

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 2

Tuesday 16 June 2020

Morning

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- 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	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
TOTAL	



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

1 Vanessa measures the height and mass of 12 children.

Circle the name given to the type of data she has collected.

[1 mark]

bivariate

qualitative

discrete

categorical

1

2 A set of 16 data values, x , has,

$$\sum (x - \bar{x})^2 = 36$$

Circle the standard deviation of the data.

Use,

$$\text{standard deviation} = \sqrt{\frac{1}{N} \sum (x - \bar{x})^2}$$

[1 mark]

0.375

1.5

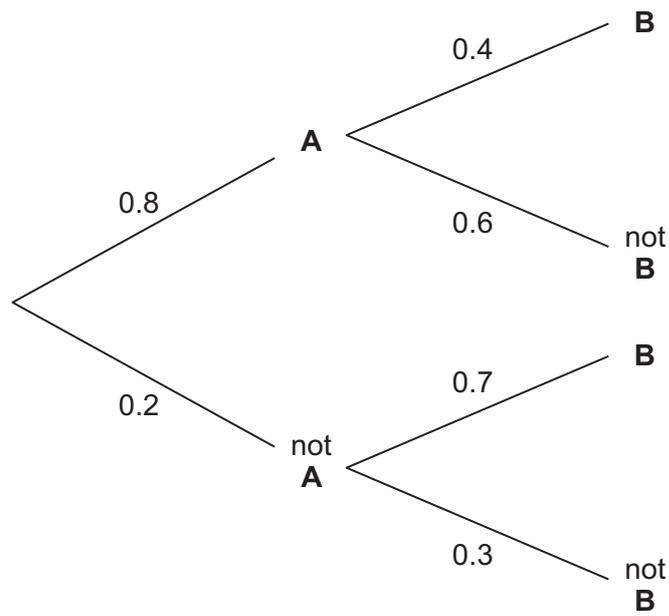
2.25

6

1



- 3** The tree diagram shows some probabilities relating to events A and B.



- 3 (a)** Circle the probability of B **given** A.

[1 mark]

0.32 0.4 0.42 0.5

- 3 (b)** Circle the probability of B **and** not A.

[1 mark]

0.9 0.7 0.14 0.06

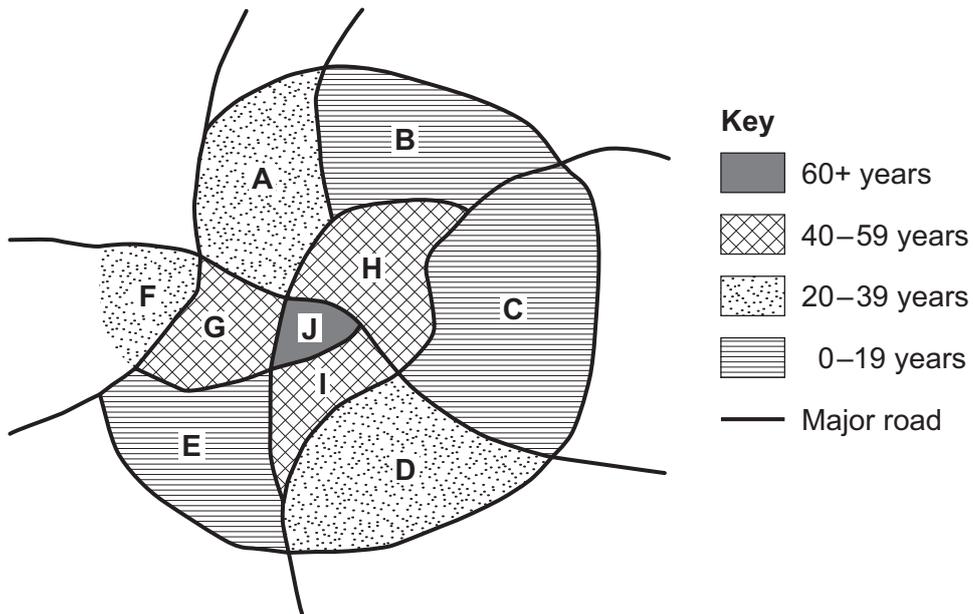
2

Turn over for the next question

Turn over ►



4 The diagram shows the map of a town.
The **modal** age of buildings in each region of the town is shown.



4 (a) Circle the modal age of the buildings in **region F** of this town.

[1 mark]

- 0–19 years 20–39 years 40–59 years 60+ years

4 (b) The oldest building in the town was built in 1847.

