AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE STATISTICS

H

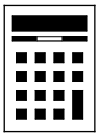
Higher tier Paper 1

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a copy of the Data Sheet
- a calculator
- mathematical instruments.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross out any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

For Examiner's Use	
Question	Mark
1-4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
TOTAL	

Answer **all** questions in the spaces provided.

Do not write outside the box

1 Two variables have no correlation.

Which of these could be the value of the Spearman's Rank Correlation Coefficient between the two variables?

Circle your answer.

[1 mark]

1 – 1 0.05 0.5

2 In quality assurance sampling applications, which measure is **not** used for the completion of a quality control chart?

Circle your answer.

[1 mark]

mean skew range median

3 A bag contains only 8 red balls and 5 blue balls.

A ball is taken out at random and not replaced.

A second ball is taken out at random.

If the first ball is blue, what is the probability the second ball is also blue?

Circle your answer.

[1 mark]

$\frac{1}{3}$ $\frac{5}{39}$ $\frac{5}{12}$ $\frac{4}{13}$

4 Which of these is **not** a method of sampling, but is a procedure of categorisation which may be used before sampling takes place?

Circle your answer.

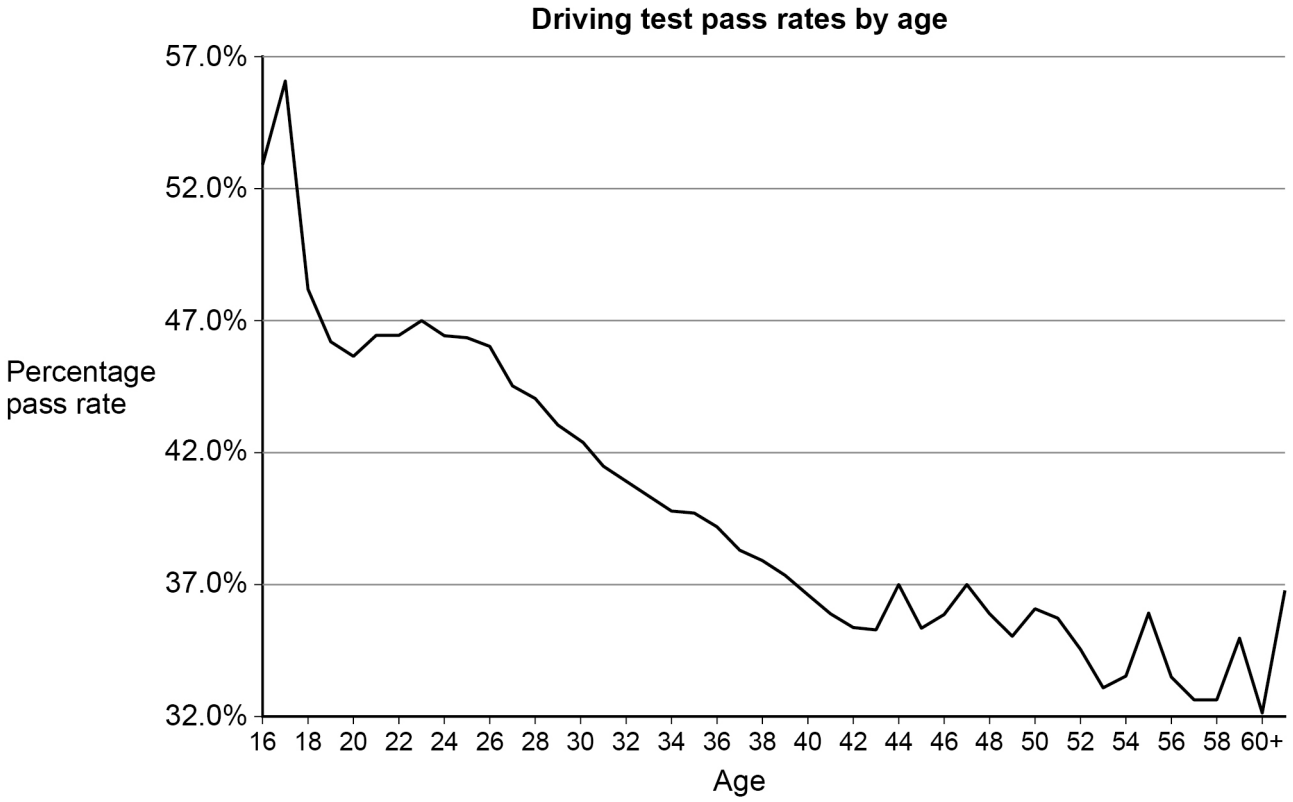
[1 mark]

