A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE STATISTICS

H

8382/1H

Higher Tier Paper 1

Time allowed: 1 hour 45 minutes

MATERIALS
For this paper you must have:
- **a calculator**
- **mathematical instruments.**

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

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INSTRUCTIONS

- **Use black ink or black ball-point pen. Draw diagrams in pencil.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do not write 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 through 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.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions in the spaces provided.

1 Two fair spinners, each numbered 1 to 8, are spun.

The numbers they land on are added up.

What is the probability the total is 16? [1 mark]

$\frac{1}{4}$ $\frac{1}{16}$ $\frac{1}{32}$ $\frac{1}{64}$

1

2 Here is the definition of a term used in sampling.

'Those who are actually available to be part of a survey or investigation.'

Circle the term being defined. [1 mark]

sample frame

census

group

population

1

3 Which of these data lists

is bi-modal

AND

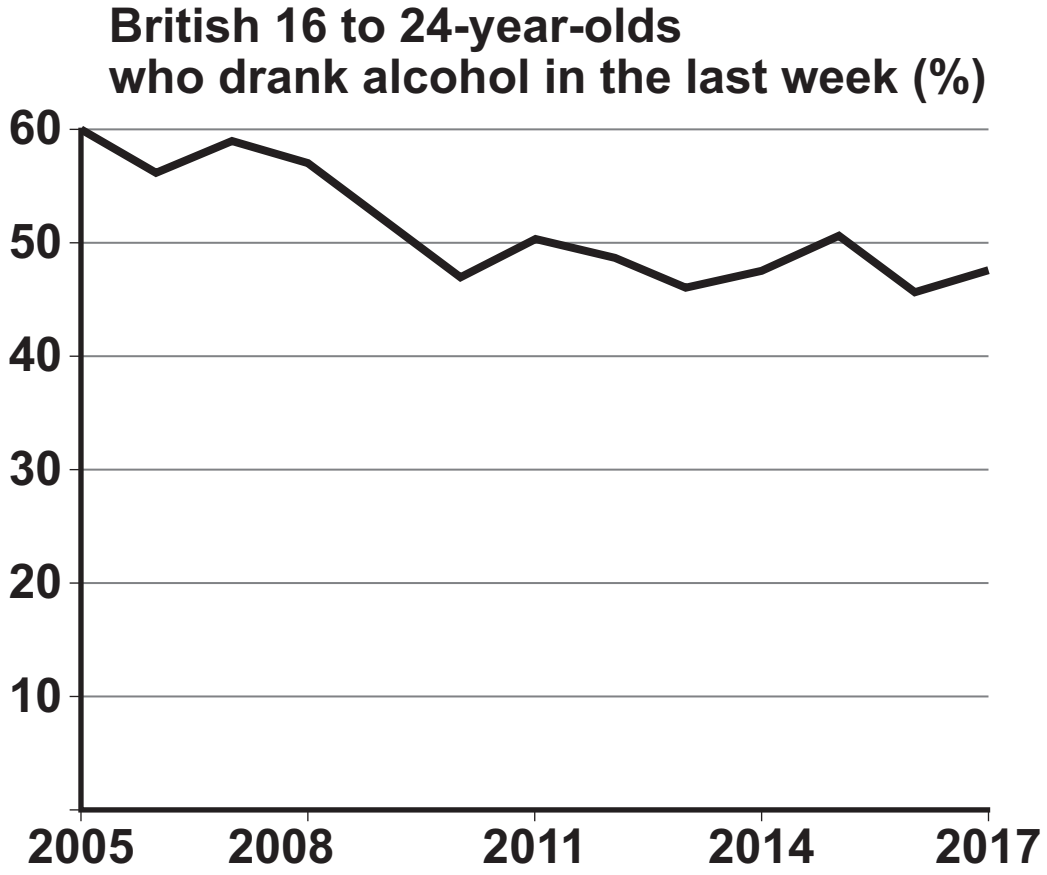
has the mean double the median?

