

Edexcel GCSE

Mathematics (Linear) – 1MA0

STRATIFIED SAMPLING

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Items included with question papers
Nil



Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

Information

The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.
Questions labelled with an **asterisk (*)** are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
Check your answers if you have time at the end.

1. The grouped frequency table shows information about the weights, in kilograms, of 20 students, chosen at random from Year 11.

| Weight (w kg) | Frequenc y |
|------------------|---------------|
| $50 \leq w < 60$ | 7 |
| $60 \leq w < 70$ | 8 |
| $70 \leq w < 80$ | 3 |
| $80 \leq w < 90$ | 2 |

There are 300 students in Year 11.

Work out an estimate for the number of students in Year 11 whose weight is between 50 kg and 60 kg.

$$\frac{7}{20} \times 300$$

.....105.....

(Total 3 marks)

2. The table shows the number of students in each year group at a school.

| | | | | | |
|--------------------|-----|-----|-----|-----|-----|
| Year group | 7 | 8 | 9 | 10 | 11 |
| Number of students | 190 | 145 | 145 | 140 | 130 |

Jenny is carrying out a survey for her GCSE Mathematics project. She uses a stratified sample of 60 students according to year group.

Calculate the number of Year 11 students that should be in her sample.

$$\frac{130}{750} \times 60 = 10.4$$

.....10.....

(Total 3 marks)

650!!!

3. A school has 450 students.
Each student studies one of Greek or Spanish or German or French.
The table shows the number of students who study each of these languages.

| Language | Number of students |
|----------|--------------------|
| Greek | 145 |
| Spanish | 121 |
| German | 198 |
| French | 186 |

An inspector wants to look at the work of a stratified sample of 70 of these students.

Find the number of students studying each of these languages that should be in the sample.

$$\frac{145}{450} \times 70 = \frac{145}{650} \times 70 = 22.5 \quad 15.61538462$$

$$\frac{121}{450} \times 70 = \frac{121}{650} \times 70 = 18.82 \quad 13.03076923$$

$$\frac{198}{450} \times 70 = \frac{198}{650} \times 70 = 30.8 \quad 21.32307692$$

$$\frac{186}{450} \times 70 = \frac{186}{650} \times 70 = 28.92 \quad 20.03076923$$

Greek 16

Spanish 13

German 21

French 20

(Total 3 marks)

4. There are three age groups in a competition.
The table shows the number of competitors in each age group.

| 16-18 years | 19-24 years | 25+ years |
|-------------|-------------|-----------|
| 120 | 250 | 200 |

John wants to do a survey of the competitors.
He uses a stratified sample of exactly 50 competitors according to each age group.

Work out the number of competitors in each age group that should be in his stratified sample of 50.

$$\frac{120}{570} \times 50 = 10.52631579$$

$$\frac{250}{570} \times 50 = \cancel{21.9} 21.92982456$$

$$\frac{200}{570} \times 50 = 17.54385965$$

10.52631579 is closer to 10 than
17.54385965 is to 17. Therefore, I
will round 10.52631579 down.

16-18 years:10.....

19-24 years:22.....

25+ years:18.....

(Total 3 marks)

5. The table shows the number of boys and the number of girls in each year group at Springfield Secondary School.

There are 500 boys and 500 girls in the school.

| Year group | Number of boys | Number of girls |
|------------|----------------|-----------------|
| 7 | 100 | 100 |
| 8 | 150 | 50 |
| 9 | 100 | 100 |
| 10 | 50 | 150 |
| 11 | 100 | 100 |
| Total | 500 | 500 |

Azez took a stratified sample of 50 girls, by year group.

Work out the number of Year 8 girls in his sample.

$$\frac{50}{500} \times 50$$

.....5.....

(Total 2 marks)

6. The table gives information about the numbers of students in the two years of a college course.

| | Male | Female |
|-------------|------|--------|
| First year | 399 | 602 |
| Second year | 252 | 198 |

Anna wants to interview some of these students.

She takes a random sample of 70 students stratified by year and by gender.

Work out the number of students in the sample who are male and in the first year.

$$\frac{399}{1451} \times 70 = 19.24879394$$

.....19.....

(Total 3 marks)

7. 258 students each study one of three languages.
The table shows information about these students.

| | Language studied | | |
|--------|------------------|--------|---------|
| | German | French | Spanish |
| Male | 45 | 52 | 26 |
| Female | 25 | 48 | 62 |

A sample, stratified by the language studied and by gender, of 50 of the 258 students is taken.

- (a) Work out the number of male students studying Spanish in the sample.

$$\frac{26}{258} \times 50 = 5.03875969 \dots 5$$

(2)

- (b) Work out the number of female students in the sample.

$$\frac{135}{258} \times 50 = 26.1627907 \dots 26$$

(2)

(Total 4 marks)

8. (a) Explain what is meant by

(i) a random sample,

.....everyone has an equal chance of getting picked

(ii) a stratified sample. (section/group)

.....number selected from each strata is proportional to strata size

(2)

The table shows some information about the members of a golf club.

| Age range | Male | Female | Total |
|-------------------------|------|--------|-------|
| Under 18 | 29 | 10 | 39 |
| 18 to 30 | 82 | 21 | 103 |
| 31 to 50 | 147 | 45 | 192 |
| Over 50 | 91 | 29 | 120 |
| Total number of members | | | 454 |

The club secretary carries out a survey of the members.

