



Sampling and Data Collection Sheet 2 Mark Scheme

Q1.

Question Number	Scheme	Marks
(a) e.g.	<p>Analyse / find estimates for a particular subgroup of the population.</p> <p>Stratified guarantees representation of all groups, srs does not.</p> <p>Observe relationships between subgroups – srs does not guarantee equal or proportionate representation.</p> <p>Rare or extreme cases as part of a small subgroups can be represented proportionately in stratified i.e. stratified represents the structure of the population– srs does not allow this.</p> <p>Stratified typically require large sample size compared to srs due to lower variability within subgroups compared to entire population.</p> <p style="text-align: right;">Any 2 distinct reasons</p>	<p>B1B1</p> <p style="text-align: right;">(2)</p>
(b) e.g.	<p>It (a stratified sample) is not biased as the members are chosen randomly.</p> <p>You can estimate the sampling errors (for a stratified sample)</p> <p>It (a stratified sample) gives more accurate estimates as it is a random process.</p> <p>A quota sample may be (interviewer / process) biased.</p> <p>It's not possible to estimate/find the sampling errors for a quota sample (whereas you can for a stratified sample)</p> <p style="text-align: right;">Any 2 distinct reasons</p>	<p>B1B1</p> <p style="text-align: right;">(2)</p>
Notes	<p>Award B1B1 two correct, B1B0 one correct.</p> <p>Allow 'it' for 'stratified'.</p> <p>Do not award marks for vague responses such as 'cheap', 'easy' 'quick' 'random' etc.</p> <p>Mentioning 'sampling frame' alone is not sufficient for a mark.</p> <p>Mentioning 'non-response are not recorded' alone is not sufficient for a mark.</p>	<p style="text-align: right;">Total 4</p>



Q2.

Question Number	Scheme	Marks
(a)	(This is a sample where) every (possible) sample (of size n) has an equal chance of being chosen.	B1 (1)
(b)	'When it is impossible to provide a sampling frame' or a correct example with an indication of sampling frame being impossible.	B1 (1)
(c)(i)	A list/register of all the students.	B1
(ii)	Number the students (from 0 to 74, 1 to 75 etc.)	B1
	Using the random no. table read off the nos. and identify or select the students allocated those nos.	B1
		(3) Total 5
Notes		
(a)	Require all / each / every etc sample and same/equal etc chance / probability etc for B1	
(b)	Require impossible / no / doesn't exist etc and sampling frame for B1	
(c)(i)	Require list/register etc and all/every/75 etc students for B1 List of 8 students is B0	
(ii)	First B1 accept 'in the corresponding position' o.e. if numbering omitted Second B1 require both for mark.	

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Q3.

Question Number	Scheme	Notes	Marks
(a)	-(accurate) estimates for each strata / job -more representative of the population -reflects population structure	Any 1 oe	B1
			(1)
(b)	Total staff=720	May be implied by calculations	B1
	Managers = $\frac{72}{720} \times 40 = 4$	For one correct calculation, follow through their 720.	M1
	Drivers = $\frac{108}{720} \times 40 = 6$		
	Administrators = $\frac{180}{720} \times 40 = 10$		
	Warehouse = $\frac{360}{720} \times 40 = 20$	4, 6, 10, 20 only. Must identify which job the values relate to.	A1
			(3)
(c)	Label all managers 1 – 72 o.e.	Idea of sampling frame or list of managers . Need not give the specific term.	B1
	Using random numbers in range 1-72 or 0-71 select 4 (managers).	Use of random numbers to select required number of managers. Must mention use of random numbers or some random selection process. If they are describing systematic sampling score B0.	B1
			(2)
			Total 6



Q4.

Question Number	Scheme	Marks
(a) e.g.	<p>Analyse / find estimates for a particular subgroup of the population.</p> <p>Stratified guarantees representation of all groups, srs does not.</p> <p>Observe relationships between subgroups – srs does not guarantee equal or proportionate representation.</p> <p>Rare or extreme cases as part of a small subgroups can be represented proportionately in stratified i.e. stratified represents the structure of the population– srs does not allow this.</p> <p>Stratified typically require large sample size compared to srs due to lower variability within subgroups compared to entire population.</p> <p style="text-align: right;">Any 2 distinct reasons</p>	<p>B1B1</p> <p style="text-align: right;">(2)</p>
(b) e.g.	<p>It (a stratified sample) is not biased as the members are chosen randomly.</p> <p>You can estimate the sampling errors (for a stratified sample)</p> <p>It (a stratified sample) gives more accurate estimates as it is a random process.</p> <p>A quota sample may be (interviewer / process) biased.</p> <p>It's not possible to estimate/find the sampling errors for a quota sample (whereas you can for a stratified sample)</p> <p style="text-align: right;">Any 2 distinct reasons</p>	<p>B1B1</p> <p style="text-align: right;">(2)</p>
Notes	<p>Award B1B1 two correct, B1B0 one correct.</p> <p>Allow 'it' for 'stratified'.</p> <p>Do not award marks for vague responses such as 'cheap', 'easy' 'quick' 'random' etc.</p> <p>Mentioning 'sampling frame' alone is not sufficient for a mark.</p> <p>Mentioning 'non-response are not recorded' alone is not sufficient for a mark.</p>	<p style="text-align: right;">Total 4</p>

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Q5.