stratification systematic quota random

4

Do not write outside the box

5 The graph shows the percentage pass rate for UK driving tests at different ages.



Source: PassMeFast

5 (a) Estimate the percentage chance that a 34-year-old will pass their test.

[1 mark]

Answer _____ %

5 (b) Betty says that the older you are the less likely you are to pass your test.

Evaluate Betty's statement, giving evidence both for and against.

[2 marks]

For _____

_____

_____

Against _____

_____

_____

3

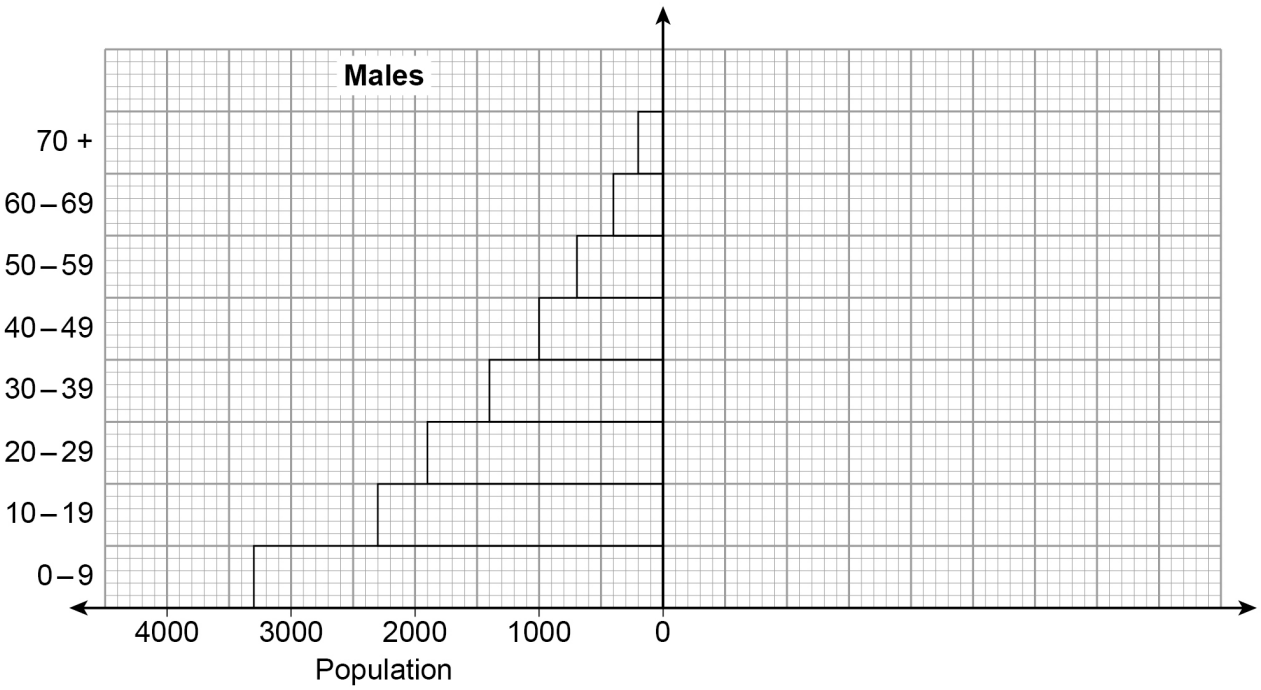
Turn over ►

Do not write outside the box

6 Luton is an industrial town.

The population pyramid shows the number of males living in Luton in **1851**.

