

**Sampling Methods - Edexcel Past Exam Questions MARK SCHEME**

1. A large company surveyed its staff to investigate the awareness of company policy. The company employs 6000 full time staff and 4000 part time staff.
- (a) Describe how a stratified sample of 200 staff could be taken. (3)
- (b) Explain an advantage of using a stratified sample rather than a simple random sample. (1)

**Mark Scheme**

- (a) Label full time staff 1 – 6000, part time staff 1 – 4000 M1  
 Use random numbers to select M1  
 Simple random sample of 120 full time staff and 80 part time staff A1 3

**Note**

- 1<sup>st</sup> M1 for attempt at labelling full-time and part-time staff.  
 One set of correct numbers.  
 2<sup>nd</sup> M1 for mentioning use of random numbers  
 1<sup>st</sup> A1 for s.r.s. of 120 full-time and 80 part-time
- (b) Enables estimation of statistics / errors for each strata or “reduce variability” or “more representative” or “reflects population structure” B1 1  
**NOT** “more accurate”

2. A telephone directory contains 50 000 names. A researcher wishes to select a systematic sample of 100 names from the directory.
- (a) Explain in detail how the researcher should obtain such a sample. (2)
- (b) Give one advantage and one disadvantage of
- (i) quota sampling,
- (ii) systematic sampling. (4)

**Mark Scheme**

- (a) Randomly select a number between 00 and 499 (001 and 500) B1  
 select every 500<sup>th</sup> person B1 2

**Note**

- 1<sup>st</sup> B1 for idea of using random numbers



to select the first from 1 – 500 (o.e.)

2<sup>nd</sup> B1 for selecting every 500<sup>th</sup> (name on the list)

If they are clearly trying to carry out stratified sample then score B0B0

(b) (i) Quota

**Advantage:**

Representative sample can be achieved (with small sample size)

Cheap (costs kept to a minimum) **not** “quick”

B1

Administration relatively easy

**Disadvantage**

Not possible to estimate sampling errors (due to lack of randomness)

Not a random process

B1 2

Judgment of interviewer can affect choice of sample – bias

Non-response not recorded

Difficulties of defining controls e.g. social class

**Note**

Score B1 for any one line

1<sup>st</sup> B1 for Quota advantage

2<sup>nd</sup> B1 for Quota disadvantage

(ii) Systematic

**Advantage:**

B1

Simple or easy to use **not** “quick” or “cheap” or “efficient”

It is suitable for large samples (not populations)

**Disadvantage**

B1 2

Only random if the ordered list is (truly) random

Requires a list of the population or must assign a number to each member of the pop.

**Note**

Score B1 for any one line

1<sup>st</sup> B1 for Systematic Advantage

2<sup>nd</sup> B1 for Systematic Disadvantage

3. A researcher is hired by a cleaning company to survey the opinions of employees on a proposed pension scheme. The company employs 55 managers and 495 cleaners.

To collect data the researcher decides to give a questionnaire to the first 50 cleaners to leave at the end of the day.

- (a) Give 2 reasons why this method is likely to produce biased results. (2)
- (b) Explain briefly how the researcher could select a sample of 50 employees using
- (i) a systematic sample,
- (ii) a stratified sample. (6)

**Mark Scheme**

- (a) Only cleaners – no managers i.e. not all types. OR Not a random sample B1g  
 1<sup>st</sup> 50 may be in same shift/group/share same views.  
 OR Not a random sample B1h 2  
 (Allow “not a representative sample” in place of “not a random sample”)

After 1<sup>st</sup> B1, comments should be in **context**, i.e. mention cleaners, managers, types of worker etc

1<sup>st</sup> B1g for one row

2<sup>nd</sup> B1h for both rows. “Not a random sample” only counts once.  
 Score B1B0 or B1B1 or B0B0 on EPEN

- (b) (i) Label employees (1–550) or obtain an ordered list B1  
 Select first using random numbers (from 1 – 11) B1  
 Then select every 11<sup>th</sup> person from the list B1
- 1<sup>st</sup> B1 for idea of labelling or getting an ordered list.  
 No need to see 1–550.
- 2<sup>nd</sup> B1 selecting first member of sample using random numbers  
 (1–11 need not be mentioned)
- 3<sup>rd</sup> B1 selecting every  $n$ th where  $n = 11$ .



