# 2.1 Statistics: Sampling: 30-minute Pack

EDEXCEL 9MA0 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

**Answer ALL questions. Show all your working.**

**1** A school has 240 students. The head wants a sample of 48 students to complete a survey about the canteen. The population is split as follows: Year 7: 80, Year 8: 50, Year 9: 110.

**(a)** Describe how the sample could be selected using stratified sampling, and find the number to be taken from each group. **(3)**

**(b)** State one advantage of stratified sampling over simple random sampling. **(1)**

**(c)** Explain how systematic sampling could be used to select a sample of 48 from the whole population of 240. **(2)**

**(Total for Question 1 is 6 marks)**

**2** A teacher puts the names of all 800 students in a hat and draws out 40 names.

**(a)** Name the sampling method described. **(1)**

**(b)** State one advantage of this method in this situation. **(1)**

**(c)** State one disadvantage of this method in this situation. **(1)**

**(Total for Question 2 is 3 marks)**


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**3** For each statement below about using a sample rather than a census, state whether the statement describes an advantage or a disadvantage of sampling.

**(a)** "Results can usually be obtained more quickly." **(1)**

**(b)** "The results may be less accurate, since conclusions about the whole population are based on only part of it." **(1)**

**(c)** "Less time and money are usually needed to collect and process the data." **(1)**

**(d)** "No individual data is available for population members who were not chosen, so no prediction can be made about any one of them specifically." **(1)**

**(Total for Question 3 is 4 marks)**

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**4** The 370 members of a club are numbered 1 to 370. A systematic sample of 74 members is selected, starting with member 2.

**(a)** Write down the sampling interval and the numbers of the first four members selected. **(2)**

**(b)** Find the number of the last member selected. **(2)**

**(c)** The club's members who are numbered with a multiple of 5 are all of one type. Explain why the sample may be biased. **(2)**

**(Total for Question 4 is 6 marks)**


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**5** Priya is a student researcher who wants to survey students at her large sixth-form college about their travel-to-college habits. She obtains a printed list of all students enrolled on A-level and BTEC courses from the college's admissions database, dated 1 September. She plans to carry out her survey the following March.

**(a)** State what is meant by a sampling frame. **(1)**

**(b)** Explain one way in which the admissions database, printed on 1 September, might not be a suitable sampling frame for Priya's survey in March. **(2)**

**(c)** Suggest one improvement Priya could make to obtain a more suitable sampling frame. **(1)**

**(Total for Question 5 is 4 marks)**

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**6** A supermarket had 850 customers pass through its tills between 9 a.m. and 5 p.m. last Saturday. The store manager wants to select a systematic sample of 25 of these customers to survey about checkout waiting times.

**(a)** Calculate the sampling interval, k, that the manager should use. **(2)**

**(b)** Describe fully how the manager should select the systematic sample of 25 customers, using the value of k found in part (a). **(2)**

**(c)** The manager considers only sampling customers who pass through the tills between 9 a.m. and 10 a.m. each day, to make identifying the sample quicker. Explain why this could introduce bias into the results. **(2)**

**(Total for Question 6 is 6 marks)**


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# Mark scheme · 2.1 Statistics: Sampling: 30-minute Pack

## Question 1

(a) sampling fraction 48/240 = 1/5, applied to each group **M1**

(a) numbers from each group: Year 7 16, Year 8 10, Year 9 22 **A1**

(a) within each group the items are selected at random (for example by random number generator) **B1**

**(a) Answer: Year 7 16, Year 8 10, Year 9 22**

(b) every group is represented in proportion, so the sample is more representative of the population **B1**

**(b) Answer: more representative of each group**

(c) sampling interval 240/48 = 5 **M1**

(c) choose a random start between 1 and 5 and then select every 5th item from the numbered list **A1**

**(c) Answer: every 5th item after a random start from 1 to 5**

## Question 2

(a) simple random sampling **B1**

**(a) Answer: simple random sampling**

(b) every student has an equal chance of being selected, so the sample is unbiased **B1**

**(b) Answer: every student has an equal chance of being selected, so the sample is unbiased**

(c) needs a complete list of the population and may be slow for a large population **B1**

**(c) Answer: needs a complete list of the population and may be slow for a large population**

## Question 3

(a) advantage **B1**

**(a) Answer: Advantage.**

(b) disadvantage **B1**

**(b) Answer: Disadvantage.**

(c) advantage **B1**

**(c) Answer: Advantage.**

(d) disadvantage **B1**

**(d) Answer: Disadvantage.**

## Question 4

(a) interval = 370/74 = 5 **B1**

(a) 2, 7, 12, 17 **B1**

**(a) Answer: interval 5; 2, 7, 12, 17**

(b) 2 + (74 - 1) x 5 **M1**

(b) 367 **A1**

**(b) Answer: 367**

(c) if the numbering follows a pattern with the same period as the sampling interval, the sample may contain only that type **B1**

(c) so each member does not have an equal chance of selection when the list is ordered in a periodic way **B1**

**(c) Answer: possible bias from a periodic list**

## Question 5

(a) a list of all the members of the population, from which the sample is selected, oe **B1**

**(a) Answer: A list of all the members of the population, used to select the sample.**

(b) identifies that some students will have left their course and new students will have joined between September and March, so the list is out of date **B1**

(b) explains the consequence: some students currently at the college have no chance of selection, and some listed students may no longer attend, so the frame does not accurately represent the population being studied in March, oe **B1**

**(b) Answer: The list is six months out of date, so some students who have since left cannot actually be surveyed, and new students who joined after September have no chance of being selected, meaning the frame does not accurately represent the population in March.**

(c) request an updated/current enrolment list from the college, printed close to the date of the survey, oe **B1**

**(c) Answer: Ask the college for an up to date enrolment list, printed close to March when the survey will actually take place.**

## Question 6

(a) 850 / 25 **M1**

(a) cao k = 34 **A1**

**(a) Answer: k = 34**

(b) choose a random starting point between 1 and k (i.e. between 1 and 34) **B1**

(b) then select every 34th customer after that point (e.g. by adding 34 repeatedly), until 25 customers have been chosen **B1**

**(b) Answer: Pick a random start between 1 and 34, then select every 34th customer after that until 25 customers are chosen.**

(c) customers shopping between 9 and 10 a.m. may differ systematically from customers shopping at other times, e.g. more likely to be doing a quick shop before work **B1**

(c) so the sample would not represent all types of customer, and conclusions about waiting times could not be generalised to the whole day, oe **B1**

**(c) Answer: Early-morning shoppers may differ from customers at other times of day (for example, doing a quick shop before work), so the sample would not represent all types of customer and results could not be generalised to the whole day.**


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