EXAMINATIONS OF THE HONG KONG STATISTICAL SOCIETY

ORDINARY CERTIFICATE IN STATISTICS, 2009

Paper I

Time Allowed: Three Hours

*Candidates may attempt **all** the questions.*

The number of marks allotted to each question or part-question is shown in brackets.

The total for the whole paper is 100.

A pass may be obtained by scoring at least 50 marks.

Graph paper and Official tables are provided.

Candidates may use calculators in accordance with the regulations published in the Society's "Guide to Examinations" (document Ex1).

This examination paper consists of 4 pages, **each printed on one side only**.
This front cover is page 1.
Question 1 starts on page 2.

There are 8 questions altogether in the paper.

1.   A country is divided into several regions, each of which is further divided into a large number of administrative districts, with each district classified as urban or rural. Lists of adults living in private households six months previously are available in each district. These lists are arranged by address.

   (i)   Suggest two different two-stage sampling methods of selecting a sample of adults from the available lists. Each of these methods should use a different combination of simple random, stratified, systematic and cluster sampling, and each of these four methods of sampling should be used once only.

(6)

   (ii)   For each of the sampling methods you have suggested, comment briefly on any benefits and drawbacks it might have in the situation under consideration.

(6)

   (iii) Suggest how the sample of adults in private households might be supplemented to obtain a sample of all adults. State any potential problems with the procedure you suggest.

(4)

2.   A national survey is being planned in which adults living in private households will be interviewed in order to obtain their perceptions of crime. Design a questionnaire, which should include detailed instructions to the interviewer, to obtain the information listed below. You may assume that potential respondents have been chosen at random from a list giving their names and addresses and have been sent a letter telling them about the survey.

   •   Age group, sex, marital status and occupation of respondents

   •   Whether they think crime is a problem in their neighbourhood

   •   Whether they think the level of crime in their neighbourhood has increased in the last five years

   •   Whether they think the level of crime in the country as a whole has increased in the last five years

   •   Whether they think violent crimes are on the increase in the country as a whole

   •   Their views on violent crimes committed by those aged under 16 years of age

(13)

Turn over

3. A survey is being planned to find out whether people have been victims of crime and to obtain details of any crimes involved. Discuss whether it is better to collect information by means of a telephone interview or by a self-completion questionnaire.

(10)

4. Describe

    (i)   the advantages,

    (ii)   the disadvantages,

    of quota sampling as compared with simple random sampling.

(6 marks for each of part (i) and part (ii))

5. The marketing manager of a travel firm wants to carry out a survey of the 750 customers who had by 31 December booked to go on a cruise during the following year. A stratified sampling scheme is to be used in which there are three strata defined by the type of cabin booked: budget booked by 377 customers, standard booked by 303, and de luxe booked by 70 customers. No customer booked to go on more than one cruise. An overall sample size of about 150 is required.

    One of the most important quantities to be estimated is the mean annual income of customers who book to go on cruises. Published results of a survey of passengers on cruises last year give £8850, £13005 and £4695 as estimated standard deviations of annual income for all passengers in budget, standard and de luxe cabins respectively.

    (i)   How many customers booking each type of cabin should be sampled, if the sample sizes are to be in approximately the same ratio as the numbers of customers booking each type of cabin?

(4)

    (ii)   How many customers booking each type of cabin should be sampled if the sample sizes are to be approximately proportional to "population size times the standard deviation of annual income" in each group of customers?

(6)

    (iii) Comment on whether there are likely to be any problems with the methods of parts (i) and (ii) in this survey.

(4)

3

Turn over

6. All surveys are subject to several sources of error. Describe the different sources of error that might arise in an interview survey of a sample of cruise passengers selected at random from passenger lists.

(12)

7. Explain the difference between questions in open format, closed format with a single answer, and closed format with multiple answers. Illustrate your answer by drafting one question in each format for a survey of cruise passengers. One question should ask them how many cruises they have gone on previously, one should ask them what newspapers they read at least once a week, and one should ask them if they hope to go on another cruise within the next two years.

(10)

8. The owners of a chain of newsagents wish to use sample data to monitor changes in the amount of money taken from customers each month from the sale of magazines and newspapers.

    (i)   What data do you think would be suitable for this purpose, and what decisions would be needed concerning the data to collect and when to collect such data?

(4)

    (ii)   Suggest how the data collected might be summarised, and how summaries might be updated over time.

(3)

    (iii) Devise a sampling scheme which would enable suitable information to be collected for the summary you have suggested in (ii).

(6)