He chooses a sample, stratified both by age range and by gender, of 90 of the 454 members.

(b) Work out an estimate of the number of male members, in the age range 31 to 50, he would have to sample.

$$\frac{147}{454} \times 90 = 29.14096916$$

.....29.....

(2)

(Total 4 marks)

9. Hamid wants to find out what people in Melworth think about the sports facilities in the town.

Hamid plans to stand outside the Melworth sports centre one Monday morning.

He plans to ask people going into the sports centre to complete a questionnaire.

Carol tells Hamid that his survey will be biased.

(i) Give **one** reason why the survey will be biased.

.....he.....is.....only.....asking.....people.....who.....use.....
.....the.....centre.....

(ii) Describe **one** change Hamid could make to the way in which he is going to carry out his survey so that it will be less biased.

.....He.....should.....ask.....a.....range.....of.....people.....
.....possibly.....using.....random.....sampling.....

(Total 2 marks)

10. There are 970 students in Bayton High School.

Brian takes a random sample of 100 students.

He asks these 100 students which subject they like best.

They can choose English or Maths or Science.

Brian is going to use his results to work out an estimate of how many of the 970 students like English best.

Explain how.

.....He.....could.....work.....out.....the.....fraction.....of.....
.....his.....sample.....that.....like.....each.....subject.....
.....then.....multiply.....by.....970.....

(Total 2 marks)

11. 340 475 people live in Brinton.
 A company carried out a survey.
 It used a random sample of 1500 of the 340 475 people.
 870 of this sample of 1500 people were male.

Work out an estimate for the number of **females** living in Brinton.

$$\frac{1500 - 870}{1500} \times 340475 = 142999.5$$

.....143000.....

(Total 3 marks)

12. The table shows some information about the pupils at Statson School.

| Year group | Boys | Girls | Total |
|------------|------|-------|-------|
| Year 7 | 104 | 71 | 175 |
| Year 8 | 94 | 98 | 192 |
| Year 9 | 80 | 120 | 200 |
| Total | 278 | 289 | 567 |

Kelly carries out a survey of the pupils at Statson School.
 She takes a sample of 80 pupils, stratified by both Year group and gender.

- (a) Work out the number of Year 8 boys in her sample.

$$\frac{94}{567} \times 80 = 13.2627866$$

.....13.....

(2)

- (b) Describe a method that Kelly could use to take a random sample of Year 8 boys.

.....Assign each boy a number, then.....
use a random number generator.....

(2)

(Total 4 marks)

13. The table gives information about the number of girls in each of four schools.

| School | A | B | C | D | Total |
|-----------------|-----|----|-----|----|-------|
| Number of girls | 126 | 82 | 201 | 52 | 461 |

Jenny did a survey of these girls.

She used a stratified sample of exactly 80 girls according to school.

Work out the number of girls from each school that were in her sample of 80.

Complete the table.

| School | A | B | C | D | Total |
|-----------------|----|----|----|---|-------|
| Number of girls | 22 | 14 | 35 | 9 | 80 |

$$\frac{126}{461} \times 80 = \frac{22.35 \dots}{21.8655}$$

$$\frac{82}{461} \times 80 = \frac{14.54}{14.2299}$$

$$\frac{201}{461} \times 80 = \frac{35.65407}{34.8807}$$

$$\frac{52}{461} \times 80 = \frac{9.225946785}{9.0239}$$

(Total 3 marks)

14. The table shows the number of boys in each of four groups.

| Group | A | B | C | D | Total |
|----------------|----|----|----|----|-------|
| Number of boys | 32 | 43 | 38 | 19 | 132 |

Jamie takes a sample of 40 boys stratified by group.

Calculate the number of boys from group B that should be in his sample.

$$\frac{43}{132} \times 40 = 13.03$$

..... 13

(Total 2 marks)

15. Melanie wants to find out how often people go to the cinema.

She gives a questionnaire to all the women leaving a cinema.

Her sample is biased.

Give two possible reasons why.

1 She is only asking women, they
..... may not be representative of all
..... people

2 She is asking people at the cinema,
..... they are more likely to attend more
..... often than average

(Total 2 marks)

16. The two-way table shows information about the number of students in a school.

| | Year Group | | | | | Total |
|-------|------------|-----|-----|-----|-----|-------|
| | 7 | 8 | 9 | 10 | 11 | |
| Boys | 126 | 142 | 140 | 135 | 125 | 670 |
| Girls | 134 | 140 | 167 | 125 | 149 | 715 |
| Total | 260 | 282 | 307 | 260 | 276 | 1385 |

Robert carries out a survey of these students.

He uses a sample of 50 students stratified by gender and by year group.

Calculate the number of girls from year 9 that are in his sample.

$$\frac{167}{1385} \times 50 = 6.028880866$$

6

(Total 2 marks)