The population values are rounded to the nearest hundred.



Source: Adapted from visionofbritain

The table shows the number of **females** living in Luton in 1851.

Age group	Population (to nearest hundred)
0 to 9	3200
10 to 19	3300
20 to 29	3000
30 to 39	1800
40 to 49	1100
50 to 59	800
60 to 69	500
70 +	300

6 (a) Complete the population pyramid to show the number of females living in Luton in 1851.

[3 marks]

Do not write outside the box

6 (b) The table shows the number of males and females in the **20 to 29** age group living in Luton in **1961**.

Number of males	Number of females
9497	8967

Source: Adapted from visionofbritain

Make **two** distinct comments on how the numbers of males and females in the 20 to 29 age group are different in 1961 compared with in 1851.

[2 marks]

Comment 1 _____

_____

_____

Comment 2 _____

_____

_____

5

Turn over for the next question

Do not write outside the box

7 Natalie is selling her house.

At a selling price of £135 000, she is advised that the house would definitely sell within one month.

For each additional £1000 on the asking price, the risk of **not** selling within any one month increases by 0.05

7 (a) Natalie wants £150 000 for her house.

7 (a) (i) At £150 000, what is the risk that she will **not** sell her house within one month?

[2 marks]

Answer _____

7 (a) (ii) At £150 000, what is the risk that she will **not** sell her house within two months?

[2 marks]

Answer _____

7 (a) (iii) What assumption did you have to make in answering **part (a)(ii)**?

[1 mark]

Do not write outside the box

7 (b) (i) Using the information given, what is the minimum price for which the house will apparently **never** sell?

[2 marks]

Answer £ _____

7 (b) (ii) Give a reason why the house may actually sell at this minimum price.

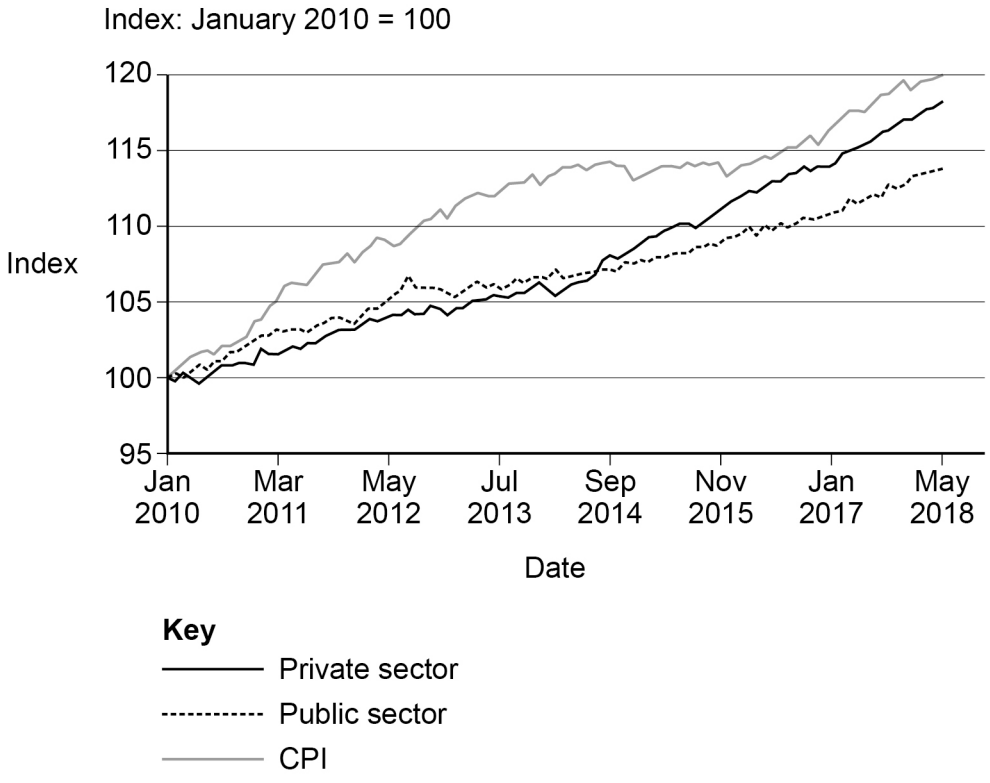
[1 mark]