Circle the letter of your answer. [1 mark]

A	4	4	6	6	30
B	2	4	6	6	42
C	0	6	6	24	24
D	0	0	6	6	38

1

4 This graph was seen on the BBC News App.



Source: ONS

Circle the letter of the statement for the graph which is DEFINITELY true. [1 mark]

A 2005 had the highest % of 16 to 24-year-olds drinking since 2000.

B The % of 16 to 24-year-olds drinking has fallen every year from 2005.

C Most 16 to 24-year-olds in 2017 did not drink alcohol in the last week.

D Most 16 to 24-year-olds in 2017 do not drink alcohol at all.

1

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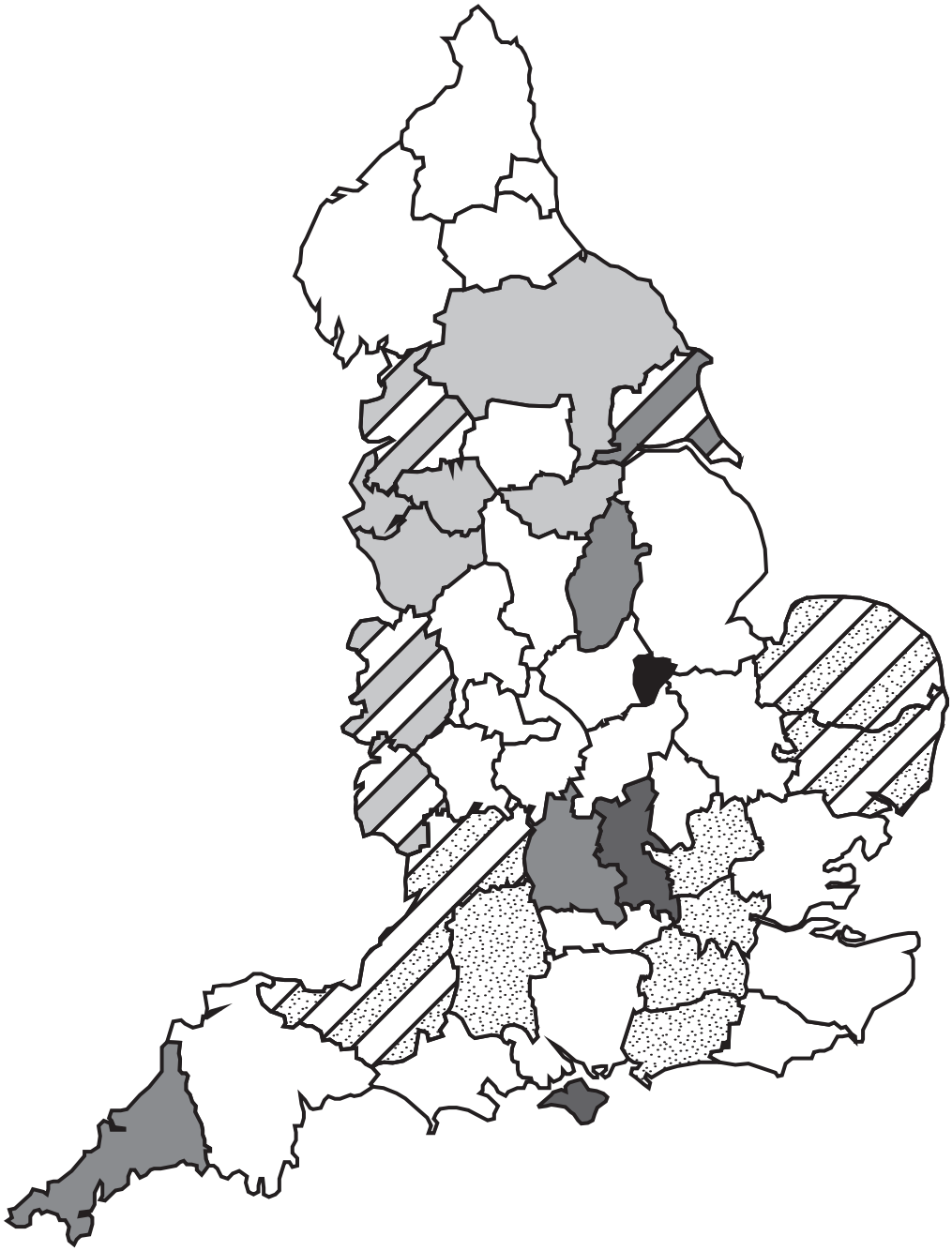
[Turn over]

5 **A sample of 670 adults in England were asked what side order they preferred at fish and chip shops.**

A striped area indicates two equally popular side orders.



