



H12-30min Stratified Sampling (Higher): 30-minute Pack

EDEXCEL 1ST0 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A dance school has 180 students split across three age groups, as shown in the table.

Age group	Under 10	10-13	14+
Students	72	63	45

A stratified sample of 20 students is needed for a feedback survey.

- (a) Write down the sampling fraction for this sample. (1)

.....

- (b) Work out the number of Under 10 students to include in the sample. (2)

.....

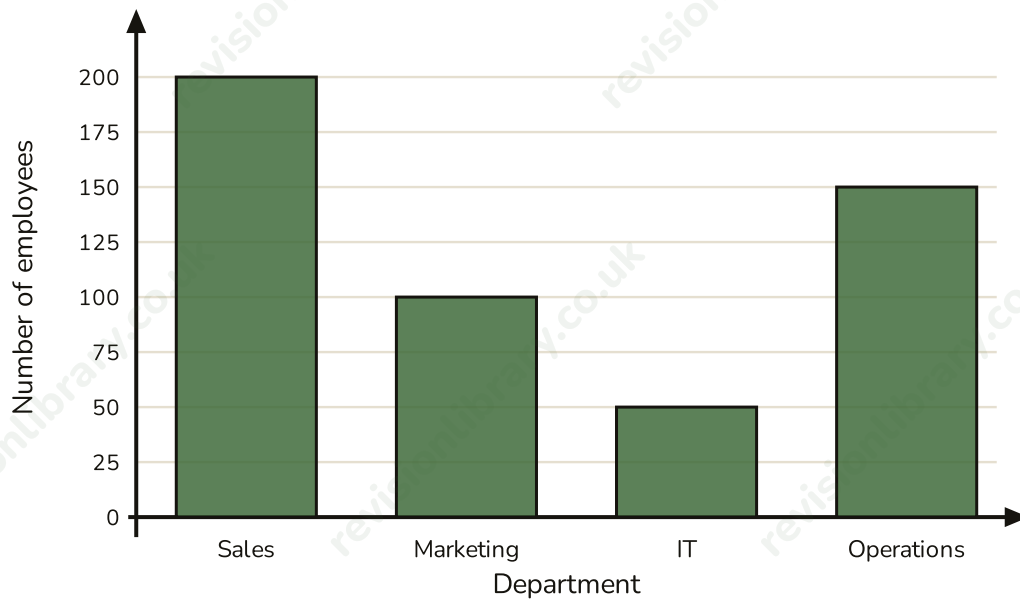
- (c) Work out the number of 10-13 students to include in the sample. (1)

.....

- (d) The 14+ group should contribute the rest of the sample. Work out this number, (2)
and show that the three sample sizes add up to 20.

(Total for Question 1 is 6 marks)

- 2 The bar chart shows the number of employees in each of four departments at Northgate Retail Ltd.



- (a) Write down the number of employees in the IT department. (1)
-
- (b) Work out the total number of employees at the company. (2)
-
- (c) A stratified sample of 50 employees is required across the four departments. (2)
Work out the number that should come from Marketing.
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- (d) Work out the number that should come from Operations. (1)
-
- (e) Show that all four department sample sizes add up to 50, given that Sales contributes 20 and IT contributes 5. (1)

(Total for Question 2 is 7 marks)

3 Elmsworth Borough Council wants to survey residents about a new recycling scheme. The borough is split into 12 wards with very different population sizes, from 1200 residents in the smallest ward to 9800 in the largest.

- (a) Explain why the council should use stratified sampling by ward, rather than a simple random sample taken from the whole borough's electoral register. (2)
- (b) Give one advantage of stratified sampling over simple random sampling, other than making sure every ward is fairly represented. (2)

(Total for Question 3 is 4 marks)

4 A gym chain wants to run a satisfaction survey of its 3000 members nationwide. Its membership database records each member's age, gender, home town, membership tier (Standard, Premium, or Family), and how long they have been a member.

- (a) The gym wants a stratified sample that reflects the very different sizes of the three membership tiers. Identify the variable that should be used to define the strata for this purpose, and give one reason for your choice. (2)
- (b) Explain why home town would usually be a less suitable single variable to stratify by for this national survey than membership tier. (2)
- (c) Give one other variable in the database (other than membership tier) that could reasonably be used to define strata, and state one thing that would need to be true about the data for this to work well. (2)

(Total for Question 4 is 6 marks)

- 5** A regional bus operator is planning several surveys. For each scenario, name the most appropriate sampling method from: stratified, systematic, quota, or cluster, and justify your choice.
- (a)** Interviewers approach passengers at every 10th stop along a long bus route, starting from a randomly chosen first stop. **(1)**
 - (b)** Interviewers are told to keep stopping people until they have spoken to 20 men and 20 women, but they can choose which 20 of each to approach. **(1)**
 - (c)** The operator wants to survey only 6 of its 40 depots (chosen at random), interviewing every driver based at those 6 depots. **(1)**
 - (d)** Give one key difference between cluster sampling and stratified sampling. **(2)**

(Total for Question 5 is 5 marks)

6 A stratified sample is taken from a company's 900 employees, split across three departments. The sampling fraction used is $\frac{1}{15}$.