Question Number	Scheme	Marks
	Label females 1 – 100 (or 0 – 99) and males 1 – 300 (or 0 – 299) Using <u>random numbers</u> for <u>each group</u> in range 1 – 100 (0 – 99) <u>select 15</u> females and using 1 – 300 (or 0 – 299) <u>select 45</u> <u>males</u>	B1 B1 B1 [Total 3]
	Notes	
	1 st B1 for labelling\numbering\listing females <u>and</u> males 2 nd B1 for use of random numbers or “randomly select” in <u>each group</u> (may be implied) 3 rd B1 for selecting the correct number of females <u>and</u> males e.g. randomly select 45 males and 15 females scores 2 nd and 3 rd B marks since randomly selecting and the “each group” is implied, If using systematic sampling within each strata allow 1 st B1 and 3 rd B1 (if earned) but 2 nd B0	

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Q6.

Question Number	Scheme	Marks
(a)i	Quota Sampling: Advantages: Fieldwork can be done quickly , <u>or</u> administering the test is easy , e.g. <u>or</u> costs are kept to a minimum (cheap), <u>or</u> gives estimates for each course. <u>or</u> OK for large populations <u>or</u> sampling frame not required (o.e.) Disadvantages: Non-random process <u>or</u> not possible to estimate the sampling e.g. errors, <u>or</u> non response not recorded, <u>or</u> interviewer can introduce bias in sample choice. (o.e.)	B1
(a)ii	Stratified Sampling: Advantages: Can give accurate estimates as it is a random process, <u>or</u> gives e.g. estimates for each course <u>or</u> representative of [BUT not “proportional” to] the whole population. (o.e.) Disadvantages: Sampling frame required, <u>or</u> strata may not be clear as some e.g. students overlap courses <u>or</u> not suitable for large populations. (o.e.)	B1
(b)	Total enrolments=1000 (may be implied by calculations) Leisure and Sport= $\frac{420}{1000} \times 100 = 42$ Information Technology= $\frac{337}{1000} \times 100 = 33.7 = 34$ Health and Social Care= $\frac{200}{1000} \times 100 = 20$ Media Studies= $\frac{43}{1000} \times 100 = 4.3 = 4$	B1 M1
(c)	The college’s information system would be used to identify each student and which course they are enrolled on. i.e. idea of sampling frame or list for each course . Use of random numbers to select required number of students from each course	A1 B1 B1
		(2) (3) (2) Total 7
	Notes	
(a)	Do not penalise for lack of context in part (a) 1 st B1 for an advantage and a disadvantage for quota sampling (must be 1 st or labelled (i)) 2 nd B1 for an advantage and a disadvantage for stratified sampling (2 nd or labelled (ii)) Do not allow opposite pairs e.g. “quicker/easier” for quota sampling and “takes a long time/more difficult” for stratified <u>or</u> quota “easy to use” but strat. “hard for large populations” Do not allow same reason for both e.g. “gives estimates for each course”	
(b)	M1 for one correct calculation, ft their “1000” A1 for 42, 34, 20 and 4 only	
(c)	1 st B1 for some mention of a suitable <u>sampling frame</u> . Need not give the specific term but a suitable source of <u>list</u> is required for all students <u>in each course</u> . 2 nd B1 for mentioning use of <u>random numbers</u> or some random selection process <u>for each course</u> . If they are describing systematic sampling score B0 here	



Q7.

Question Number	Scheme	Marks								
(a)	Sampling frame within each species of fish in the lake impossible to obtain.	B1 (1)								
(b)	Quota sampling	B1 (1)								
(c)	Advantages: Sample can be obtained quickly Costs are kept to a minimum Administration of survey is easy Disadvantages: Not possible to estimate sampling errors Process not random Surveyor may not be able to identify species of fish easily	B1 B1 (2)								
(d)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Species</th> <th>Quota</th> </tr> </thead> <tbody> <tr> <td>Trout</td> <td>$\frac{1400}{2450} \times 30 = 17.14$</td> </tr> <tr> <td>Bass</td> <td>$\frac{600}{2450} \times 30 = 7.35$</td> </tr> <tr> <td>Pike</td> <td>$\frac{450}{2450} \times 30 = 5.51$</td> </tr> </tbody> </table> <p>Fish are caught from the lake until the quota of 17 trout, 7 bass and 6 pike are reached. If a fish is caught and the species quota is full, then this is ignored.</p>	Species	Quota	Trout	$\frac{1400}{2450} \times 30 = 17.14$	Bass	$\frac{600}{2450} \times 30 = 7.35$	Pike	$\frac{450}{2450} \times 30 = 5.51$	B1B1B1 B1 (4) Total 8
Species	Quota									
Trout	$\frac{1400}{2450} \times 30 = 17.14$									
Bass	$\frac{600}{2450} \times 30 = 7.35$									
Pike	$\frac{450}{2450} \times 30 = 5.51$									
	Notes									
(a)	'You can't / it's very difficult to number all the fish' or equivalent									
(c)	Correct answer to (b) required. Some detail required.									
(d)	1 st B1 any one correct calculation seen or implied 2 nd B1 all correct to at least 1 dp 3 rd B1 for 17,7,6 4 th B1 accept equivalent statement. Require comment on what to do with 'extra fish'.									



