



F11-30min Stratified Sampling (Foundation): 30-minute Pack

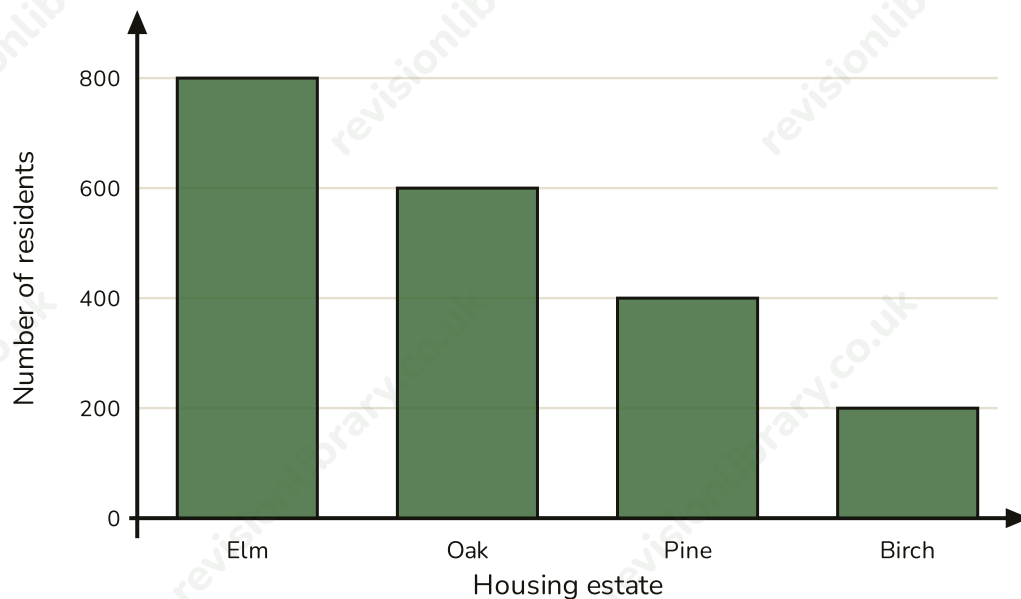
EDEXCEL 1ST0 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** The bar chart shows the number of residents living on each of four housing estates in a town.



- (a) Write down the number of residents living on Pine Estate. (1)
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- (b) Work out the total number of residents living across all four estates. (2)
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- (c) A stratified sample of 50 residents is to be chosen across the four estates. Work out the number that should be chosen from Elm Estate. (2)
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- (d) Work out the number that should be chosen from Oak Estate. (1)

(Total for Question 1 is 6 marks)

- 2** A charity has 500 volunteers. 40% work in fundraising, 35% work in events, and the rest work in admin.
- (a) Work out the number of volunteers who work in admin. (2)
- (b) The charity wants a stratified sample of 40 volunteers. Work out the number of fundraising volunteers that should be included in the sample. (2)

(Total for Question 2 is 4 marks)

- 3** Give one way in which stratified sampling is similar to simple random sampling, and one way in which it is different.
- (a) Give one way stratified sampling is similar to simple random sampling. (1)
- (b) Give one way stratified sampling is different from simple random sampling. (1)

(Total for Question 3 is 2 marks)

- 4 A supermarket has 120 employees, split by contract type and department, as shown in the table.

Group	Full-time, Tills	Full-time, Warehouse	Part-time, Tills	Part-time, Warehouse
Employees	45	30	15	30

A stratified sample of 24 employees is needed, split across the four groups in proportion to their size.

- (a) Work out the sampling fraction that gives a sample of 24 from a population of 120. (1)

- (b) Work out the number of full-time Tills employees to include in the sample. (2)

- (c) Work out the number of full-time Warehouse employees to include in the sample. (1)

- (d) Work out the number of part-time Tills employees to include in the sample. (1)

- (e) The number of part-time Warehouse employees needed is 6. Show that the total sample across all four groups is 24. (1)

(Total for Question 4 is 6 marks)

- 5** A youth club has 18 members in its Under-14 age group, numbered 1 to 18 in the register. A stratified sample requires 4 members to be chosen from this age group.

To choose them fairly, the youth leader generates random numbers and works through them in order, ignoring any number greater than 18 and ignoring any number that has already been chosen:

7, 23, 7, 2, 15, 31, 9, 18, 4

(a) Explain why the numbers 23 and 31 are ignored. (1)

(b) Explain why the second 7 is ignored. (1)

(c) Write down the register numbers of the 4 members selected for the sample. (2)

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(d) Give one advantage of using random numbers to choose the sample within this age group, rather than the youth leader picking members herself. (1)

(Total for Question 5 is 5 marks)

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- 6** A national retailer is deciding whether to use stratified sampling to survey its staff.