KEY:

- Curry sauce
- Gravy
- Ketchup
- Mushy peas
- Mayonnaise or salad cream
- No responses recorded

5 (a) Based on area of land, which is the most popular side order? [1 mark]

Answer _____

5 (b) Give TWO reasons why your answer to PART (a) might not be the side order that most people eating fish and chips in England prefer. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

3

6 Tom is doing a statistical study into the amount of homework received by Year 7 and Year 11 students in his school.

6 (a) Write down a hypothesis Tom could use. [1 mark]

_____

_____

_____

6 (b) State the population of his study. [1 mark]

_____

_____

_____

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[Turn over]

6 (c) **Tom wants a sample of Year 7 students and a sample of Year 11 students to complete a questionnaire for him.**

He considers these three sampling methods for Year 7 students.

METHOD A
Number all the students in Year 7.
Obtain 30 random numbers.
Ask the students whose random numbers come up to complete the questionnaire.

METHOD B
Wait outside the dinner hall.
Ask the first 30 Year 7 students he sees to complete the questionnaire.

METHOD C
Choose three Year 7 students from each of the 10 maths sets.
Ask these students to complete his questionnaire.

Name and compare the merits of each sampling method.

Make a reasoned choice of which method Tom should use. [7 marks]

6 (d) **One of Tom's questions is,**

'How much homework do you receive?'

Write down TWO problems with this question. [2 marks]

Problem 1 _____

_____

_____

Problem 2 _____

_____

_____

6 (e) **Tom improves his questionnaire and collects his data.**

He finds that:

- **on average Year 7 have five hours of homework per week**
- **on average Year 11 have eight hours of homework per week.**

Write a possible conclusion for Tom. [1 mark]