Ahmed says that this building is in region J.

Is Ahmed correct?

Tick (✓) a box.

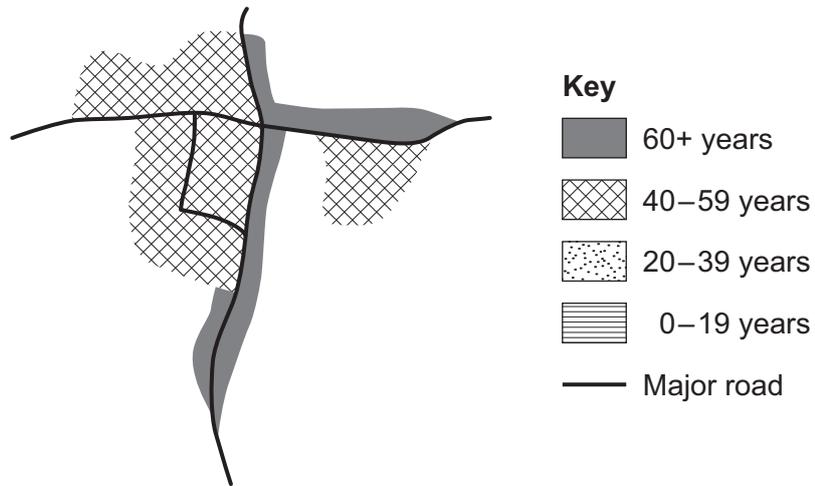
Yes No Cannot tell

Give a reason for your answer.

[1 mark]



4 (c) The diagram below shows the **modal** age of buildings in a neighbouring village.



Compare the age of buildings in the village with the age of buildings in the town.

[1 mark]

3

Turn over for the next question

Turn over ►



5 A town council is considering reducing the opening hours of the local library.
Grace and Alex want to find out how people living in the town feel about this.

5 (a) Grace decides to ask people as they leave a supermarket in the town at different times one week.

She collects data from,

30 males and 30 females aged 40 years and under

30 males and 30 females aged 41 years and over.

5 (a) (i) What is the name given to this type of sampling?

[1 mark]

Answer _____

5 (a) (ii) Give **two** different reasons why her sample may be unreliable.

[2 marks]

Reason 1 _____

Reason 2 _____



The town has 8000 houses.

Alex decides to obtain a sample of 120 of these houses using random sampling.

5 (b) Explain how Alex can use a list of random numbers to select his sample.

[3 marks]

5 (c) Alex plans to interview one person face-to-face from each house he samples.

5 (c) (i) Write down **one** problem that he could have when he tries to carry out the interviews.

[1 mark]

5 (c) (ii) Write down **one** way that he could overcome the problem you wrote down in **part (c)(i)**.

[1 mark]

8

Turn over for the next question

Turn over ►



- 6** The tables show the **mean** number of portions of fruit and vegetables eaten per day by children and adults of different ages and gender in England.

Children

	Age (years)				
	5–7	8–10	11–13	14–15	All ages
Females	3.3	3.2	3.5	3.2	3.3
Males	3.3	3.5	3.1	2.9	3.2
All children	3.3	3.4	3.3	3.0	3.2

Adults

	Age (years)							
	16–24	25–34	35–44	45–54	55–64	65–74	75+	All ages
Females	3.2	3.8	3.7	3.7	3.8	3.9	3.4	3.7
Males	2.6	3.4	3.6	3.4	3.5	3.9	3.6	3.4
All adults	2.9	3.6	3.7	3.6	3.7	3.9	3.5	3.5

Source: Adapted from *Health Survey for England*, 2015

- 6 (a) (i)** Compare the amount of fruit and vegetables eaten by males **aged 14–15** with the amount eaten by females of the same age.

[1 mark]

- 6 (a) (ii)** Write **two** comparisons of the amount of fruit and vegetables eaten by different ages of **adults**.

[2 marks]

Comparison 1 _____

Comparison 2 _____



Natalie wants to investigate how many portions of fruit and vegetables students in her year group at school eat.

The table shows the number of students of each gender in her year group.

Gender	Number
Males	99
Females	121

Natalie decides to interview a sample of 40 students.

She decides to **stratify** by gender.

6 (b) Explain why it is sensible for Natalie to stratify by gender.

[1 mark]

6 (c) Show that Natalie should select 18 male students from her year group.

[2 marks]

6 (d) Natalie's friend suggests she should interview students in her year group eating school dinners.

Explain why this could give biased results.

