Sampling Methods – Mark Scheme

Q1.

<table>
<tr><th>Question number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>(a)</td><td>M1 $\frac{140}{1200}\times 60$ o.e.

A1A1
<table><tr><td>Bedrooms</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5+</td></tr><tr><td>Houses in sample</td><td>7</td><td>15</td><td>21</td><td>12</td><td>5</td></tr></table></td><td>Accept a correct equivalent calculation shown for any one class
M1 implied by one correct answer OR an indication they need 1 in 20

1st A1 for any one value correct
2nd A1 for all correct</td><td>(3)</td></tr>
<tr><td>(b)</td><td>B1 Use a sampling frame for each strata

B1 Select houses randomly or generate random numbers

B1 For an aspect of detail</td><td>Each category/strata to be considered separately

Samples have to be random

e.g. How the random numbers are obtained and used</td><td>(3)</td></tr>
</table>

Q2.

Question number	Answer	Additional guidance	Mark
(a)	B1 All people/items have the same/equal chance of being chosen.	B1 for demonstrating understanding of a random sample	(1)
(b)	B1B1B1 for each of three aspects from: • Get a list / register (as the sampling frame) of all the students in the school oe • Number the students in the (sampling frame) list / register • Generate random numbers using a calculator / computer / random number table • Students with the matching number are selected	B1×3 for demonstrating understanding of how to select a random sample	(3)
(c)	B2 for a complete answer e.g. the plan is appropriate **AND** e.g. the number of hours spent on homework might differ between school years OR if B2 not earned... B1 for an incomplete answer e.g. the plan is appropriate, with an attempt at a reason OR for correct reason without conclusion	B2 for complete answer assessing the appropriateness of the suggested plan OR if B2 not earned... B1 for an attempt at assessing the appropriateness of the suggested plan	(2)

Q3.

Question	Answer	Additional guidance	Mark
(a)	B1 Advantage: • e.g. Convenient • e.g. Easy B1 Disadvantage • e.g. Not representative • e.g. Biased • e.g. Students arriving early may all travel to school using the same transport	1st B1 any one correct advantage 2nd B1 any one correct disadvantage	(2)
(b)	B1B1B1 for each of three aspects from: • Number the students in the database / use the position in the database • Generate numbers using a calculator / computer / random number table • Students with the matching number are selected • Ignore repeated numbers or numbers outside the range of those given to the students	B1B1B1 for demonstrating understanding of how to select a random sample	(3)

Q4.

Question	Answer	Additional guidance	Mark
	B1B1B1 for each of 3 assessments Though stratified sampling is an appropriate method to • e.g. represent the population • e.g. reduce bias It is not appropriate here since • e.g. sample size is too small (some strata would have few members selected) • e.g. you shouldn't stratify by the variable you are investigating (age)	B1B1B1 for each of assessments of the appropriateness of the sampling method	(3)

Q5.

	B1 Quota B1 Quota sampling is useful when • time is limited • a sampling frame is not available • the research budget is tight • when detailed accuracy or randomness is not important	B1 for quota B1 for a correct explanation when it is appropriate to use quota sampling eg one of the bullet points	(2)

Q6.

(a)	B1 Any one from • used to select sample • used to identify the population	B1 for a correct use of a sample frame	(1)
(b)	B2 eg 'not a suitable sample frame since it does not include all members of the population'	B2 for assessing the suitability of the sampling frame with supporting reason (B1 for assessing the suitability of the sampling frame with incomplete reasoning)	(2)

Q7.

Question	Answer	Additional guidance	Mark
(a)	B1 eg 'convenient'	B1 for any suitable advantage of opportunity sampling	(1)
(b)	B1 eg 'not random'	B1 for any suitable disadvantage of cluster sampling	(1)
(c)	M1 $\frac{930}{6200}\times 150$ A1 22 or 23	M1 for an equivalent calculation (may be implied by a correct answer or by 22.5)	(2)
(d)	B2 eg 'Method 3 is most representative since it guarantees people from all ages are included in the sample'	B2 for Method 3 and correct supporting reason (B1 for Method 3 with incomplete reasoning)	(2)

Q8.

