300 - (9709-S 2013-Paper 7/1-Q1) - *Sampling*

Marie wants to choose one student at random from Anthea, Bill and Charlie. She throws two fair coins. If both coins show tails she will choose Anthea. If both coins show heads she will choose Bill. If the coins show one of each she will choose Charlie.

(i) Explain why this is not a fair method for choosing the student. [2]

(ii) Describe how Marie could use the two coins to give a fair method for choosing the student. [2]

301 - (9709-S 2014-Paper 7/2-Q7) - *Hypothesis Testing Using Normal Distribution, Sampling*

A researcher is investigating the actual lengths of time that patients spend with the doctor at their appointments. He plans to choose a sample of 12 appointments on a particular day.

(i) Which of the following methods is preferable, and why?

- Choose the first 12 appointments of the day.
- Choose 12 appointments evenly spaced throughout the day. [2]

Appointments are scheduled to last 10 minutes. The actual lengths of time, in minutes, that patients spend with the doctor may be assumed to have a normal distribution with mean μ and standard deviation 3.4. The researcher suspects that the actual time spent is more than 10 minutes on average. To test this suspicion, he recorded the actual times spent for a random sample of 12 appointments and carried out a hypothesis test at the 1% significance level.

(ii) State the probability of making a Type I error and explain what is meant by a Type I error in this context. [2]

(iii) Given that the total length of time spent for the 12 appointments was 147 minutes, carry out the test. [5]

(iv) Give a reason why the Central Limit theorem was not needed in part **(iii)**. [1]

302 - (9709-S 2015-Paper 7/3-Q1) - *Sampling*

Jyothi wishes to choose a representative sample of 5 students from the 82 members of her school year.

(i) She considers going into the canteen and choosing a table with five students from her year sitting at it, and using these five people as her sample. Give two reasons why this method is unsatisfactory. [2]

(ii) Jyothi decides to use another method. She numbers all the students in her year from 1 to 82. Then she uses her calculator and generates the following random numbers.

231492 762305 346280

From these numbers, she obtains the student numbers 23, 14, 76, 5, 34 and 62. Explain how Jyothi obtained these student numbers from the list of random numbers. [3]

303 - (9709-W 2016-Paper 7/3-Q2) - *Sampling*

Dominic wishes to choose a random sample of five students from the 150 students in his year. He numbers the students from 1 to 150. Then he uses his calculator to generate five random numbers between 0 and 1. He multiplies each random number by 150 and rounds up to the next whole number to give a student number.

(i) Dominic's first random number is 0.392. Find the student number that is produced by this random number. [1]

(ii) Dominic's second student number is 104. Find a possible random number that would produce this student number. [1]

(iii) Explain briefly why five random numbers may not be enough to produce a sample of five student numbers. [1]

304 - (9709-S 2017-Paper 7/3-Q1) - *Sampling*

A residents' association has 654 members, numbered from 1 to 654. The secretary wishes to send a questionnaire to a random sample of members. In order to choose the members for the sample she uses a table of random numbers. The first line in the table is as follows.

1096 4357 3765 0431 0928 9264

The numbers of the first two members in the sample are 109 and 643. Find the numbers of the next three members in the sample. [3]

305 - (9709-S 2019-Paper 7/2-Q2) - *Sampling*

The random variable X has mean 372 and standard deviation 54.

(i) Describe fully the distribution of the mean of a random sample of 36 values of X. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(ii) The distribution in part **(i)** might be either exact or approximate. State a condition under which the distribution is exact. [1]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

306 - (9709-S 2019-Paper 7/3-Q3) - *Sampling*

Luis has to choose one person at random from four people, A, B, C and D. He throws a fair six-sided die. If the score is 1, he will choose A. If the score is 2 he will choose B. If the score is 3, he will choose C. If the score is 4 or more he will choose D.

(i) Explain why the choice made by this method is not random. [1]

.....

.....

.....

.....

.....

(ii) Describe how Luis could use a single throw of the die to make a random choice. [1]

.....

.....

.....

.....

.....

On another day, Luis has to choose two people at random from the same four people, A, B, C and D.

(iii) List the possible choices of two people and hence describe how Luis could use a single throw of the die to make this random choice. [2]

.....

.....

.....

.....

.....

.....

.....

.....