[1 mark]

Question 6 continues on the next page

Turn over ►

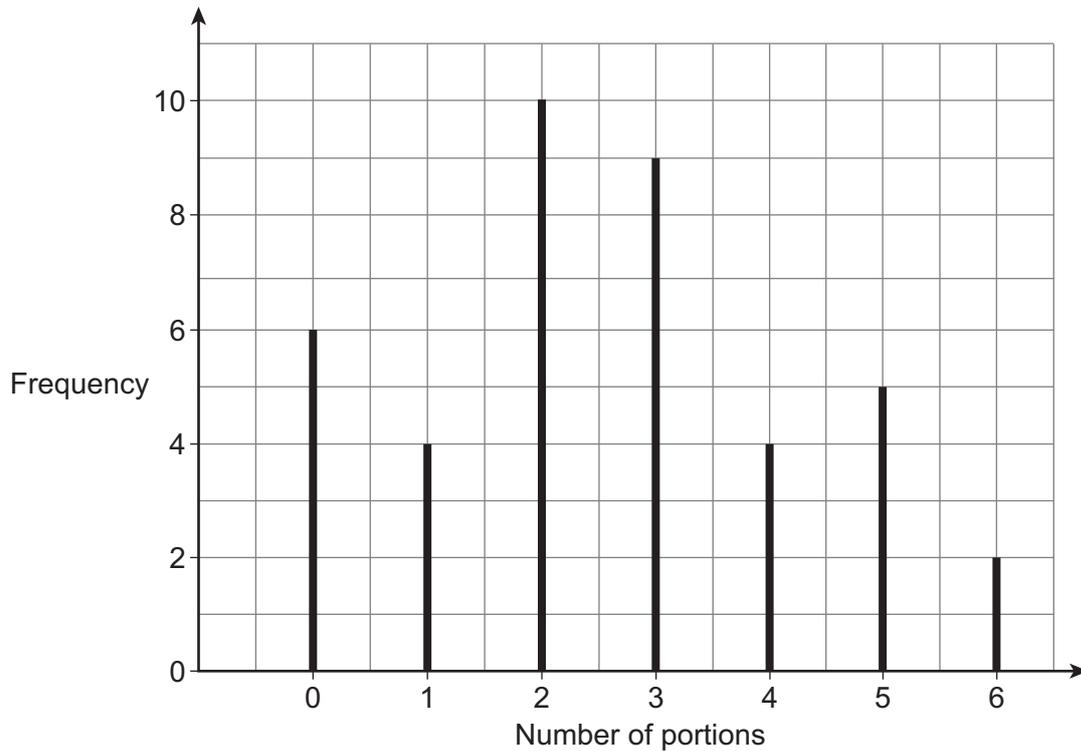


Natalie decides to select 18 male students and 22 female students at random from her year group.

She asks each student,

“How many portions of fruit and vegetables did you eat yesterday?”

The bar line graph shows the number of portions of fruit and vegetables eaten by the 40 students in her sample.



It is recommended that everyone should eat at least 5 portions of fruit and vegetables every day.

- 6 (e)** Calculate an estimate of the percentage of students in Natalie’s year group that ate at least 5 portions.

[2 marks]

Answer _____ %



Students in Natalie's year are aged **14–15 years**.

6 (f) Compare the number of portions of fruit and vegetables eaten by students in Natalie's year with the corresponding figure for England.

You should,

- use the information from the bar line graph on page 10 and the information from the table on page 8
- calculate an appropriate average.

[5 marks]

6 (g) Suggest **two** things that Natalie could have done to make her comparison more reliable.

[2 marks]

Suggestion 1 _____

Suggestion 2 _____



- 7** A small pottery factory has two designers, Lucy and William.
The factory makes three types of pottery: vases, jugs and teapots.

The table shows some information about the number of items of pottery made in 2018 by each designer.