Give one disadvantage of stratified sampling compared with simple random sampling.

(Total for Question 6 is 2 marks)

- 7 A cinema has 250 staff: 150 full-time and 100 part-time. A stratified sample of 20 staff is required.

A trainee manager's working is shown below.

$$\text{Sampling fraction} = 20/250 = 0.08$$

$$\text{Full-time sample} = 150 \times 20 = 3000$$

$$\text{Part-time sample} = 100 \times 0.08 = 8$$

- (a) Identify the error in the full-time calculation. (1)
- (b) Work out the correct full-time sample size. (2)
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- (c) Check that the corrected full-time sample size and the part-time sample size given (8) together total the required sample of 20. (1)
- (d) The cinema decides to double the overall sample to 40, keeping the same proportion of full-time and part-time staff. Work out the new full-time sample size. (2)

(Total for Question 7 is 6 marks)

Mark scheme · F11-30min Stratified Sampling (Foundation): 30-minute Pack

Question 1

- (a) **B1** 400 cao
- (a) **Answer: 400**
- (b) **M1** $800+600+400+200$, oe
- (b) **A1** 2000 cao
- (b) **Answer: 2000**
- (c) **M1** $800/2000 \times 50$, oe (ft their total from (b))
- (c) **A1** 20 cao
- (c) **Answer: 20**
- (d) **B1** 15 cao ($600/2000 \times 50$, ft)
- (d) **Answer: 15**

Question 2

- (a) **M1** $100-40-35$ (=25%), then 0.25×500 , oe
- (a) **A1** 125 cao
- (a) **Answer: 125**
- (b) **M1** 0.4×500 (=200) then $200/500 \times 40$, oe (or equivalently 0.4×40)
- (b) **A1** 16 cao
- (b) **Answer: 16**

Question 3

- (a) **B1** within each stratum, members are still selected using random sampling, oe
- (a) **Answer: Within each stratum, members are chosen at random.**
- (b) **B1** stratified sampling splits the population into groups first and samples proportionally from each group, whereas simple random sampling selects directly from the whole population with no groups, oe
- (b) **Answer: Stratified sampling splits the population into groups first; simple random sampling does not.**

Question 4

- (a) **B1** $24/120$ oe ($1/5$, 0.2) cao
- (a) **Answer: $24/120$ (= $1/5$)**
- (b) **M1** $45 \times 1/5$, oe
- (b) **A1** 9 cao
- (b) **Answer: 9**
- (c) **B1** 6 cao ($30 \times 1/5$)
- (c) **Answer: 6**
- (d) **B1** 3 cao ($15 \times 1/5$)
- (d) **Answer: 3**
- (e) **B1** $9+6+3+6 = 24$
- (e) **Answer: $9+6+3+6 = 24$**

Question 5

- (a) **B1** there are only 18 members in this age group, so any number greater than 18 does not correspond to a member, oe
- (a) **Answer: 23 and 31 are greater than 18, so they do not match a member's register number.**
- (b) **B1** member 7 has already been chosen, and each member can only be chosen once, oe
- (b) **Answer: Member 7 has already been selected, so the repeat is skipped.**
- (c) **M1** working through the list in order, keeping only valid, non-repeated numbers of 18 or less
- (c) **A1** 7, 2, 15, 9 (in this order)
- (c) **Answer: 7, 2, 15, 9**
- (d) **B1** random numbers remove personal choice/bias, so every member of the age group has an equal chance of being picked, oe
- (d) **Answer: Random numbers avoid personal bias, giving every member an equal chance of selection.**

Question 6

- **B1** an up-to-date, accurate list of every staff member's group (stratum) must exist before sampling can start, oe
- **B1** organising the population into strata and sampling from each one takes more time and planning than a simple random sample, oe
- **Answer: It needs an accurate group list in advance, and takes more time to organise than a simple random sample.**

Question 7

- (a) **B1** the trainee multiplied 150 by 20 instead of by the sampling fraction 0.08 (should be 150×0.08), oe
- (a) **Answer: 150 was multiplied by 20 instead of by the sampling fraction 0.08.**
- (b) **M1** 150×0.08 , oe
- (b) **A1** 12 (ao)
- (b) **Answer: 12**
- (c) **B1** $12 + 8 = 20$
- (c) **Answer: $12 + 8 = 20$**
- (d) **M1** $150/250 \times 40$, oe
- (d) **A1** 24 (ao)
- (d) **Answer: 24**