The Hong Kong Polytechnic University
Department of Applied Mathematics

AMA1501 Introduction to Statistics for Business/
AMA1502 Introduction to Statistics
Semester 1, 2019/20

Assignment 1

Hand in solutions to questions 1, 2, 3, 4 by **17:00, 1 Nov, 2019**. Late submissions may not be marked, and if marked will receive reduced or zero credit. Please submit your work to the assignment box of AMA which is at TU 7/F (near Core T).

1. ISB Co. Ltd. wishes to investigate the sales of its retail outlets in 2017. A random sample of 60 outlets is selected and their sales in 2017 are summarized as follows.

Sales (million dollars)	Number of outlets
20.0 to less than 25.0	2
25.0 to less than 30.0	13
30.0 to less than 35.0	24
35.0 to less than 40.0	12
40.0 to less than 45.0	4
45.0 to less than 50.0	5

   (a) Calculate the mean, median and standard deviation of the sales.

   [9 marks]

   (b) Calculate the Coefficient of Variation and discuss briefly its advantage(s) in comparing the variability of data. [5 marks]

   (c) Estimate, from the frequency table, the number of outlets whose sales were between 33.5 and 43.5 million dollars in 2017. [6 marks]

   (d) Estimate, from the frequency table, the sales amount above which 20% of the retail outlets achieved in 2017. [5 marks]

2. (a) There are 3 rotten eggs in a carton of 10 eggs. If 3 eggs are randomly selected from the carton in order to make an omelet,

    i. What is the probability that the omelet will contain at least 1 rotten egg? [3 marks]

    ii. If it is known that the omelet made contains at least one rotten egg, what is the probability that it contains 2 rotten eggs. [4 marks]

(b) The general manager of an airline is worried about the likelihood of strikes conducted by two groups of his employees, flight attendants and pilots. He has estimated that the probability that the flight attendants will strike is 0.65 and the probability that the pilots will strike is 0.25. Furthermore, he knows that if the pilots strike, there is a probability of 0.8 that the flight attendants will strike.

    i. Find the probability that both the flight attendants and pilots will strike. [3 marks]

    ii. Find the probability that both the flight attendants and pilots will not strike. [4 marks]

    iii. Given that the flight attendants strike, what is the probability that the pilots will not strike. [5 marks]

(c) For some reasons, a student goes to school by bus on Monday and Tuesday, by train on Wednesday, and by light bus on Thursday and Friday. The probabilities that the student is late to school if he travels by bus, train and light bus are 0.15, 0.35 and 0.1, respectively. Given that the student is late to school on one day, what is the probability that the day is Wednesday? Assume that the student does not go to school on Saturday and Sunday.

[6 marks]

3. (a) In a multi-national company, the annual travel expenses of its executives is normally distributed with a mean of $15,000 and a standard deviation of $2,500.

   i. What is the probability that the annual travel expenses of a randomly selected executive are between $13,000 and $16,500? [5 marks]

   ii. Above what value does one find the highest 10% of the executives' annual travel expenses? [4 marks]

   iii. A random sample of 250 executives is selected from the company. What is the probability that more than 80% of the selected executives have annual travel expenses more than $13,000? [6 marks]

   (b) The number of claims handled by an insurance agent follows a Poisson distribution with a mean of 5 per day.

   i. What is the probability that there are less than 4 claims handled by the agent in a randomly selected day? [4 marks]

   ii. What is the probability that among 20 randomly selected days, there are more than 17 days that have more than 3 claims? [6 marks]

4. (a) A marketing firm is investigating the time that people living in a certain city are spending on internet games. It is found that the time is normally distributed with a mean of 3 hours/day and a standard deviation of 1.25 hours/day. Find the probability that a random sample of 36 people selected from the city will have their mean time spent on internet games more than 3.5 hours/day. [4 marks]

(b) A market researcher wishes to conduct a study on the monthly expenses of university students in Hong Kong. A random sample of 10 students is selected and their monthly expenses ($) in the last month are given below:

$$2851 \quad 4275 \quad 3330 \quad 3528 \quad 2982$$
$$3108 \quad 3253 \quad 2760 \quad 5126 \quad 3678$$

Construct a 90% confidence interval for the mean monthly expenses of all university students in Hong Kong last month. State any necessary assumption(s) and/or approximation(s) for your calculation. Interpret your result. [12 marks]

(c) In a study of reading habits, it is desired to produce a point estimate of the average number of hours a person spends on reading per week. Assuming that the population is normally distributed with a standard deviation of 2.5 hours/week, determine the sample size required if the estimate is expected to have an error less than 0.25 hour/week at 95% confidence. [4 marks]

(d) A survey finds that 40% of a random sample of 500 car owners i.n Hong Kong purchase only third party. insurance for their vehicles. Construct a 99% confidence interval for the population proportion of car owners in Hong Kong purchasing only third party insurance for their vehicles.

[5 marks]

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