

Department of Applied Mathematics
AMA1501 Introduction to Statistics for Business / AMA1502 Introduction to Statistics
Homework 2017/2018 Semester 1
Due date: 3 November 2017 (Friday) 12:30 p.m.

1. To investigate the validity of a proposed retirement benefit scheme, a researcher conducted a survey about the monthly expenses of retirees and the results of a random sample are summarized in the table below:

Monthly Expenses (\$)	No. of retirees
0 but less than 2000	19
2000 but less than 4000	30
4000 but less than 6000	36
6000 but less than 8000	18
8000 but less than 10000	11
10000 but less than 12000	6

- (a) Calculate the mean, mode and standard deviation of the monthly expenses of the retirees.
- (b) Estimate, from the frequency distribution table, the monthly expenses that is exceeded by 55% of all retirees.
- (c) Estimate, from the frequency distribution table, the proportion of retirees with monthly expenses over \$5500.
- (d) If 10 additional retirees are randomly selected, estimate the probability that 4 of them have monthly expenses over \$5500.
2. (a) A shipping company receives an order of a certain product from a customer. Seven, eight and five cartons will be delivered to City A, B and C, respectively. Suppose only six cartons can be shipped each time.
- (i) Six cartons are randomly selected. Find the probability that four cartons will be delivered to City A and the rest will be delivered to City B.
- (ii) Six cartons are placed in a line randomly for shipping. It is known that one, two and three of them will be shipped to City A, B and C, respectively. What is the probability that the 3 cartons that will be shipped to City C are placed together?
- (b) In Country D, it is known that 54% of citizens are male and 72% of them have been involved in a minor traffic accident. Furthermore, from past statistics, 80% of the citizens have been involved in a minor traffic accident.
- (i) A citizen is randomly selected. Determine the probability that the citizen is a male or has been involved in a minor traffic accident.
- (ii) A citizen is randomly selected. What is the probability that the citizen has been involved in a minor traffic accident given that the citizen is a female?
- (iii) Given that 28% of male and 34% of female are under 30 years old, what is the probability that a randomly selected citizen is under 30 years old?

- (c) A shipping company ships the cargoes through three piers, namely, F, G and H. It is known that 28%, 37% and 35% of the cargoes are shipped through pier F, G and H, respectively. Furthermore, the proportion that the cargoes are shipped to Hong Kong through pier F, G and H are 30%, 20% and 15%, respectively. A cargo is randomly selected. Given that it will be shipped to Hong Kong, what is the probability that the cargo will be shipped through pier H?
3. (a) The annual staff turnover rates of the companies of a certain sector follow a normal distribution with a mean of 8% and a standard deviation of 1.6%.
- (i) What is the probability that the annual staff turnover rate of a randomly selected company of that sector is between 4.8% and 10.4%?
- (ii) Find the annual staff turnover rate such that the probability of exceeding it is 80%.
- (iii) A randomly selected company has an annual staff turnover rate less than 10%. Find the probability that it is more than 6%.
- (b) The number of enquiries received by a company follows a Poisson distribution with a mean of 5 per hour.
- (i) What is the probability that there are at least 5 enquiries within a randomly selected hour?
- (ii) What is the probability that at least 50 out of 80 randomly selected hours have more than 4 enquiries each?
4. (a) Suppose that the time spent by voters in a polling station at district D follows the normal distribution approximately with a mean of 5 minutes and a standard deviation of 1.2 minutes. What is the probability that total time spent by a random sample of ten voters is between 42 minutes and 52 minutes?
- (b) The analyst of a company investigates the expenditures of customers at their online shop in the last month. A random sample of customers is selected and their expenditures (\$) in the last month are listed below:
- | | | | | | |
|-----|-----|-----|-----|-----|-----|
| 380 | 430 | 438 | 831 | 748 | 488 |
| 268 | 687 | 583 | 622 | 510 | 532 |
- (i) Construct a 95% confidence interval for the mean expenditures at the online shop in the last month among all customers. State the assumption(s) and/or approximation(s). Interpret your results.
- (ii) Calculate the sample size required, if the error in estimating the mean expenditures of all customers in the last month is within \$20 at 99% level of confidence.
- (c) In a recent opinion survey, a random sample of 500 voters is selected in which 380 of them stated that they will vote for candidate A. Construct a 95% confidence interval for the population proportion of voters who will vote for candidate A.

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Reminder: keep a photocopy of your written solution before submission