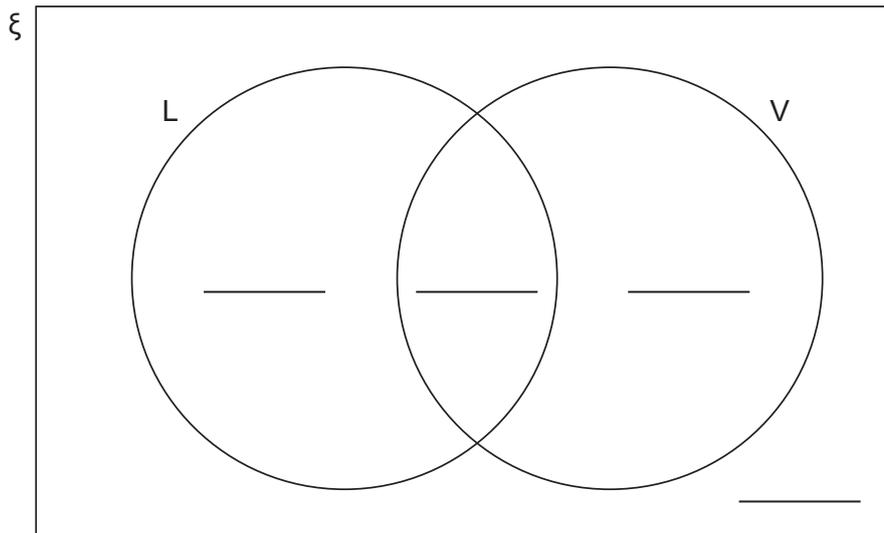
	Vases	Jugs	Teapots	Total
Lucy	325	115	40	480
William	250	145	95	490
				970

- 7 (a)** Use the information in the table to complete the Venn diagram for these items.

ξ = 970 items of pottery made by Lucy and William

L = Number of items of pottery made by Lucy

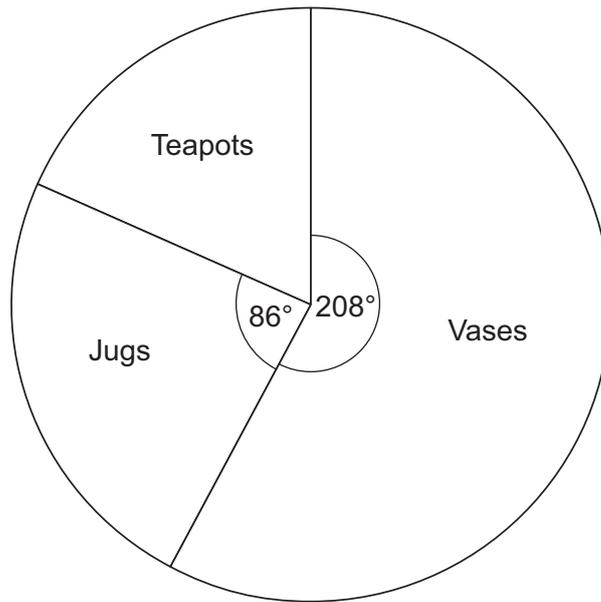
V = Number of vases made



[3 marks]



7 (b) The pie chart represents the items of pottery made by William in **2019**.



William made 312 Vases in 2019.

Did William make more **teapots** in 2019 than in 2018?

You **must** show your working.

[3 marks]