8

Turn over for the next question

Do not write outside the box

8 The graph shows changes in private and public sector pay and the Consumer Price Index (CPI).



Source: ONS

8 (a) What does CPI measure?

[1 mark]

8 (b) By what percentage, approximately, did public sector pay increase between Jan 2010 and May 2012?

Circle your answer.

[1 mark]

4 5 104 105

Do not write outside the box

8 (c) Compare the changes in public sector and private sector pay between Jan 2010 and May 2018.

[2 marks]

8 (d) Jim says,

> "The index number for CPI is 120 to the nearest whole number for May 2018 with Jan 2010 as base.
>
> So the index number for CPI for Jan 2010 with May 2018 as base will be 80 to the nearest whole number."

Evaluate **all** of Jim's statement.

Use calculations, where necessary, to show if he is correct.

[3 marks]

7

Turn over for the next question

Do not write outside the box

9 (a) Here are the descriptions of some sets of data.

Draw a line to match each description with the type of data.

The first one has been completed for you.

[2 marks]

Description	Type of data
How likely students are to recommend studying GCSE Statistics. eg Very unlikely, unlikely, likely or very likely	Qualitative
Age group people are in. eg 11 – 12, 13 – 14, 15 – 16 or 17 – 18	Ordinal
People's eye colour. eg Blue, brown, green, hazel or other	Bivariate
Age and value of cars. eg £12 500 and 3 years old	Categorical

9 (b) Name the type of data that matches this description.

[1 mark]

A doctor collects patient data including: blood pressure, weight, height, cholesterol and diet.	_____

3

Do not write outside the box

10 Bob uses an alarm clock to wake him up on days he travels to work.

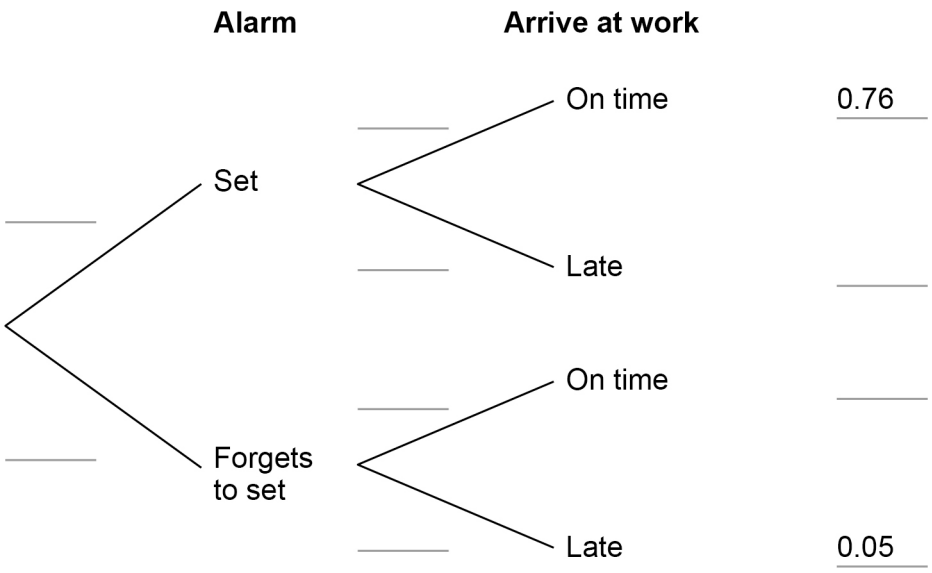
The probability that he remembers to set his alarm is four times more than the probability he forgets to set it.