Question	Answer	Additional guidance	Mark
(a)	B1 Quota		(1)
(b)	B1 for eg • not random • not representative • biased • there are very different numbers of students from each nationality	B1 for a correct statement explaining why the method of sampling is not appropriate	(1)
(c)	M1 $\frac{600\times 979}{11727}$ A1 50	Accept a correct equivalent calculation	(2)

Q9.

Question number	Answer	Additional guidance	Mark
(a)	B1B1 Any two from: • Repeated random numbers • Random numbers out of range/may not correspond to students' numbers • Selected students may not (want to) participate • Some students may have left the university	B1 for each bullet point up to a maximum of 2 Accept each bullet point only once Students may have joined the university is B0. There may not be 100 students at the university is B0. Random numbers may not be whole numbers is B0. Database may not be up to date on its own is B0. Do not accept (random) numbers may be more than 100 for the second bullet point. Ignore extraneous non-contradictory comments.	(2)
(b)	B1B1 Any two advantages from: • Easy/convenient/quick/efficient/cheap • Represents population (proportions) • Allows for comparison (between undergraduates and postgraduates) • No sample frame required	B1 for each bullet point up to a maximum of 2 Accept each bullet point only once For 2nd bullet point allow e.g. 'fair number of each (group)' 'Unbiased' on its own is B0. Ignore extraneous non-contradictory comments.	(2)
(c)	B1 Any one from: • Not every student has an equal(o.e.) chance of being selected • Only those in the main building can be selected/not every student has a chance of being selected • Robert is choosing the students	B1 for a reason which states or implies 'equal likelihood' of being selected or that Robert is doing the choosing Do not allow 'even' chance or 'its biased' for the first bullet point, but condone 'fair chance'.	(1)

Q10.

Question number	Answer	Additional guidance	Mark
(a)	M1 $\frac{4479 \times 200}{9963}$ (=89.9126…) or 0.45×200 or $45\% \times 200$ oe A1 90	Accept a correct equivalent calculation. M1 implied by 89.9 Do not award M1 for e.g. 45% of 200 alone. A1 accept either 89 or 90	(2)
(b)	B1 e.g • When the investigation only relates to one gender e.g. pregnancy, all boys schools • When a comparison is being made between genders e.g. male heights compared to female heights • If gender is not recorded in the data	B1 for a correct explanation of a **statistical situation** when it would not be appropriate to take a sample stratified by gender. Accept responses that refer to only one gender being present in the sample. Do not accept when gender is not relevant to the investigation / when gender is relevant to the investigation unless accompanied by an example of a situation.	(1)
(c)	B1 type of school/college. (Allow by gender **and** by type of school/college).	Accept maintained/independent/other and overseas only if all three listed.	(1)

Q11.

Question	Answer	Additional guidance	Mark
(a)	B1 name		**(1)**
(b)	B2 It is not an appropriate way to stratify because you should not stratify by the variable you are investigating	B2 for decision of not appropriate with a correct assessment as to why it is not appropriate (B1 for decision of not appropriate with any reason)	**(2)**

Q12.

Question	Answer		Additional guidance	Mark
(a)	B1	Each (student) has the same chance of selection, oe	B1 for a correct equivalent explanation of randomness	(1)
(b)	B1	All the students at her school	B1 for an answer indicating **all** the students, BUT an answer indicating population size (850) alone scores B0	(1)
(c)	B1 B1	One number (940) is out of range (so cannot be used) One number (310) is repeated (so needs replacing)	1st B1 for a statement recognising that only numbers on the sampling frame can be used 2nd B1 for recognising the repeated number has to be rejected.	(2)
(d)	B2	Terri's method is not appropriate as the large population would make it impracticable	B2 for a complete answer rejecting Terri's idea with an appropriate reason. eg it would take too long. OR B1 for an incomplete answer, eg correct reasoning without a conclusion, OR correct conclusion with an attempt at reasoning.	(2)

Q13.

Question number	Answer	Additional guidance	Mark
(a)	B1 e.g. Likely to be representative (with a small sample), or Age groups and genders will be fairly represented	B1 for recognising that stratifying will help give a representative sample	(1)
(b)	B1 e.g. makes it easy to analyse responses / put into graphs B1 B1 for any two problems from: • List is not exhaustive / too few options (e.g. no 'radio' / no 'other') • Students may use more than one option • Students may not follow the news • Accept: students' ages not recorded • Not investigating effect of gender so no need to split into male and female	1st B1 for recognising the advantage that responses will be easy to work with 2nd/3rd B1 for each of two appropriate problems identified	(3)

Q14.

