HIGHER

H12-test Stratified Sampling (Higher): Test Pack

Total Marks

EDEXCEL 1ST0 · Calculator allowed · about 25 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A youth orchestra has 240 members. The strings section has 96 members. A stratified sample of 30 members is to be taken from the whole orchestra.

Which calculation correctly gives the number of strings players to include in the sample?

- ☐ A) 96/240 x 30
- ☐ B) 30/96 x 240
- ☐ C) 96/30 x 240
- ☐ D) 240/96 x 30

(Total for Question 1 is 1 mark)

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2 A supermarket employs 400 staff across three sections: Grocery, Fresh Produce and Bakery. 50% of staff work in Grocery, 30% work in Fresh Produce, and the rest work in Bakery. A stratified sample of 40 staff is required for a training review.

(a) Work out the number of staff who work in Bakery. **(2)**

.....

(b) Work out the number of Grocery staff to include in the sample. **(2)**

.....

(c) Work out the number of Fresh Produce staff to include in the sample. **(1)**

.....

(d) Show that the three sample sizes total 40, given that 8 Bakery staff should be included. **(1)**

(Total for Question 2 is 6 marks)

3 The Premium tier at one branch of a gym chain has 84 members, numbered 01 to 84 in the membership register. A sample of 5 Premium members is required from this branch.

To choose them, the branch manager reads the following string of random digits in pairs:

40 91 07 40 66 12 84

(a) Explain why 91 is not used as a member number. **(1)**

(b) Explain why the second appearance of 40 is skipped. **(1)**

(c) Write down the register numbers of the 5 members selected. **(2)**

.....

(d) Give one reason why using random digits, rather than the manager simply choosing 5 members she knows, produces a fairer sample within this stratum. **(1)**

(Total for Question 3 is 5 marks)

4 A researcher is investigating how much time students spend on homework each week, at a secondary school of 1000 students across three year groups: Year 9 (400 students), Year 10 (350 students) and Year 11 (250 students). The researcher plans to use stratified sampling to select an overall sample of 100 students.

(a) Plan: Give one reason why a stratified sample across the three year groups is more appropriate here than a cluster sample of 2 whole tutor groups. **(1)**

(b) Collect: Work out how many students should be sampled from each year group. **(3)**

.....

(c) Process: Describe how the researcher should select the actual 40 Year 9 students from the full list of Year 9 students. **(1)**

(d) Interpret: The mean weekly homework time in the sample was 5.4 hours in Year 9, 6.8 hours in Year 10, and 8.1 hours in Year 11. Use these sample means, weighted by the sample sizes from part (b), to estimate the mean weekly homework time across the whole sample of 100 students. **(3)**

.....

(e) Interpret: Give one reason why this weighted estimate is likely to be a better estimate of the true whole-school mean than simply averaging the three year-group means (5.4, 6.8 and 8.1) without weighting. **(2)**

(Total for Question 4 is 10 marks)

Mark scheme · H12-test Stratified Sampling (Higher): Test Pack

Question 1

- **B1** A cao
- **Answer: A) 96/240 x 30**

Question 2

- (a) **M1** 100-50-30 (= 20%), then 0.2 x 400, oe
- (a) **A1** 80 cao
- **(a) Answer: 80**
- (b) **M1** 50% x 40, oe (or 200/400 x 40)
- (b) **A1** 20 cao
- **(b) Answer: 20**
- (c) **B1** 12 cao (30% x 40)
- **(c) Answer: 12**
- (d) **B1** 20+12+8 = 40
- **(d) Answer: 20+12+8 = 40**

Question 3

- (a) **B1** there are only 84 members (numbered 01 to 84), so 91 is too large to correspond to a member, oe
- **(a) Answer: 91 is greater than 84, so it does not match any member's register number.**
- (b) **B1** member 40 has already been selected, and each member can only appear once in the sample, oe
- **(b) Answer: Member 40 was already chosen, so selecting it again would not add a new member.**
- (c) **M1** working through the digits in order, keeping only valid, non-repeated numbers of 84 or less
- (c) **A1** 40, 07, 66, 12, 84 cao (in this order)
- **(c) Answer: 40, 07, 66, 12, 84**
- (d) **B1** it removes personal bias/judgement, giving every member of the stratum an equal chance of being chosen, oe
- **(d) Answer: Random digits remove personal bias, giving every Premium member an equal chance of selection.**

Question 4

- (a) **B1** tutor groups are small and typically drawn from only one or two year groups, so a cluster sample of just 2 tutor groups would very likely miss one or more year groups entirely, oe
- **(a) Answer: A cluster sample of just 2 tutor groups would very likely fail to represent all three year groups' homework habits.**
- (b) **M1** 100/1000 = 1/10, oe
- (b) **A1** Year 9: 40
- (b) **B1** Year 10: 35 and Year 11: 25
- **(b) Answer: Year 9: 40; Year 10: 35; Year 11: 25**
- (c) **B1** use a random method (e.g. a random number generator) to choose 40 students from the complete Year 9 list, so every Year 9 student has an equal chance of selection, oe
- **(c) Answer: Use a random method, such as random numbers, to pick 40 names from the full Year 9 list.**
- (d) **M1** (40 x 5.4) + (35 x 6.8) + (25 x 8.1), oe
- (d) **A1** 656.5
- (d) **A1** 6.565 hours cao (awrt 6.57)
- **(d) Answer: 6.565 hours**
- (e) **B1** an unweighted average would give Year 11 the same influence as Year 9, even though Year 9 has many more students (400 compared with 250), oe
- (e) **B1** weighting by sample size (which reflects each year group's true share of the school) gives a fairer, more accurate estimate of the whole-school mean, oe
- **(e) Answer: An unweighted average would let the smaller Year 11 group affect the result as much as the larger Year 9 group; weighting by sample size reflects each year's true share of the school.**