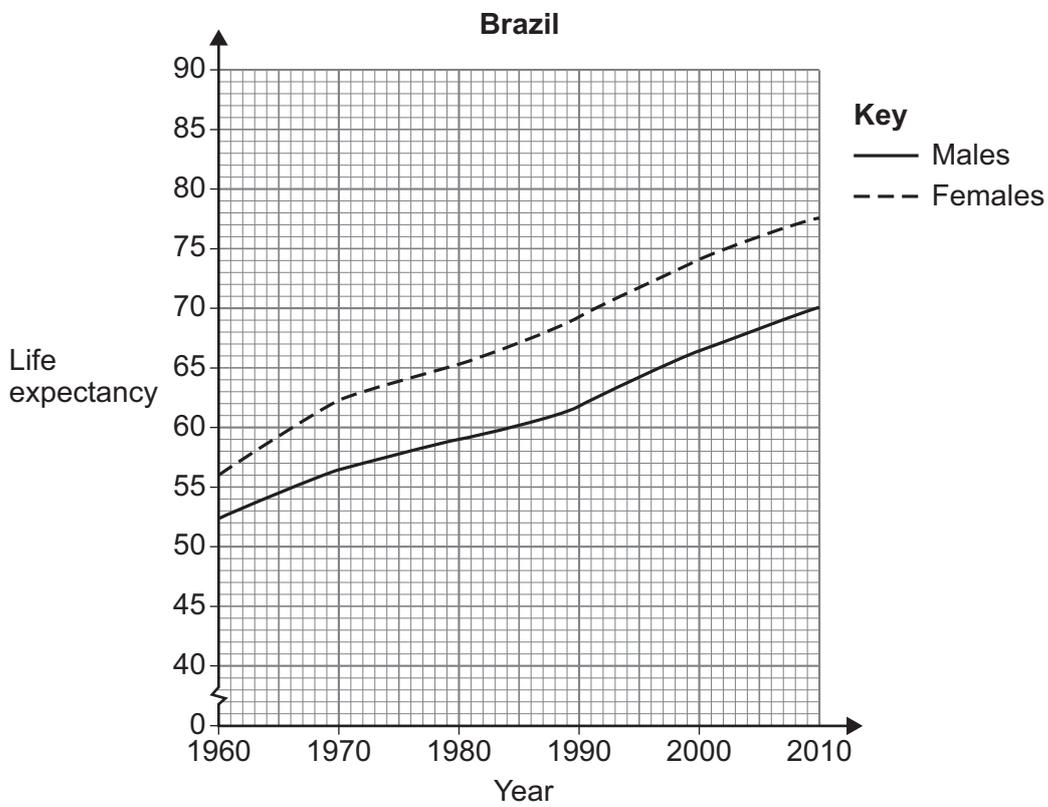
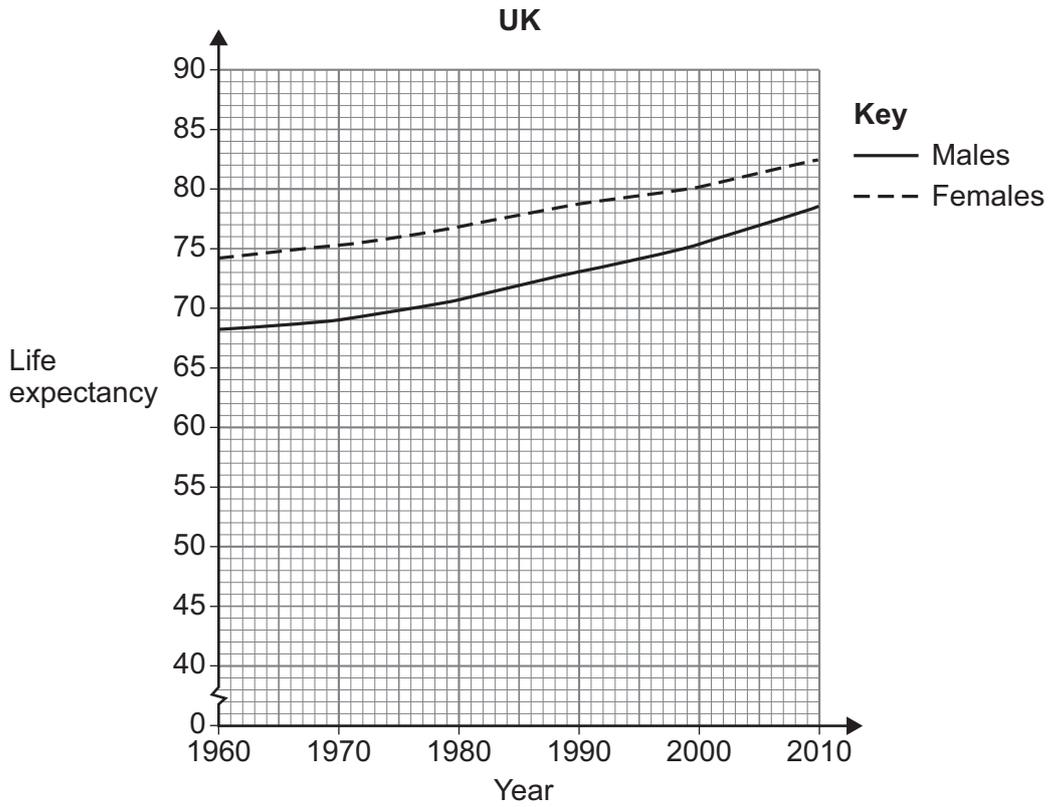
6

Turn over for the next question

Turn over ►



8 The line graphs show the life expectancy at birth of males and females in the UK and in Brazil.



Source: data.worldbank.org



- 9** The table shows some of the index numbers for the average prices of houses in different countries of the UK in 2015, 2016 and 2017.

The base year is 2015.

The table also shows the weightings.

Country	2015	2016	2017	Weighting
England	100	100.4	105.7	84
Wales	100	101.7	105.2	4
Scotland	100	101.6	100.6	10
Northern Ireland	100	99.3	103.4	2

Source: adapted from ONS

- 9 (a)** Explain why the weighting for England is greater than the weightings for the other countries of the UK.