_____

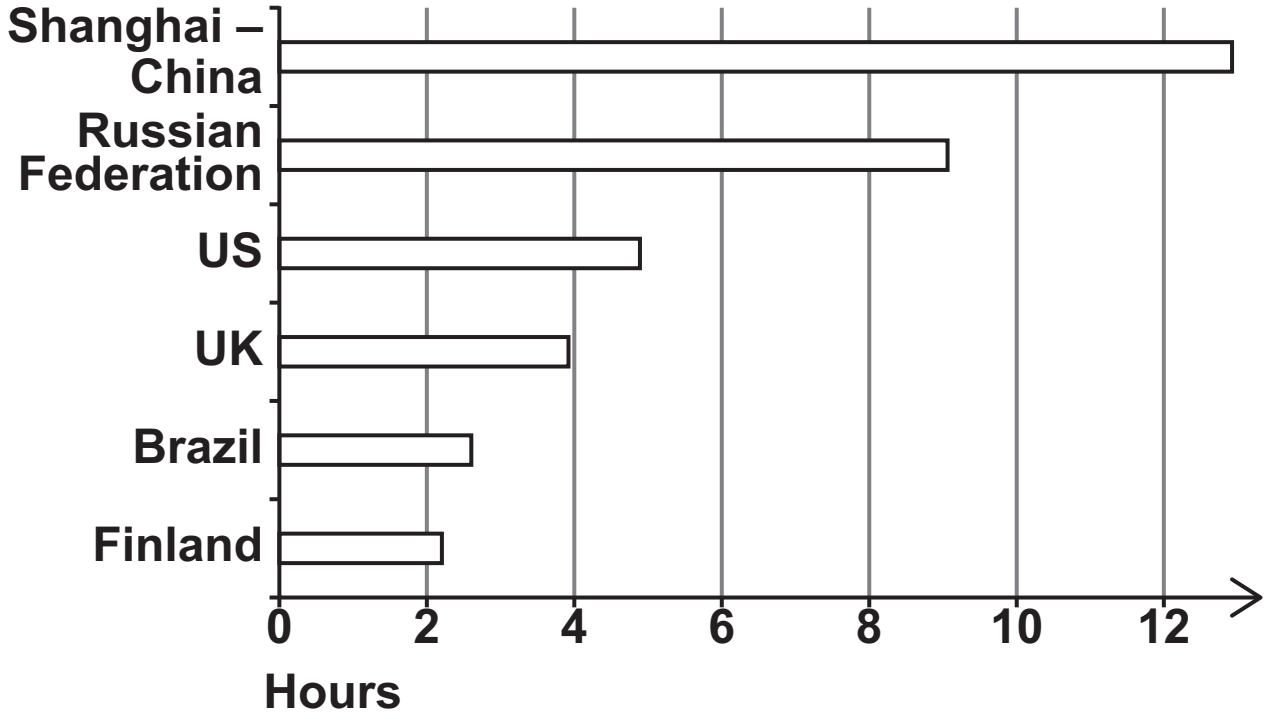
_____

_____

6 (f) Tom wonders how this compares with other schools in the UK and schools in other countries.

He finds this chart on the internet but it has no source.

How much time do 15-year-olds spend on homework?



Use the chart to compare Tom's Year 11 results of an average of 8 hours homework per week with those for other schools in the UK and with other countries. [2 marks]

Tom’s school and other UK schools

Tom’s school and schools in other countries

6 (g) **Why are Tom's data and the internet data not completely comparable? [1 mark]**

_____

_____

_____

6 (h) **Is Tom's data or the internet data more reliable?**

Give a reason for your answer. [1 mark]

_____

_____

_____

16

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[Turn over]

7 **The information below gives the risk of getting lung cancer and how smoking changes that risk.**

LUNG CANCER RISK

Never smoked
Male 0.2%
Female 0.3%

Former smokers
Male 5.4%
Female 2.7%

Current smokers
Male 15.8%
Female 9.6%

Heavy smokers
Male 24.6%
Female 18.6%

Based on a 2009 study

7 (a) How many out of every 1000 women who have NEVER SMOKED are expected to get lung cancer? [2 marks]

Answer _____

7 (b) How many times greater is the risk of getting lung cancer for a man who is a HEAVY SMOKER compared with a man who has NEVER SMOKED? [2 marks]

Answer _____

7 (c) **Give TWO reasons why the information might not be that helpful for someone to estimate their risk of lung cancer now. [2 marks]**

1 _____

_____

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_____

2 _____

_____

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_____

6

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[Turn over]

8 Rachel and Mitch own a café.

They want to decide whether more staff are needed at certain times.

On one day, Rachel records how long customers wait to be served at specific times AFTER 9am.

8 (a) Write down the independent and dependent variables. [2 marks]

