Statistics - Assignment 1

Announced: 2024/03/14
Due date: 2024/03/28

Finish this assignment and submit it on the E3 system, as a single PDF file (a file with context or photos should be good), by 2024/03/228 23:59. Please be as detailed as possible in your response (Mandarin or English). 可以打字或是手寫拍照貼到pdf上繳交。

Round off to the 2nd decimal place

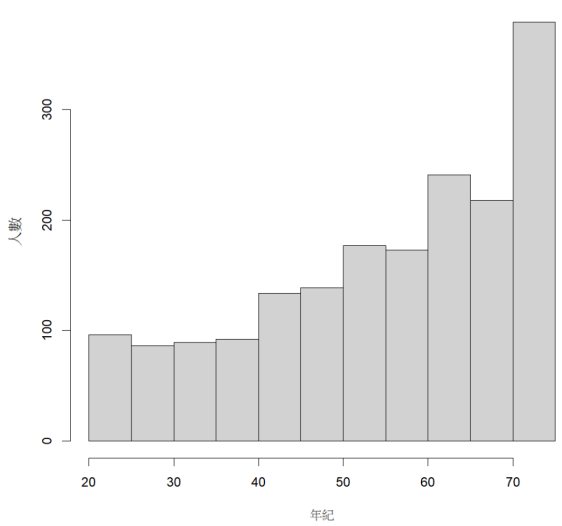
1. **Accounting and Machiavellianism.** Behavioral Research in Accounting (January 2008) published a study of Machiavellian traits in accountants. Machiavellian describes negative character traits that include manipulation, cunning, duplicity, deception, and bad faith. A questionnaire was administered to a random sample of 700 accounting alumni of a large southwestern university; however, due to nonresponse and incomplete answers, only 198 questionnaires could be analyzed. Several variables were measured, including age, gender, level of education, income, job satisfaction score, and Machiavellian ("Mach") rating score. The research findings suggest that Machiavellian behavior is not required to achieve success in the accounting profession among the study population. (40pts)
    a. What is the population of interest to the researcher?
    b. What type of data (**quantitative or qualitative**) is produced by each of the variables measured?
    c. Identify the sample.
    d. What inference was made by the researcher?

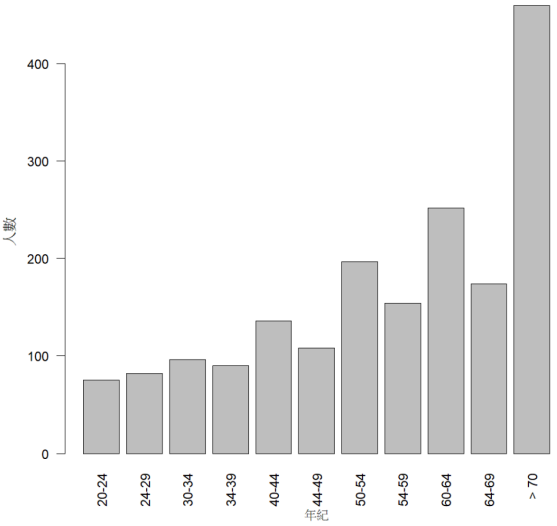
2. **MLB statistics** The data below represents the home run counts for the top 20 MLB players in home runs in 2023 (from https://baseballsavant.mlb.com/, statistics). (25 pts)

1st	2	3	4	5	6	7	8	9	10
54	47	46	44	41	40	39	39	38	37
11	12	13	14	15	16	17	18	19	20th
36	36	35	34	33	33	33	33	32	31

    a. What is the third quartile in this dataset (top 20 players)?
    b. What is the median of this dataset?
    c. What is the interquartile range of this dataset?
    d. What is the mode of this dataset?
    e. How many outliers are there in this dataset?

3. **TW presidential election**. This is the age distribution of respondents in a survey. What is the difference between the two charts? (5pts)





4. **Voltage sags and swells.** Two causes of poor power quality are “sags” and “swells.”. (A sag is an unusual dip and a swell is an unusual increase in the voltage level of a transformer.) For Turkish transformers built for heavy industry, the mean number of sags per week was 353 and the mean number of swells per week was 184. Assume the standard deviation of the sag distribution is 30 sags per week and the standard deviation of the swell distribution is 25 swells per week. Also, assume that the number of sags and number of swells are both normally distributed. Suppose one of the transformers is randomly selected and found to have 400 sags and 100 swells in a week. (10pts)
    a. What is the probability that the number of sags per week is less than 400?
    b. What is the probability that the number of swells per week is greater than 100?

5. **Establishing tolerance limits.** The tolerance limits for a particular quality characteristic (e.g., length, weight, or strength) of a product are the minimum and/or maximum values at which the product will operate properly. Tolerance limits are set by the engineering design function of the manufacturing operation (Total Quality Management, Vol. 11, 2000). The tensile strength of a particular metal part can be characterized as being normally distributed with a mean of 25 pounds and a standard deviation of 2 pounds. The upper and lower tolerance limits for the part are 30 pounds and 21 pounds, respectively. A part that falls within the tolerance limits results in a profit of $10. A part that falls below the lower tolerance limit costs the company $2; a part that falls above the upper tolerance limit costs the company $1. Find the company’s expected profit per metal part produced. (20pts)