[1 mark]

- 9 (b)** The average price of a house in **Wales** in 2016 was £177 000

Calculate the average price of a house in Wales in **2017**.

[3 marks]

Answer £ _____



- 9 (c)** Calculate a weighted index number for the price of houses in the whole of the UK in **2017**, using 2015 as the base year.

[3 marks]

Answer _____

- 9 (d)** The table below shows the average price of a house in London in 2015 and 2017.

2015	£499 000
2017	£543 000

A newspaper claims that the average price of a house in London has increased by a greater percentage between 2015 and 2017 than houses in the UK as a whole.

Comment on the newspaper's claim.

You **must** show your working.

[2 marks]

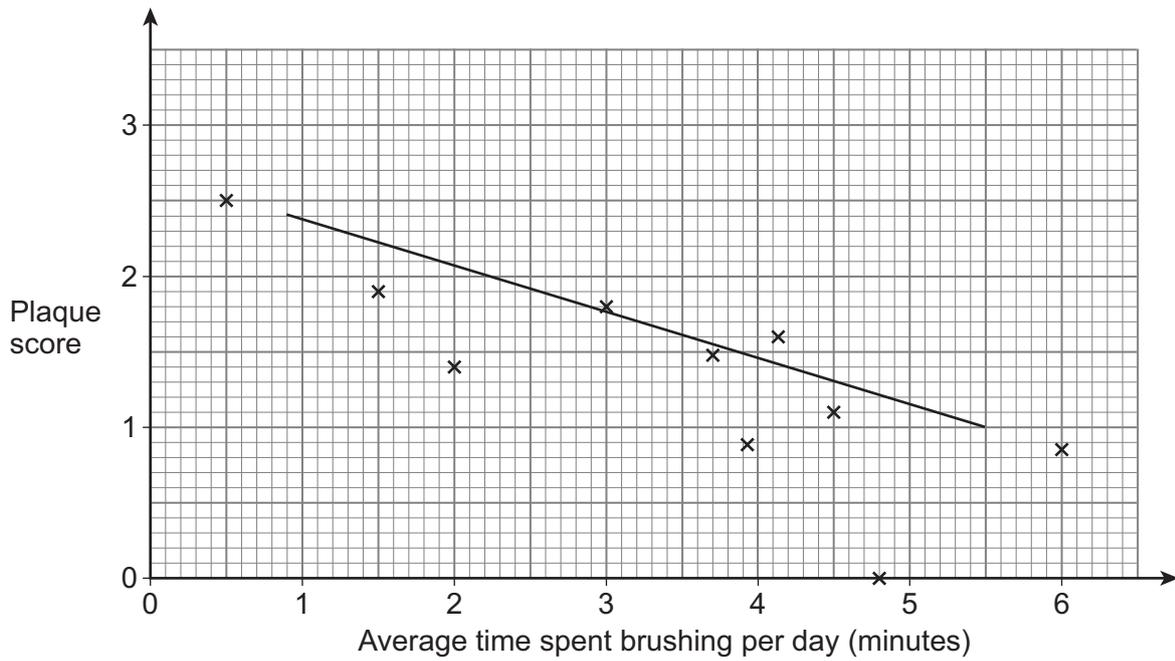
9

Turn over for the next question

Turn over ►



10 (c) He draws this scatter diagram to show the data he collects and adds a line of best fit.



Write down **two** different problems with Tim's line of best fit.

[2 marks]

Problem 1 _____

Problem 2 _____

Question 10 continues on the next page

Turn over ►



- 10 (d)** Ellie, another dentist, does the same experiment with some of her patients. She draws a line of best fit on her scatter diagram. The equation of her line is $y = 2.7 - 0.43x$ where,
- y is plaque score
 x is average time spent brushing **per day** (minutes)

- 10 (d) (i)** Ellie suggests that her patients should brush their teeth **twice** a day for an average of 2 minutes each time.

Estimate the plaque score for a patient who follows Ellie's advice.

[2 marks]

Answer _____

- 10 (d) (ii)** Ellie collects her data from 12 patients.

She ranks her data and finds that $\sum d^2 = 520$

Calculate the value of Spearman's rank correlation coefficient.

Use $r_s = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$

[2 marks]

Answer _____



- 10 (e)** Tim collects plaque data for some different patients.
He also asks them to record the average time they spend showering each day.
The Spearman's rank correlation coefficient for his data is -0.76

He concludes,

“People can reduce their plaque score by spending more time in the shower every day.”

Is Tim's conclusion valid?