- |      |  |    |   |
|------|--|----|---|
| (ii) | Label managers (1–55) and cleaners (1–495) | M1 |   |
|      | Use random numbers to select...            | M1 |   |
|      | ...5 managers and 45 cleaners              | A1 | 6 |
- 

4. Describe one advantage and one disadvantage of

- |     |                         |     |
|-----|-------------------------|-----|
| (a) | quota sampling,         | (2) |
| (b) | simple random sampling. | (2) |

### **Mark Scheme**

Advantages:

- |     |  |    |  |
|-----|--|----|--|
| (a) | <ul style="list-style-type: none"><li>• does not require the existence of:<br/>a sampling frame<br/>a population list</li><li>• <u>field work can be done quickly</u> as representative sample can be achieved with a small sample size</li><li>• costs kept to a minimum (<u>cheaply</u>)</li><li>• administration relatively <u>easy</u></li><li>• non-response not an issue</li></ul> | B1 |  |
|     | <i>any one</i>   |    |  |

Disadvantages:

- |     |  |    |   |
|-----|--|----|---|
| (a) | <ul style="list-style-type: none"><li>• not possible to estimate sampling errors</li><li>• interviewer choice and may not be able to judge easily / <u>may lead to bias</u></li><li>• non-response not recorded</li><li>• non-random process</li></ul> | B1 | 2 |
|     | <i>any one</i>   |    |   |
| (b) | <p><u>Advantages:</u></p> <ul style="list-style-type: none"><li>• <u>random process</u> so possible to <u>estimate sampling errors</u></li><li>• free from <u>bias</u></li></ul>   | B1 |   |
|     | <i>any one</i>   |    |   |



Disadvantages:

- not suitable when sample size is large
- sampling frame required which may not exist  
or may be difficult to construct for a large population

B1 2

*any one*

*NO REPETITION / OPPOSITES*

**[4]**

5. A school has 15 classes and a sixth form. In each class there are 30 students. In the sixth form there are 150 students. There are equal numbers of boys and girls in each class. There are equal numbers of boys and girls in the sixth form. The head teacher wishes to obtain the opinions of the students about school uniforms.

Explain how the head teacher would take a stratified sample of size 40.

**(7)**

**Mark Scheme**

Total in School =  $(15 \times 30) + 150 = 600$

B1

random sample of  $\frac{30}{600} \times 40$  (Use of  $\frac{40}{\text{their } 600}$ )

M1

= 2 from each of the 15 classes

A1

random sample of  $\frac{150}{600} \times 40$  Either

= 10 from sixth form;

A1

Label the boys in each class from 1 – 15 and the girls from 1 – 15.

B1

use random numbers to select 1 girl and 1 boy

B1

Label the boys in the sixth form from 1 – 75 and the girls from 1 – 75.

B1

use random numbers to select 5 different boys and 5 different girls.

**[7]**

6. (a) State two reasons why stratified sampling might be chosen as a method of sampling when carrying out a statistical survey. (2)
- (b) State one advantage and one disadvantage of quota sampling. (2)

### Mark Scheme

- (a) Population divides into mutually exclusive; groups  
distinct strata B1; B1 2
- (b) Advantages  
– enables fieldwork to be done quickly  
– costs kept to a minimum  
– administration is relatively easy B1  
*Any one*
- Disadvantages  
– non-random so not possible to estimate sampling errors  
– subject to possible interviewer bias B1 2  
– non-response not recorded  
*Any one*
- [4]

- 
7. There are 64 girls and 56 boys in a school.  
Explain briefly how you could take a random sample of 15 pupils using
- (a) a simple random sample, (3)
- (b) a stratified sample. (3)