(a) Work out the total size of the stratified sample. (1)

(b) The Finance department contributed 12 employees to the sample. Work out the number of employees in the Finance department. (2)

(c) The remaining two departments, Operations and Support, have a combined 720 employees. Work out how many of the 60 sample places should come from Operations and Support combined. (2)

(d) Support has 240 employees. Work out the number of Support employees in the sample. (1)

(Total for Question 6 is 6 marks)

Mark scheme · H12-30min Stratified Sampling (Higher): 30-minute Pack

Question 1

- (a) **B1** 20/180 oe (1/9) cao
- (a) **Answer: 20/180 (= 1/9)**
- (b) **M1** $72 \times \frac{1}{9}$, oe
- (b) **A1** 8 cao
- (b) **Answer: 8**
- (c) **B1** 7 cao ($63 \times \frac{1}{9}$)
- (c) **Answer: 7**
- (d) **M1** $45 \times \frac{1}{9}$, oe (= 5)
- (d) **A1** $8+7+5 = 20$
- (d) **Answer: 5; $8+7+5 = 20$**

Question 2

- (a) **B1** 50 cao
- (a) **Answer: 50**
- (b) **M1** $200+100+50+150$, oe
- (b) **A1** 500 cao
- (b) **Answer: 500**
- (c) **M1** $100/500 \times 50$, oe
- (c) **A1** 10 cao
- (c) **Answer: 10**
- (d) **B1** 15 cao ($150/500 \times 50$)
- (d) **Answer: 15**
- (e) **B1** $20+10+5+15 = 50$
- (e) **Answer: $20+10+5+15 = 50$**

Question 3

- (a) **B1** a simple random sample could by chance select very few, or no, residents from a small ward, oe
- (a) **B1** stratified sampling by ward guarantees every ward is represented in proportion to its population, giving a fairer picture of opinion across the whole borough, oe
- (a) **Answer: An SRS risks under-representing small wards by chance; stratified sampling guarantees proportional representation of every ward.**
- (b) **B1** it allows meaningful comparison between individual wards, because each ward is given its own known, guaranteed sample size, oe
- (b) **B1** this comparison would be unreliable with an SRS, where some wards might by chance have very few or no respondents at all, oe
- (b) **Answer: Stratified sampling lets the council reliably compare results ward by ward, since every ward has a guaranteed sample size.**

Question 4

- (a) **B1** membership tier
- (a) **B1** tier sizes differ substantially, and satisfaction may well differ by tier, so each tier needs to be represented in the sample in proportion to its size, oe
- (a) **Answer: Membership tier; because tier sizes vary a lot and satisfaction may differ between tiers, each tier needs proportional representation.**
- (b) **B1** there could be a very large number of different home towns, many containing very few members, so many strata would be tiny or empty, oe
- (b) **B1** whereas membership tier gives a small number of large, well-defined groups that can each be sampled from proportionally, oe
- (b) **Answer: Home town would create huge numbers of tiny, impractical strata, whereas membership tier gives a few large, well-defined groups.**
- (c) **B1** a valid variable, e.g. age (grouped into bands such as under 25, 25-44, 45+), oe
- (c) **B1** a valid requirement, e.g. every member's age band must be known/recorded, and the bands must cover everyone with no overlap, oe
- (c) **Answer: Age, grouped into bands (e.g. under 25, 25-44, 45+); every member's age would need to be known and each member would need to fall into exactly one band.**

Question 5

- (a) **B1** systematic - passengers/stops are chosen at a fixed, regular interval from a random starting point, oe
- (a) **Answer: Systematic sampling**
- (b) **B1** quota - interviewers fill fixed quotas for each group but choose which individuals to approach themselves (non-random selection), oe
- (b) **Answer: Quota sampling**
- (c) **B1** cluster - the population is divided into groups (depots), a small number of whole groups are randomly selected, and everyone within them is surveyed, oe
- (c) **Answer: Cluster sampling**
- (d) **B1** in stratified sampling, some members are sampled from every stratum (group), whereas in cluster sampling entire clusters are either included in full or excluded entirely, oe
- (d) **B1** cluster sampling therefore only ever samples from a selection of clusters, not all of them, unlike stratified sampling which always represents every group, oe
- (d) **Answer: Stratified sampling always takes some members from every group; cluster sampling surveys everyone in only a few, randomly chosen whole groups and none from the rest.**

Question 6

- (a) **B1** 60 cao ($900 \times 1/15$)
- (a) **Answer: 60**
- (b) **M1** $12 / (1/15)$, oe (or 12×15)
- (b) **A1** 180 cao
- (b) **Answer: 180**
- (c) **M1** $720 \times 1/15$, oe (or $60 \cdot 12$)
- (c) **A1** 48 cao
- (c) **Answer: 48**
- (d) **B1** 16 cao ($240 \times 1/15$)
- (d) **Answer: 16**