Tick (✓) a box.

Yes

No

Give a reason for your answer.

[1 mark]

9

Turn over for the next question

Turn over ►



11 (a) In this question you will need to use,

$$\text{flu vaccination rate} = \frac{\text{number receiving vaccine}}{\text{number offered vaccine}} \times 1000$$

The table gives some information about the number of children receiving the flu vaccine in two NHS areas one winter.

NHS area	Number of children offered vaccine	Number of children receiving vaccine	Flu vaccination rate
Greater Manchester	188 500	113 100	
South East		171 800	

[Source: Public Health England]

The flu vaccination rates in Greater Manchester and the South East are equal.

Complete the table.

[3 marks]



All young children are offered the MMR (measles, mumps and rubella) vaccine.
91% of young children in England receive the vaccine.

11 (b) A child minder in England cares for 4 young children.

11 (b) (i) Write down **one** assumption that must be made if the number of these children who receive the MMR vaccine follows a Binomial distribution with probability 0.91

[1 mark]

11 (b) (ii) Assuming this Binomial distribution is appropriate, calculate the probability that **at least** 3 of these 4 children receive the MMR vaccine.

[4 marks]

Answer _____

Question 11 continues on the next page

Turn over ►



- 11 (c)** Lara randomly selects 250 young children attending nursery schools in a city.
230 of these children receive the MMR vaccine.

Lara says,

“Children in this city are more likely to receive the MMR vaccine than children in the whole of England.”

Explain why Lara may **not** be correct.

You **must** show your working.

[2 marks]

10



12 A trout is a type of fish.

Gemma wants to estimate the number of trout living in a lake.

She captures 138 trout from the lake.

She marks these trout and then releases them back into the lake.

The following week she captures a second sample of 95 trout.

She finds that 23 trout from her second sample are marked.

12 (a) (i) Calculate an estimate of the number of trout in the lake.

[3 marks]

Answer _____

12 (a) (ii) Why does Gemma wait one week before she takes her second sample?

[1 mark]

