# 2.1 Statistics: Sampling: 1-hour Pack

EDEXCEL 9MA0 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

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

**1** A school has 840 students. The head wants a sample of 42 students to complete a survey about the canteen. The population is split as follows: Year 7: 360, Year 8: 120, Year 9: 360.

**(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 42 from the whole population of 840. **(2)**

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


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**2** A library has 280 registered members. The librarian selects 56 members to ask about opening hours. The population is split as follows: Section 1: 120, Section 2: 100, Section 3: 60.

**(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 56 from the whole population of 280. **(2)**

**(Total for Question 2 is 6 marks)**

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**3** A factory produces 720 batteries each day. An inspector tests a sample of 36 of them. The population is split as follows: Group A: 360, Group B: 120, Group C: 240.

**(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 36 from the whole population of 720. **(2)**

**(Total for Question 3 is 6 marks)**


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**4** A market researcher stands outside a shopping centre and asks the first 40 adults who walk past to complete a questionnaire.

**(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 4 is 3 marks)**

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**5** The 140 members of a club are numbered 1 to 140. A systematic sample of 28 members is selected, starting with member 5.

**(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 5 is 6 marks)**

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**6** The 400 members of a club are numbered 1 to 400. A systematic sample of 16 members is selected, starting with member 17.

**(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 25 are all of one type. Explain why the sample may be biased. **(2)**

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


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**7** A factory produces 340 batteries each day. An inspector tests a sample of 34 of them. The population is split as follows: Group A: 140, Group B: 80, Group C: 120.

**(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 34 from the whole population of 340. **(2)**

**(Total for Question 7 is 6 marks)**

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**8** State what is meant by a 'sample'.

**(Total for Question 8 is 1 mark)**

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**9** A local council wants to find out residents' opinions on a proposed new cycle lane. It posts a survey link on the council's official social media page, and asks residents to comment with their views.

**(a)** State the sampling method used. **(1)**

**(b)** Explain two separate ways in which this method could lead to a biased sample of residents' opinions. **(2)**

**(c)** Suggest a more appropriate sampling method the council could use, given that it holds the electoral register for the area. **(1)**

**(Total for Question 9 is 4 marks)**


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**10** A factory produces 464 identical components during a shift. A systematic sample of 8 components is required. Calculate the sampling interval that should be used.

**(Total for Question 10 is 2 marks)**

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**11** A factory production line manufactures 1350 identical components during a shift. The quality control team wants a systematic sample of 40 components.

**(a)** Calculate the sampling interval, giving your answer to the nearest whole number. **(2)**

**(b)** Using an interval of 34, explain why selecting every 34th component from a random start may result in fewer than 40 components being sampled during the shift, and determine the smallest number of components that could be sampled. **(3)**

**(c)** Suggest one way the quality control team could adjust their method to obtain the full sample of exactly 40 components. **(1)**

**(Total for Question 11 is 6 marks)**


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# Mark scheme · 2.1 Statistics: Sampling: 1-hour Pack

## Question 1

(a) sampling fraction 42/840 = 1/20, applied to each group **M1**

(a) numbers from each group: Year 7 18, Year 8 6, Year 9 18 **A1**

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

**(a) Answer: Year 7 18, Year 8 6, Year 9 18**

(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 840/42 = 20 **M1**

(c) choose a random start between 1 and 20 and then select every 20th item from the numbered list **A1**

**(c) Answer: every 20th item after a random start from 1 to 20**

## Question 2

(a) sampling fraction 56/280 = 1/5, applied to each group **M1**

(a) numbers from each group: Section 1 24, Section 2 20, Section 3 12 **A1**

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

**(a) Answer: Section 1 24, Section 2 20, Section 3 12**

(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 280/56 = 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 3

(a) sampling fraction 36/720 = 1/20, applied to each group **M1**

(a) numbers from each group: Group A 18, Group B 6, Group C 12 **A1**

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

**(a) Answer: Group A 18, Group B 6, Group C 12**

(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 720/36 = 20 **M1**

(c) choose a random start between 1 and 20 and then select every 20th item from the numbered list **A1**

**(c) Answer: every 20th item after a random start from 1 to 20**

## Question 4

(a) opportunity (convenience) sampling **B1**

**(a) Answer: opportunity (convenience) sampling**

(b) quick, cheap and needs no sampling frame **B1**

**(b) Answer: quick, cheap and needs no sampling frame**

(c) not random, so the sample may not be representative of the population **B1**

**(c) Answer: not random, so the sample may not be representative of the population**

## Question 5

(a) interval = 140/28 = 5 **B1**

(a) 5, 10, 15, 20 **B1**

**(a) Answer: interval 5; 5, 10, 15, 20**

(b) 5 + (28 - 1) x 5 **M1**

(b) 140 **A1**

**(b) Answer: 140**

(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 6

(a) interval = 400/16 = 25 **B1**

(a) 17, 42, 67, 92 **B1**

**(a) Answer: interval 25; 17, 42, 67, 92**

(b) 17 + (16 - 1) x 25 **M1**

(b) 392 **A1**

**(b) Answer: 392**

(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 7

(a) sampling fraction 34/340 = 1/10, applied to each group **M1**

(a) numbers from each group: Group A 14, Group B 8, Group C 12 **A1**

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

**(a) Answer: Group A 14, Group B 8, Group C 12**

(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 340/34 = 10 **M1**

(c) choose a random start between 1 and 10 and then select every 10th item from the numbered list **A1**

**(c) Answer: every 10th item after a random start from 1 to 10**

## Question 8

a subset of the population, selected for study, oe **B1**

**Answer: A subset of the population that is actually selected and studied.**


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## Question 9

(a) self-selecting sample (volunteer sample) **B1**

**(a) Answer: Self-selecting sample (volunteer sample).**

(b) only residents who use/follow that particular social media platform can respond, so residents without an account or who are less active online, e.g. some older residents, are excluded **B1**

(b) residents with strong opinions, for or against the cycle lane, are more likely to respond than those who feel neutral, so the sample may over-represent extreme views, oe **B1**

**(b) Answer: Residents who do not use that social media platform, such as some older residents, cannot respond at all; and residents with strong feelings, for or against the cycle lane, are more likely to comment than those who are neutral, so the results may over-represent extreme opinions.**

(c) take a simple random sample or a stratified sample of residents from the electoral register, oe **B1**

**(c) Answer: Take a simple random sample (or a stratified sample) of residents directly from the electoral register.**

## Question 10

464 / 8 **M1**

58 cao **A1**

**Answer: 58**

## Question 11

(a) 1350 / 40 (= 33.75) **M1**

(a) cao 34 **A1**

**(a) Answer: Interval = 34.**

(b) 34 x 40 = 1360, which is greater than 1350, so for a late random start there are not enough components in the shift to make 40 selections at this interval **B1**

(b) 1350 / 34 **M1**

(b) cao: 1350/34 = 39.7..., so the smallest possible sample is 39 components **A1**

**(b) Answer: The smallest possible sample is 39 components.**

(c) reduce the sampling interval to 33 (since 1350/40 = 33.75 rounded down), or treat the production line as circular and wrap around to the start once the end is reached, oe **B1**

**(c) Answer: Use a smaller interval of 33 instead of 34 (or treat the list of components as circular, wrapping back to the start once the end of the shift is reached).**


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