The probability that he sets his alarm **and** then is on time for work is 0.76

The probability that he forgets to set his alarm **and** then is late for work is 0.05

10 (a) Complete the tree diagram below.

[4 marks]



10 (b) Bob travels to work on 225 days per year.

On how many days would he expect to be late for work?

[3 marks]

Answer _____ days

7

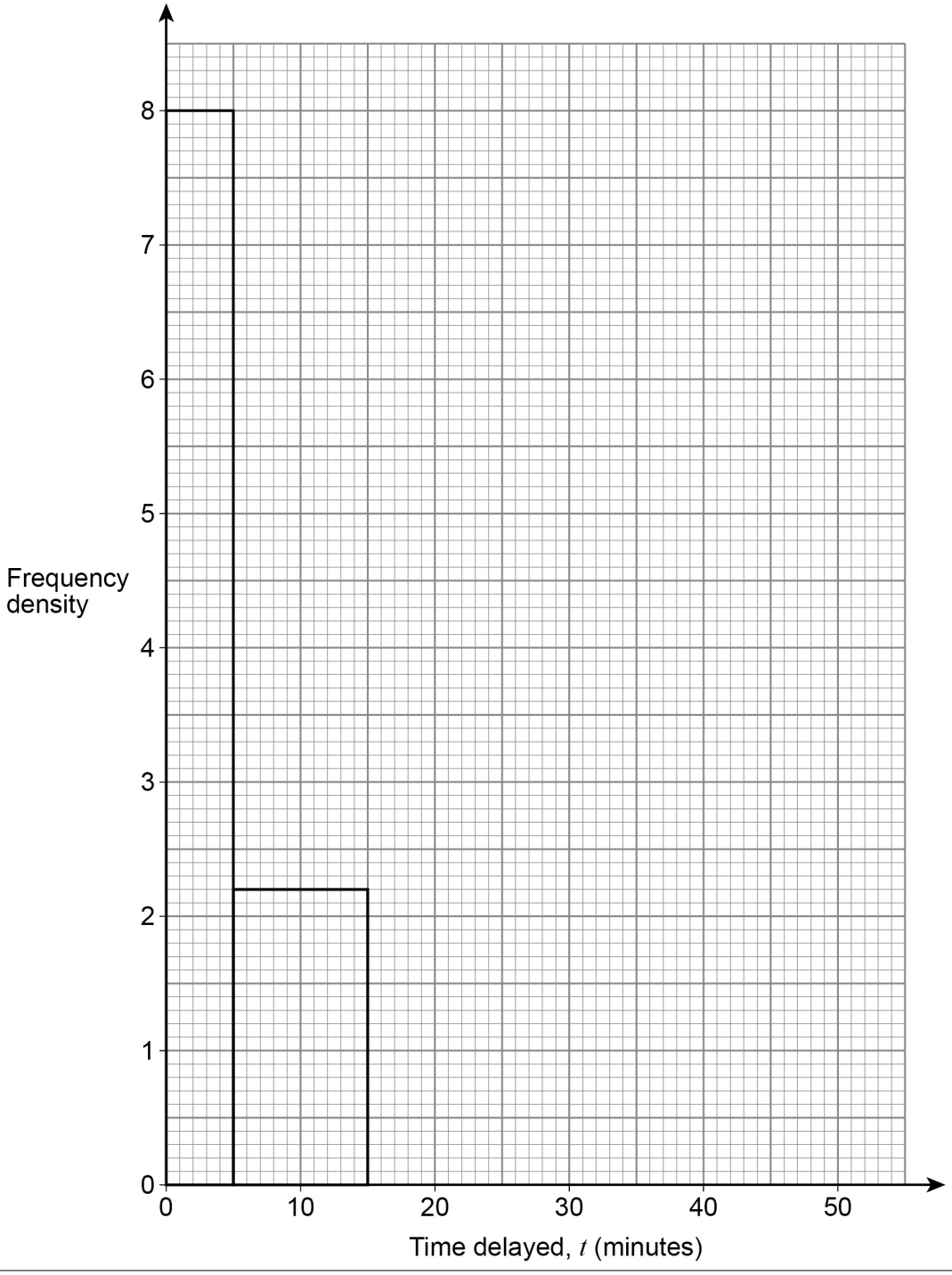
Turn over for the next question

Do not write outside the box

11 The table shows, for one train company, some data about the amount of time by which 100 trains were delayed.

Time delayed, t (minutes)	Frequency
$0 < t \leqslant 5$	40
$5 < t \leqslant 15$	22
$15 < t \leqslant 20$	18
$20 < t \leqslant 30$	8
$30 < t \leqslant 50$	12

Here is a partly completed histogram for the data in the table.



Do not write outside the box

11 (a) Complete the histogram.

[3 marks]

11 (b) By using the histogram or the table, calculate an estimate for the median value.

[3 marks]

Answer _____ minutes

11 (c) Give a reason why the data does **not** necessarily show that the train company is performing badly.

[1 mark]

7

Turn over for the next question

Do not write outside the box

12 Large car parks often have signs indicating the number of spaces available.

Councils can collect these data to judge whether they have enough car parks.

Negan, a council worker, records data hourly from 8 am to 5 pm about the spaces available in the main city centre car park.

The car park has 800 spaces.

Number of hours after 8 am	0	1	2	3	4
Spaces available	632	176	34	8	0

Number of hours after 8 am	5	6	7	8	9
Spaces available	0	0	25	106	447

12 (a) Estimate the **percentage** of this car park's spaces available at 9.30 am.

You **must** show your working.

[2 marks]

Answer _____ %