### Mark Scheme

- (a) Allocate a number between 1 and N (or equiv) to each pupil. M1  
Use random number tables, computer or calculator to select 15 different  
numbers between 1 and 120 (or equiv). B1  
Pupils corresponding to these numbers become the sample. B1 3
- (b) Allocate numbers 1 – 64 to girls and 1 – 56 to boys. Idea of  
different sets for boys and girls M1



Select $\frac{64}{120} \times 15 = 8$ random numbers between 1 – 64 for girls	M1	
<i>attempt find no</i>		
Select 7 random numbers between 1 – 56 for boys.	A1	3
<i>Both 7 and 8</i>		
		<b>[6]</b>

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8. Explain how to obtain a sample from a population using
- (a) stratified sampling, (2)
- (b) quota sampling. (2)
- Give one advantage and one disadvantage of each sampling method. (4)

**Mark Scheme**

- (a) Take a (simple) random sample from (mutually exclusive) groups of the population 1g/1h B1
- Sample sizes within strata in strict proportion to numbers in each strata in the population B1
- Advantage:**  
More accurate estimate of variance of population mean  
Individual estimates for strata available Any one B1
- Disadvantage:**  
Difficult if strata are large  
Definition of strata problematic (may overlap) Any one B1 4



- (b) Non-random sampling from groups of the population B1  
B1 dep
- Advantage:**  
 Representative sample can be achieved with small sample size  
 Cheap (costs kept to a minimum)  
 Administration relatively easy Any one (not quick) B1
- Disadvantage**  
 Not possible to estimate sampling errors due to lack of randomness  
 Judgment of interviewer can affect choice of sample – bias OK  
 Non-response not recorded  
 Difficulties of defining controls e.g. social class Any one B1 4
- 
- [8]**

9. Explain what you understand by

- (a) a sampling unit, (1)
- (b) a sampling frame, (1)

**Mark Scheme**

(a)	Individual member or element of the population or sampling frame	B1 (1)
(b)	A <u>list</u> of <u>all</u> sampling units or <u>all</u> the population	B1 (1)



10. Before introducing a new rule, the secretary of a golf club decided to find out how members might react to this rule.
- (a) Explain why the secretary decided to take a random sample of club members rather than ask all the members. (1)
  - (b) Suggest a suitable sampling frame. (1)
  - (c) Identify the sampling units. (1)

**Mark Scheme**

Question Number	Scheme	Marks
(a)	<p>Saves time / cheaper / easier <span style="float: right;">any one</span></p> <p>or</p> <p><u>A census/asking all members</u> takes a long time or is expensive or difficult to carry out</p>	<p>B1</p> <p>(1)</p>
(b)	<p><u>List, register or database of all club members/golfers</u></p> <p>or</p> <p><u>Full membership list</u></p>	<p>B1</p> <p>(1)</p>
(c)	<p>Club <u>member(s)</u></p>	<p>B1</p> <p>(1)</p>
		<b>Total 3 marks</b>



11. (a) Explain what you understand by a census. (1)

Each cooker produced at GT Engineering is stamped with a unique serial number. GT Engineering produces cookers in batches of 2000. Before selling them, they test a random sample of 5 to see what electric current overload they will take before breaking down.

- (b) Give one reason, other than to save time and cost, why a sample is taken rather than a census. (1)
- (c) Suggest a suitable sampling frame from which to obtain this sample. (1)
- (d) Identify the sampling units. (1)

### Mark Scheme

Question Number	Marks	Scheme	
1. (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			
1. (a)		<b>B1</b> 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)		<b>B1</b> Idea of Tests to destruction. Do not accept cheap or quick	
(c)		<b>B1</b> Idea of list/ register/database of cookers/serial numbers	
(d)		<b>B1</b> cooker(s) / serial number(s)  The sample of 5 cookers or every 400 <sup>th</sup> cooker gets B1	