

Homework 3

Problem 1 (20 points)

The following are historical data on staff salaries (dollars per pupil) for 30 schools sampled in the eastern part of the United States in the early 1970s.

3.79 2.99 2.45 2.14 3.36 2.05 3.14 3.54

2.77 2.91 3.10 1.84 2.52 3.22 2.67 2.52 2.71 2.75 3.57 3.85 2.89 2.83 3.13 2.44 2.10 3.71 2.37
2.68 3.51 3.37

- (a) Compute the sample mean and sample standard deviation.
- (b) Construct a relative frequency histogram of the data.
- (c) Construct a stem-and-leaf display of the data
- (d) Construct a box plot of the data

Problem 2 (10 points)

A contractor wishes to build 9 houses, each different in design. In how many ways can he place these houses on a street if 6 lots are on one side of the street and 3 lots are on the opposite side?

Problem 3 (10 points)

How many ways are there that no two students will have the same birth date in a class of size 60?

Problem 4 (10 points)

From past experience, a stockbroker believes that under present economic conditions a customer will invest in tax-free bonds with a probability of 0.6, will invest in mutual funds with a probability of 0.3, and will invest in both tax-free bonds and mutual funds with a probability of 0.15. At this time, find the probability that a customer will invest

- (a) in either tax-free bonds or mutual funds
- (b) in neither tax-free bonds nor mutual funds

Problem 5 (10 points)

In a poker hand consisting of 5 cards, find the probability of holding

- (a) 3 aces
- (b) 4 hearts and 1 club

Problem 6 (10 points)

The probability that a vehicle entering the Luray Caverns has Canadian license plates is 0.12; the probability that it is a camper is 0.28; and the probability that it is a camper with Canadian license plates is 0.09. What is the probability that

- (a) a camper entering the Luray Caverns has Canadian license plates?
- (b) a vehicle with Canadian license plates entering the Luray Caverns is a camper?
- (c) a vehicle entering the Luray Caverns does not have Canadian plates or is not a camper?

Problem 7 (10 points)

A paint-store chain produces and sells latex and semigloss paint. Based on long-range sales, the probability that a customer will purchase latex paint is 0.75. Of those that purchase latex paint, 60% also purchase rollers. But only 30% of semigloss paint buyers purchase rollers. A randomly selected buyer purchases a roller and a can of paint. What is the probability that the paint is latex?

Problem 8 (20 points)

A cereal manufacturer is aware that the weight of the product in the box varies slightly from box to box. In fact, considerable historical data have allowed the determination of the density function that describes the probability structure for the weight (in ounces). Letting X be the random variable weight, in ounces, the density function can be described as

$$f(x) = \begin{cases} \frac{2}{5}, & 23.75 \leq x \leq 26.25 \\ 0, & \text{elsewhere} \end{cases}$$

- (a) Verify that this is a valid density function.
- (b) Determine the probability that the weight is smaller than 24 ounces.
- (c) The company desires that the weight exceeding 26 ounces be an extremely rare occurrence. What is the probability that this rare occurrence does actually occur?

Submission Format

1. Submit all the solutions in word format or handwritten format (scan and upload)
2. For visualizations use R and generate the figures
3. Submit the R codes in .R format
4. All the formulas used for the numerical solutions must be included