Question 12 continues on the next page

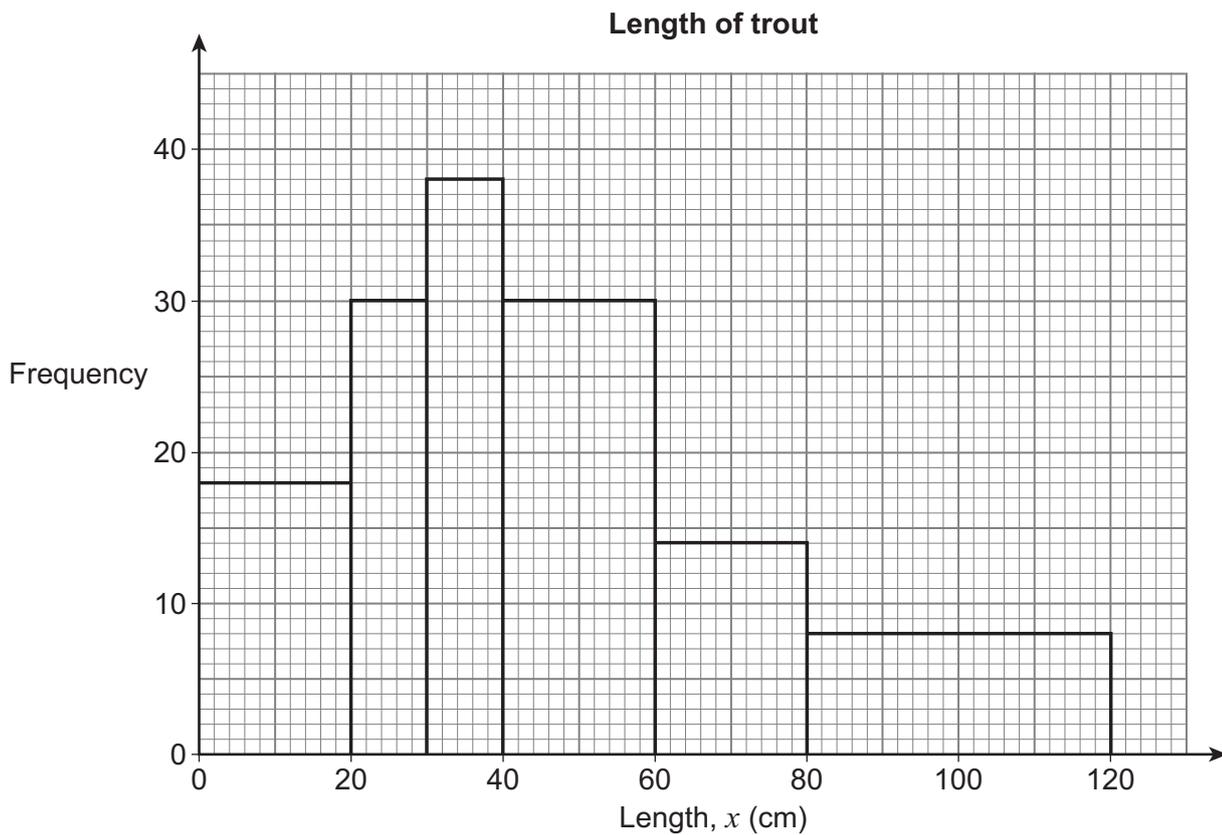
Turn over ►



- 12 (b)** Gemma measured the length of the 138 trout she captured in her first sample. The table gives information about the length of these trout.

Length, x (cm)	Frequency
$0 < x \leq 20$	18
$20 < x \leq 30$	30
$30 < x \leq 40$	38
$40 < x \leq 60$	30
$60 < x \leq 80$	14
$80 < x \leq 120$	8

- 12 (b) (i)** Gemma wants to show her information as a histogram. She draws this diagram.



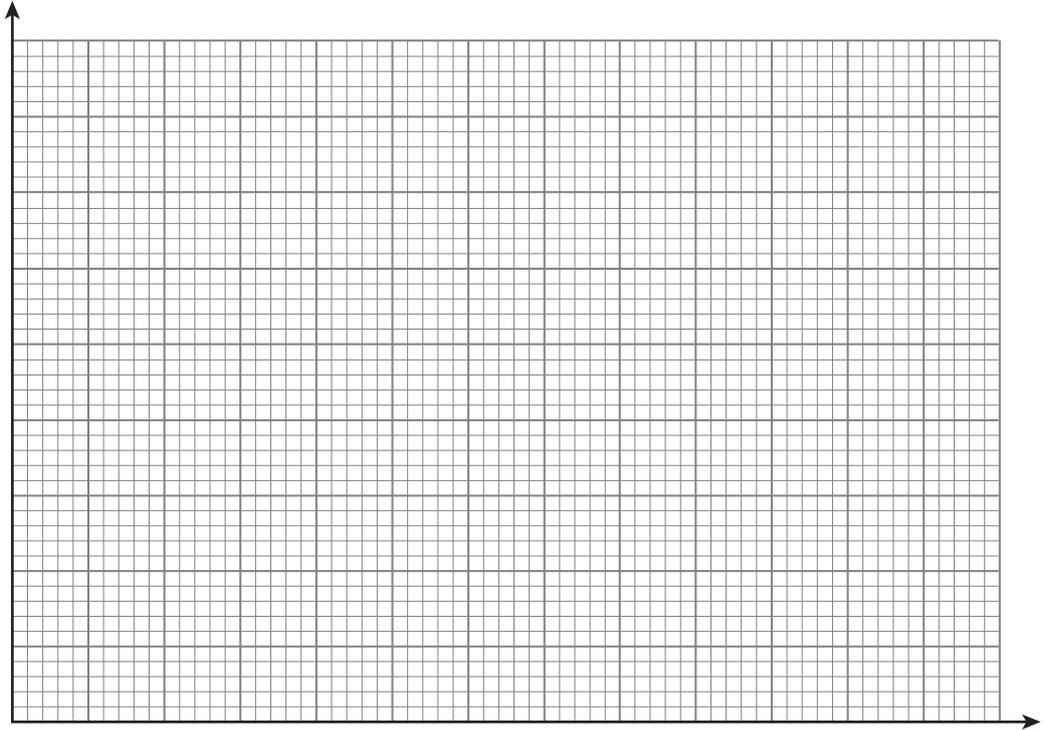
What mistake has Gemma made in drawing her histogram?

[1 mark]



12 (b) (ii) Draw a correct histogram to show Gemma's information.

[4 marks]



12 (b) (iii) What type of skewness is shown in the histogram you drew in part (b)(ii)?

[1 mark]

Answer _____

10

END OF QUESTIONS



There are no questions printed on this page

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



There are no questions printed on this page

*Do not write
outside the
box*

**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 © 2020 AQA and its licensors. All rights reserved.



3 2



2 0 6 G 8 3 8 2 / 2 H

G/Jun20/8382/2H