Q8.

Question Number	Marks	Scheme	
(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			
(a)	<p>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></p> <p>enumerating the population on its own gets B0</p>		
(b)	<p>B1 Idea of Tests to destruction. Do not accept cheap or quick</p>		
(c)	<p>B1 Idea of list/ register/database of cookers/serial numbers</p>		
(d)	<p>B1 cooker(s) / serial number(s)</p> <p>The sample of 5 cookers or every 400th cooker gets B1</p>		



Q9.

Question Number	Marks	Scheme	
(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			
(a)	<p>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></p> <p>enumerating the population on its own gets B0</p>		
(b)	<p>B1 Idea of Tests to destruction. Do not accept cheap or quick</p>		
(c)	<p>B1 Idea of list/ register/database of cookers/serial numbers</p>		
(d)	<p>B1 cooker(s) / serial number(s)</p> <p>The sample of 5 cookers or every 400th cooker gets B1</p>		



Q10.

Question Number	Scheme	Marks
(a)	Randomly select a number between 00 and 499 (001 and 500) select every 500 th person	B1 B1 (2)
(bi)	<u>Quota</u> Advantage: <u>Representative</u> sample can be achieved (with small sample size) <u>Cheap</u> (costs kept to a minimum) not "quick" Administration relatively <u>easy</u> Disadvantage Not possible to estimate sampling errors (due to lack of randomness) Not a random process Judgment of interviewer can affect choice of sample – <u>bias</u> Non-response not recorded Difficulties of defining controls e.g. social class	B1 B1 (2)
(bii)	<u>Systematic</u> Advantage: <u>Simple</u> or <u>easy</u> to use not "quick" or "cheap" or "efficient" It is suitable for large <u>samples</u> (not populations) Disadvantage Only random if the ordered list is (truly) random Requires a list of the population <u>or</u> must assign a number to each member of the pop.	B1 B1 (2) [6]
(a)	1 st B1 for idea of using random numbers to select the first from 1 - 500 (o.e.) 2 nd B1 for selecting every 500 th (name on the list) If they are clearly trying to carry out <u>stratified</u> sample then score B0B0	
(b)	Score B1 for any one line	
(i)	1 st B1 for Quota advantage 2 nd B1 for Quota disadvantage	
(ii)	3 rd B1 for Systematic Advantage 4 th B1 for Systematic Disadvantage	



Q11.

Question number	Scheme	Marks
(a)	Only cleaners - no managers i.e. not all <u>types</u> . OR Not a random sample 1 st 50 may be in same shift/group/share <u>same views</u> . OR Not a random sample (Allow "not a representative sample" in place of "not a random sample")	B1g B1h (2)
(b)(i)	Label employees (1-550) or obtain an ordered list Select <u>first</u> using <u>random numbers</u> (from 1 - 11) Then select every 11 th person from the list	B1 B1 B1
(ii)	Label managers (1-55) and cleaners (1-495) Use random numbers to select... ...5 managers and 45 cleaners	M1 M1 A1 (6)
(c)	390, 372 (They must be in this order)	B1, B1 (2)
10 marks		
(a)	After 1 st B1, comments should be in context , i.e. mention cleaners, managers, types of worker etc 1 st B1g for one row 2 nd B1h for both rows. "Not a random sample" only counts once. Score B1B0 or B1B1 or B0B0 on EPEN	
(b)(i)	1 st B1 for idea of labelling or getting an ordered list. No need to see 1-550. 2 nd B1 selecting first member of sample using random numbers (1-11 need not be mentioned) 3 rd B1 selecting every n th where $n = 11$.	
(ii)	1 st M1 for idea of <u>two</u> groups and labelling <u>both</u> groups. (Actual numbers used not required) 2 nd M1 for use of random numbers within each strata. Don't give for SRS from all 550. "Assign random numbers to managers and cleaners" scores M0M1 A1 for 5 managers <u>and</u> 45 cleaners. (This mark is dependent upon scoring at least one M)	

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