Independent variable _____

_____

Dependent variable _____

_____

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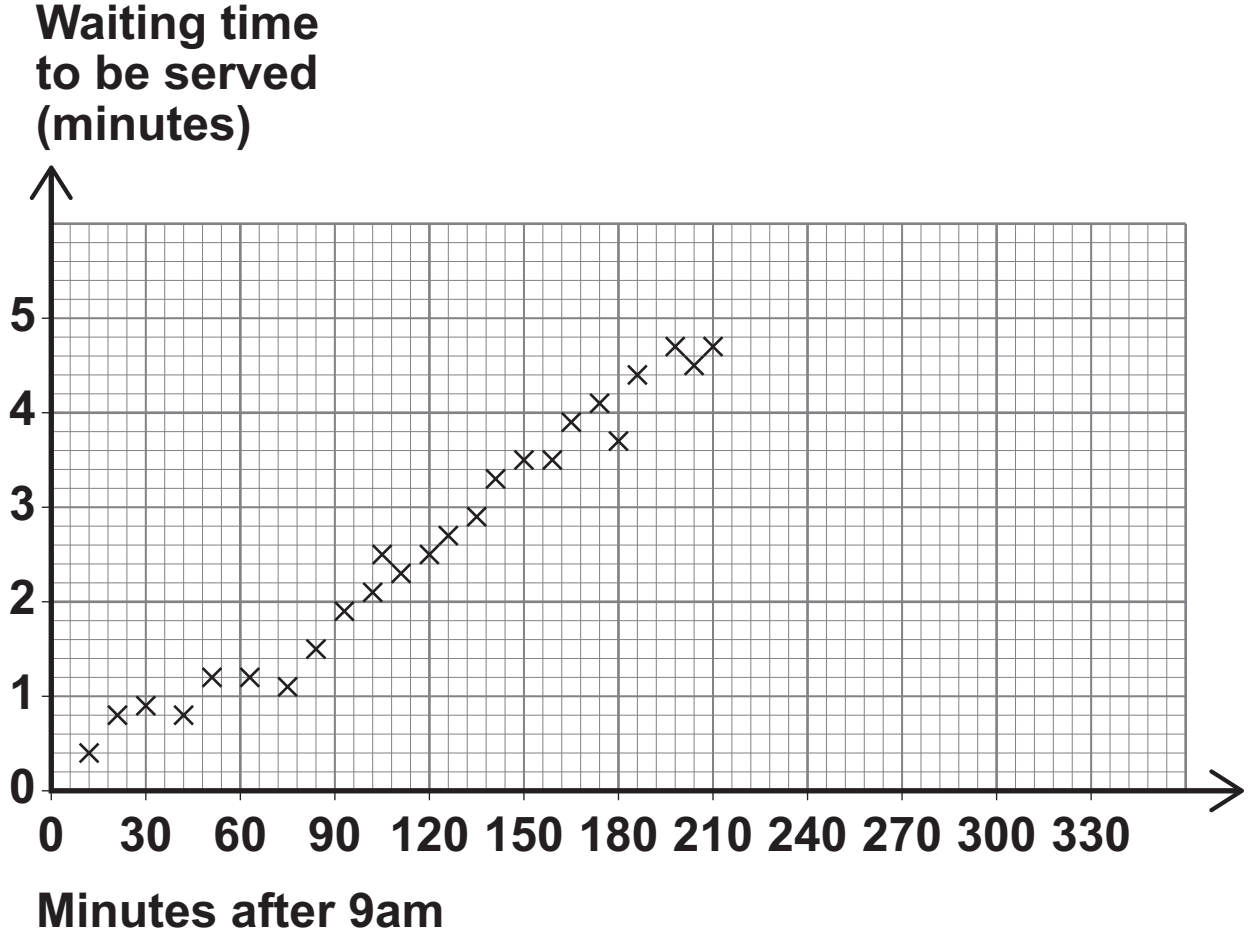
[Turn over]

8 (b) **The scatter diagram shows the results for 25 customers Rachel sampled.**



8 (b) (i) **Which of these is a possible equation for a regression line for the data shown?**

Circle your answer. [1 mark]

$y = -0.06 + 0.689x$ $y = -0.06 + 0.023x$

$y = 4.8 - 0.689x$ $y = 4.8 - 0.023x$

8 (b) (ii) **Here is some information about the results sampled for later in the day.**

- **After 12.30pm but before 1.30pm all five customers sampled waited between 4 and 5 minutes.**
- **From 1.30pm, the six results showed a strong negative correlation.**

On the scatter diagram, show possible results for these additional 11 sampled customers.
[2 marks]

8 (b) (iii) **Mitch decides to employ an extra person for a two-hour time period.**

Which time period would you suggest?
[1 mark]

Answer _____

to _____

[Turn over]

8 (c) **Lucy is a statistician who visits the café.**

She identifies a problem with Rachel's data collection strategy and offers a solution.

Describe the problem and the solution Lucy may have suggested. [2 marks]

Problem _____

_____

_____

_____

_____

Solution _____

_____

_____

_____

_____

8

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[Turn over]

9 **A tech company's website offers rewards according to how many days you visit it.**

The table shows the number of rewards achieved by a sample of 500 customers.