12 (b) The Product Moment Correlation Coefficient (PMCC) is calculated for the 5 data pairs in the top table and separately for the 5 data pairs in the bottom table.

By looking at patterns in the data, use **one** of the values listed below to complete each statement.

[2 marks]

1.25	0.831	0	–0.016	–0.845

The PMCC for the top table is _____

The PMCC for the bottom table is _____

Do not write outside the box

12 (c) Interpret your answers to **part (b)** in context.

[2 marks]

The PMCC for the top table shows _____

_____

_____

The PMCC for the bottom table shows _____

_____

_____

12 (d) Lucille looks at the data and says,

"This car park is full for most of the day which shows there are not enough car parks."

Criticise both parts of her statement.

[2 marks]

"This car park is full for most of the day…" _____

_____

_____

"…which shows there are not enough car parks." _____

_____

_____

8

Turn over for the next question

Do not write outside the box

13 Miss Peng sets a practice exam for her students.

There are three papers, each of which has a different weighting.

The table shows the marks scored by Anneka and the weighting for each paper.

Paper	Weighting	Mark
1	60	82
2	40	59
3	20	26

13 (a) Calculate the weighted mean of Anneka's marks.

[3 marks]

Answer _____

13 (b) Adam has recently joined the school.

Miss Peng decides to compare Adam's performance to the rest of the class.

She calculates his standardised scores for each paper using the formula,

$$\text{Standardised score} = \frac{(\text{value} - \text{mean})}{\text{standard deviation}}$$

Do not write outside the box

13 (b) (i) In Paper 1, Adam scored 58 marks.

The class mean was 56 marks and the standard deviation was 10 marks.

Calculate Adam's standardised score for Paper 1.

