PSTAT 5A Practice Worksheet 3

Comprehensive Review: Probability, Counting, an Conditional Probability

Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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# 1. Instructions and Overview

**⏰ Time Allocation:**

* **Section A (Warm-up):** 8 minutes
* **Section B (Intermediate):** 15 minutes
* **Section C (Advanced):** 12 minutes
* **Section D (Review):** 15 minutes
* **Total:** 50 minutes

**📝 Important Instructions:**

* Use the formulas provided for guidance
* Round final answers to 4 decimal places unless otherwise specified
* Identify your approach before calculating
* Use calculator as needed

**📚 Key Formulas Reference:**

**Basic Probability:**

* **Conditional Probability:**
* **Law of Total Probability:**
* **Addition Rule:**
* **Multiplication Rule:**

**Counting:**

* **Multiplication Rule:** If a procedure consists of steps, with ways for step 1, for step 2, …, for step , then total ways:
* **Factorial:**
* **Permutations:**
* **Combinations:**

# 2. Section A: Probability

*⏱️ Estimated time: 8 minutes*

**Problem A1: Probability Distributions**

Each row in the table below is a proposed grade distribution for a class. Identify each as a valid or invalid probability distribution, and explain your reasoning.

| Class | A | B | C | D | F |
| --- | --- | --- | --- | --- | --- |
| (a) | 0.3 | 0.3 | 0.3 | 0.2 | 0.1 |
| (b) | 0 | 0 | 1 | 0 | 0 |
| (c) | 0.3 | 0.3 | 0.3 | 0 | 0 |
| (d) | 0.3 | 0.5 | 0.2 | 0.1 | -0.1 |
| (e) | 0.2 | 0.4 | 0.2 | 0.1 | 0.1 |
| (f) | 0 | -0.1 | 1.1 | 0 | 0 |

**Work Space:**

# 3. Section B: Permutations and Combination

*⏱️ Estimated time: 15 minutes*

**Problem B1: Permutations and Combinations**

A cybersecurity team needs to create a secure access protocol.

**Part (a):** How many 6-character passwords can be formed using 3 specific letters and 3 specific digits if repetitions are not allowed and letters must come before digits?

|  |
| --- |
| Tip |
| Since letters must come before digits, think of this as two separate arrangement problems:   * First, arrange the 3 letters in the first 3 positions * Then, arrange the 3 digits in the last 3 positions * Use the multiplication principle to combine these results |

**Part (b):** If the team wants to select 4 people from 12 employees to form a security committee where order doesn’t matter, how many ways can this be done?

|  |
| --- |
| Tip |
| Since order doesn’t matter, this is a combination problem. Ask yourself:   * Are we arranging people in specific positions, or just selecting a group? * Which formula should you use: or ? |

**Work Space:**

# 4. Section C: Conditional Probability

*⏱️ Estimated time: 12 minutes*

**Problem C1: Drawing Cards (Without Replacement)**

You draw two cards, one after the other, from a standard 52-card deck without putting the first card back. Let

A = ,

B = .

1. P(A)
2. P(B)
3. Compare your answers in (3) vs. (4). Why are they different (or the same)? What does this tell you about drawing cards without replacement?

**Work Space:**

# 5. Section D: Conditional Probability

*⏱️ Estimated time: 15 minutes*

**Problem D1: Advanced Counting with Restrictions**

A restaurant offers a prix fixe menu where customers must choose:

* 1 appetizer from 6 options
* 1 main course from 8 options
* 1 dessert from 5 options

However, there are restrictions:

* If you choose the seafood appetizer, you cannot choose the vegetarian main course
* If you choose the chocolate dessert, you must choose either the beef or chicken main course (3 of the 8 main courses)

**Part (a):** How many valid meal combinations are possible?

**Part (b):** If customers choose randomly among valid combinations, what is the probability someone chooses the chocolate dessert?

**Work Space:**