, Cynthia, and Doris. The teacher makes a note of their four names, and she rehearses them all evening at home. The next day, when she sees the new students again, she addresses them each by name, although she feels that she has no idea which name belongs to which girl. What is the probability that no one of the girls will be called by her own name?
3. Eight persons attend in a party.
 - a. At the end, three guests are chosen by lottery to receive first prize, second prize, and third prize gifts. What is the probability that Abe will win the first prize, Bill the second prize, and Charles the third prize?
 - b. At the end, three of the eight guests are chosen by a random draw and are handed three identical prizes. What is the probability that Abe, Bill, and Charles will be the winners?

2 Calculus

1. Find $\iint_U x^2 \sin^2 y \, dx \, dy$ where $A = \{(x, y) \in \mathbb{R}^2, 0 < x < 1, 0 < y < \frac{\pi}{4}\}$
2. Evaluate $\iint_U x \cos(x + y) \, dx \, dy$ where U is the subset of \mathbb{R}^2 bounded by the triangle with vertices $(0, 0)$, $(\pi, 0)$, and (π, π)
3. Evaluate $\iint_U x \cos(x + y) \, dx \, dy$ where $U = \{(x, y) \in \mathbb{R}^2; x^2 + y^2 \leq 2y\}$

3 Solutions for the nice lists of problems

Probability

$$1 \text{ a. } \frac{1}{3^{13}}$$

$$\text{b. } \frac{1 + 2 \cdot 13}{3^{13}} = \frac{27}{3^{13}}$$

$$2 \frac{9}{24}$$

$$3 \frac{1}{\binom{8}{4}} = \frac{1}{70}$$

Calculus

$$1 \frac{(\pi - 2)}{24}$$

$$2 \frac{\pi}{2}$$

$$3 \frac{3\pi}{2}$$