[2 marks]

Answer _____

13 (b) (ii) Adam's standardised scores for Papers 2 and 3 were 0 and –0.3 respectively.

Which of the three papers did he perform best on?

Tick (✓) a box and give a reason for your answer.

[1 mark]

Paper 1 ☐ Paper 2 ☐ Paper 3 ☐

Reason _____

6

Turn over for the next question

Do not write outside the box

14 A professor believes that young people have faster reaction times if they listen to their favourite song whilst having their reaction time measured.

She sets up an experiment in which students hit a button when they see a light.

- Group A students do the experiment without listening to music
- Group B students do the experiment whilst listening to their favourite song

14 (a) What is the statistical name for Group A?

[1 mark]

Answer _____

14 (b) The professor considers two ways of setting up the experiment.

Method 1 Ask for volunteers and randomly allocate them to Group A or Group B.

Method 2 Ask for volunteers and allow them to choose which Group to be in.

Make **one** comment about each method.

[2 marks]

Method 1 _____

_____

_____

Method 2 _____

_____

_____

Do not write outside the box

14 (c) The professor decides to use **Method 1**

14 (c) (i) Name **one** possible extraneous variable in this experiment.

[1 mark]

14 (c) (ii) Give **one** way that the effects of the variable you identified in **part (c)(i)** could be controlled.

[1 mark]

5

Turn over for the next question

Do not write outside the box

15 You will need the **Data Sheet** to answer this question.

Shoab is a Year 11 student in a school which has a large Sixth Form.

He thinks the A-level results in Maths at his school are good.

He decides to investigate how they compare with national results.

15 (a) Write down a suitable hypothesis Shoab could use to investigate this.

[1 mark]

15 (b) His school has had a Sixth Form since 1997 so he decides to look at results for every second year starting in 1999.

Comment on his decision to use sampling rather than taking a census in this situation.

[2 marks]

15 (c) He calculates the proportion of students getting an A or A* grade in A-level Maths for his school.

Here are his results.

Year	Proportion
1999	0.69
2001	0.58
2003	0.46
2005	0.56

Year	Proportion
2007	0.47
2009	0.51
2011	0.63
2013	0.50

Year	Proportion
2015	0.44
2017	0.42
2019	0.37
Mean	**0.51**

The mean of these sample proportions is 0.51 (to 2 decimal places).

Here are some correct proportions for Shoab's school,

X = The true proportion of students getting an A or A* in A-level Maths for **all years** 1999 to 2019 is 0.48 (to 2 decimal places).

Y = The true proportion of students getting an A or A* in A-level Maths for the years for which Shoab collected data (1999, 2001, 2003,…, 2019) is 0.49 (to 2 decimal places).

Do not write outside the box

15 (c) (i) Give **one** reason why the value for **X** is different to 0.51

[1 mark]

15 (c) (ii) Give **one** reason why the value for **Y** is different to 0.51

Your reason should be different from that used in your answer to **part (c)(i)**.

[1 mark]

Question 15 continues on the next page

Do not write outside the box

15 (d) Shoab then uses the Internet to source information about national results achieved at A-level Maths.

He finds information for the years 2003 – 2016.

These data are on the **Data Sheet**.

15 (d) (i) Use Shoab's data for his school and the national data on the **Data Sheet** to complete a back-to-back stem and leaf diagram for A and A* grades for A-level Maths results.

You should only include data for years where **both** figures for his school and the national results are available, ie 2003, 2005 and so on.

[5 marks]

Do not write outside the box

15 (d) (ii) Compare statistically the school data and the national data.

In your answer you will need to calculate and compare appropriate measures and discuss any trends you note.

[6 marks]

15 (e) Describe **one** issue which may affect the validity of any conclusions made.

[1 mark]

17

END OF QUESTIONS

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Copyright information

For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from www.aqa.org.uk.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team.

Copyright © 2022 AQA and its licensors. All rights reserved.