EXPERT TUITION

Maths Questions By Topic:

Statistical Sampling
Mark Scheme

A-Level Edexcel

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Qu	Scheme	Marks	AO
1. (a)	Systematic (sampling)	B1 **(1)**	1.2
(b)(i)	[Daily Mean] Wind Speed	B1	2.2a
(ii)	Light	B1 **(2)**	1.2
(c)	Variable *A* occurs most (around 80~90%) of the time	B1 **(1)** **(4 marks)**	2.2b
	Notes		
(a)	B1 for identifying the correct sampling technique Allow slight misspelling e.g. "sysmatic", "sytmatic" Do NOT allow "systemic"		
(b)(i)	B1 for identifying appropriate qualitative variable. {LDS mark} Allow "Wind speed" or "Wind strength" but NOT just "wind" or "wind direction"		
(ii)	B1 for realising that modal wind speed is "Light" {LDS mark} Allow just "light" or "most light"		
NB	These two B marks are independent so can score B0B1 for e.g. "rainfall" and "light"		
(c)	B1 for inferring that frequency of *A* can be estimated fairly reliably: {underestimates *B* and over estimates *C*} e.g. "*A* is the most frequent" [can then ignore comments about *B* and *C*]		

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Question	Scheme	Marks	AOs
2(a)	It is not possible to have a sampling frame	B1	2.3
		(1)	
(b)	Quota sampling **and** (catch 85 common carp, 45 mirror carp and 30 leather carp) **or** (ignore any fish caught of a type where the quota is full)	M1	1.1a
	Quota sampling **and** catch 85 common carp, 45 mirror carp and 30 leather carp **and** ignore any fish caught of a type where the quota is full	A1	1.1b
		(2)	
		(3 marks)	

		Notes
(a)	**B1:**	For the idea there cannot be a sampling frame/list
(b)	**M1:**	Quota sampling **and** either for the correct numbers of each type **or** for the idea that if quota full ignore the fish.
	A1:	Quota sampling **and** both the correct numbers of each type **and** for the idea that if quota full ignore the fish or sample until all quotas are full

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Question	Scheme	Marks	AOs
3	Label **each** year group	B1	1.1b
	Use <u>random</u> numbers to select a ...	B1	1.1b
	Simple random sample of <u>24 Year 12s</u> and <u>16 Year 13s.</u>	B1	1.1b
		(3)	
			(3 marks)
Notes			
3	**B1:** for a suitable numbered/labelled/ordered(o.e.) list/database/register(o.e.) for **each** year group. Condone poor numbering but if just one list, then the Year 12s must be distinguishable from the Year 13s		
	B1: for use of random numbers/sample/selection to choose students		
	B1: for <u>24 Year 12s</u>, and <u>16 Year 13s</u>		
Note:	A description of a systematic sample: only allow access to the first mark and therefore may score maximum B1B0B0		

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Question	Scheme	Marks	AOs
4(a)	Systematic (sample) cao	B1	1.2
(b)	In LDS some days have gaps because the data was not recorded	B1	2.4
		(2 marks)	

Notes:

(b)
B1: A correct explanation

Question	Scheme	Marks	AOs
5 (i)	Not a good method since only uses 11 days from one location in one month	B1	2.4
(ii)	e.g. She should use data from more of the UK locations and more of the months **or** using a spreadsheet or computer package she could use all of the available UK data	B1	2.4
		(2)	
		(2 marks)	

Notes:

(i)
B1: For a comment that supports the idea that her sampling method was not a good one

(ii)
BI: For some sensible suggestions that would give a better representation of the data across the UK. Must show some awareness of the fact that LDS has different locations and more months of data available but must be clear they are NOT using any overseas locations

N.B. B0 for a comment that says use more than one location without specifying that only UK locations are required

Qu 6	Scheme	Marks	AO
6	**Disadvantage:** e.g. Not random; cannot use (reliably) for inferences	B1 **(1)**	1.1b **(1 mark)**

	Notes		
6	B1 for a suitable disadvantage:		

Allow (B1)	Do NOT allow (B0)
Not random <u>or</u> less random (o.e.)	Not representative
Cannot use (reliably) for inferences	Less accurate
(More likely to be) biased	Any comment based on time or cost
	Any mention of skew
	Any mention of non-response

Qu 7	Scheme	Marks	AO
(a)	Convenience <u>or</u> opportunity [sampling]	B1 (1)	1.2
(b)	Quota [sampling] e.g. Take 4 people every 10 minutes	B1 B1 (2)	1.1a 1.1b
(c)	Census	B1 (1)	1.2
		(4 marks)	
	Notes		

(b)	1st B1 for quota (sampling) mentioned ("Stratified" or "systematic" or "random" are B0B0)
	 2nd B1 for a description of how such a system might work, requires suitable strata or categories
	      e.g. time slots, departments, gender, age groups, distance travelled etc
	     Suggestion of randomness is B0		

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Question Number	Scheme	Marks
8 (a)	A population is collection of all items	B1 (1)
(b)	(A random variable) that is a function of the sample which contains no unknown quantities/parameters.	B1 (1)
(c)	The voters in the town	B1
	Percentage/proportion voting for Dr Smith	B1 (2)
(d)	Probability Distribution of those voting for Dr Smith from all possible samples (of size 100)	B1 (1)
		[5]

Notes

(a)   **B1** – collection/group **all** items – need to have /imply all eg entire/complete/every

(b)   **B1** – needs <u>function/calculation(o.e.) of the sample/random variables/observations</u> **and** <u>no unknown quantities/parameters(o.e.)</u> NB do not allow unknown variables

e.g. "A calculation based <u>solely</u> on observations from a given sample." B1 | Solely/only imply no unknown quantities
     "A calculation based <u>only</u> on known data from a sample" B1
     "A calculation based on known observations from a sample" B0

(c)   **B1** – Voters

Do not allow 100 voters.

B1 – percentage/ proportion voting (for Dr Smith)
     the **number** of people voting (for Dr Smith)
     Allow 35% of people voting (for Dr Smith)
     Allow 35 people voting (for Dr Smith)
     Do **not** allow 35% or 35 alone

(d)   **B1** – answers must include all three of these features
     (i)   All possible samples,
     (ii)   their associated probabilities,
     (iii)   context of voting for Dr Smith.

e.g "It is all possible values of the percentage and their associated probabilities." B0 no context

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Question Number	Scheme	Marks
9. (a)	A census is when <u>every member</u> of the <u>population</u> is investigated.	B1
(b)	There would be no cookers left to sell.	B1
(c)	A list of the unique identification numbers of the cookers.	B1
(d)	A cooker	B1
		(4)

Notes		

9. (a)	**B1** Need one word from each group
	    (1) <u>Every member /all items / entire /oe</u>
	    (2) <u>population/collection of individuals/sampling frame/oe</u>
	
	enumerating the population on its own gets B0	

(b)	**B1** Idea of Tests to destruction. Do not accept cheap or quick	
(c)	**B1** Idea of list/ register/database of cookers/serial numbers	
(d)	**B1** cooker(s) / serial number(s) The sample of 5 cookers or every 400th cooker gets B1	