Question number	Answer	Additional guidance	Mark
(a)(i)	B1 all of the students in John's school		(1)
(a)(ii)	B1 all of the (types of) films (in UK cinemas last year)	'All' is required, but condone omission in (a)(ii) if omitted in (a)(i).	(1)
(b)	B1 e.g. 'use a trusted website', 'use up-to-date / recent data'	B1 for a suitable suggestion Accept 'use reliable website / reliable source'	(1)
(c)	B1 Method A: e.g. 'each student may not have the same chance of being selected' B1 Method B: e.g. 'selecting at a particular time/place so not all students have an equal chance of being selected'	B1 for any suitable reason as to why this quota sampling method is not random B1 for any suitable reason as to why this opportunity sampling method is not random	(2)
(d)	B2 Method A/quota sampling should be less biased since it is more likely to be representative (OR if B2 not scored B1 Method A/quota sampling should be less biased with an attempt at a reason)	B2 for Method A and identifying that quota sample aims to represent the characteristics of the population (OR if B2 not scored B1 for Method A and an attempt at a supporting reason)	(2)

Q15.

Question number	Answer	Additional guidance	Mark
	B1 e.g. 'Every member of the population has the same probability of being selected'	B1 for a correct description	(1)

Q16.

Question number	Answer	Additional guidance	Mark
(a)	B1 for random start point (from 1 to 20) B1 for selecting every 20th item		(2)
(b)	B1 for e.g. • not random • not representative • interval may coincide with some pattern in the population	B1 for identifying a disadvantage of systematic sampling	(1)

Q17.

Question number	Answer	Additional guidance	Mark
(a)	B1 Not appropriate as it is a question / is not a statement	B1 for recognising that a question is not a hypothesis	(1)
(b)	B1 e.g. Likely to be representative (with a small sample), or Age groups and genders will be fairly represented	B1 for recognising that stratifying will help give a representative sample	(1)

Q18.

Question number	Answer	Additional guidance	Mark
(a)	B1 A **list of all** the students at his school	B1 for a suitable sampling frame Must have list or suitable alternative e.g. register/database and include the whole population Allow a list of students who have school meals	(1)
(b)	B1 Quota (sampling)		(1)

Q19.

Question number	Answer	Additional guidance	Mark
	B1 for each of three correct comments eg • neither sampling method is random (or reference to one of the methods) /not everyone has an equal chance of being included • cluster sampling will not give a representative sample / only the views of a small number of branches/everyone in same restaurant might have the same opinion • judgement sample may be biased as the head chef may select people who will say positive things / agree with him • Only asking people who work kitchen staff who work at the restaurants so are likely to support the restaurant • judgement sample would mean that the people asked will have the experience to be able to answer the questions e.g. no one would be included who has only just started	B1 for each correct comment on the appropriateness of the sampling approaches	(3)

Q20.

Question number	Answer	Additional guidance	Mark
(a)	B1 e.g. • the population is very large • a sample will be easier/quicker to take • a sample would be cheaper • not practical (possible) to ask every child in the UK/less data to handle	B1 for a correct explanation why a sample is preferable to a census Allow converse statements if they include the word census.	(1)
(b)	B1 for a correct explanation e.g. • Not all students will do chores • There may be some outliers • They may not give the answers in the same units • They might not know how long they do chores for • Not all may agree on what a chore is B1 for a suggestion to overcome the problem e.g. • Before giving out the pieces of paper she could ask if they do chores • Ask them face to face • Give an incentive to complete the survey • She could plan to remove outliers • She should tell them to collect the information to the nearest hour • Give them options of timescales for how long they do chores • She could give them a defined list of chores.	B1 for any explanation of what problems she may encounter with regards to non-response or unexpected outcomes Do not allow the student could lie B1 for a suggestion of how to overcome the problem	(2)

Q21.

Question number	Answer	Additional guidance	Mark
(a)	B1 ordinal		(1)
(b)	B1B1B1 • Number **all** the students (from e.g. 000 to 466) • Select students with corresponding number from random number list • Select 50 numbers ignoring any repeats / numbers out of range	B1 for numbering B1 for selecting students with the corresponding selected numbers B1 for 50 unique numbers in range	(3)