Name: _____ **Date:** _____

PSTAT 5A: Discussion Worksheet 1

Summer Session A 2025,
Instructor: Narjes Mathlouthi

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1. A random number generator performs three draws sequentially:

   (i) First it selects one number from the set $\{1, 2, 3\}$.

   (ii) Next it selects one number from the set $\{1, 2, 3, 4\}$.

   (iii) Finally it selects one number from the set $\{0, 1\}$.

   a) Draw a tree diagram to represent all possible outcomes of this experiment.
   b) Are we justified in using the classical definition of probability here? Explain briefly.
   c) Using the classical approach, compute the following probabilities (use proper notation):
      (i) $E = \{$"first draw is 2"$\}$.
      (ii) $F = \{$"second draw is 4"$\}$.
      (iii) $G = \{$"first draw is 1 or third draw is 1 (or both)"$\}$.
   d) Let A, B, and C denote the first, second, and third numbers drawn, respectively. Compute
   $$\Pr\big(A < B + C\big)$$
   by finding the probability of the complement event.

2. For each variable below, classify it as *discrete*, *continuous*, *ordinal*, or *nominal*. Then, state the most appropriate visualization for its distribution.

   a) $x =$ the finishing time (in minutes) of cyclists in a time-trial race.
   b) $y =$ the number of children in families in different neighborhoods.
   c) $z =$ the species of 100 plants sampled at Leadbetter Beach.

3. Let $X = \{x_i\}_{i=1}^n$ and define $Y = \{y_i\}_{i=1}^n$ by $y_i = a\,x_i$ for some fixed constant $a \neq 0$. Prove the following relationships:
   $$\sum_{i=1}^{n} y_i \;=\; a \sum_{i=1}^{n} x_i, \quad \overline{Y} \;=\; a\,\overline{X}, \quad S_Y^2 \;=\; a^2\,S_X^2.$$