Number of rewards	% of sample
1	52.8
2	27.2
3	10.4
4	7.6
5	2

9 (a) **Show, with working that, for this sample,**

median = interquartile range

[3 marks]

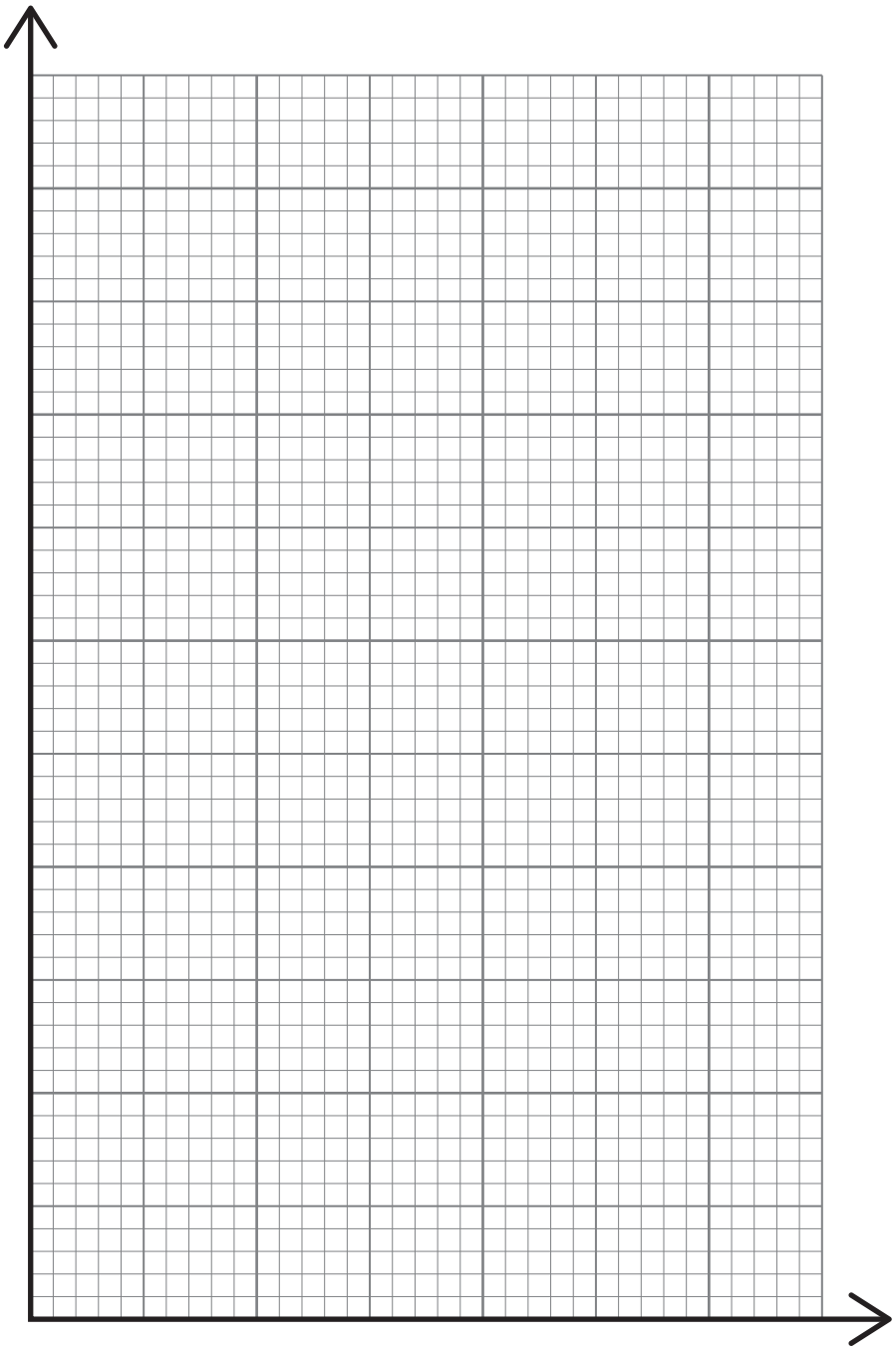
9 (b) **The tech company wants to change the reward system so that**

- **the median number of rewards is increased**
- **the interquartile range is increased.**

They make some changes and take a new sample of 500 customers.

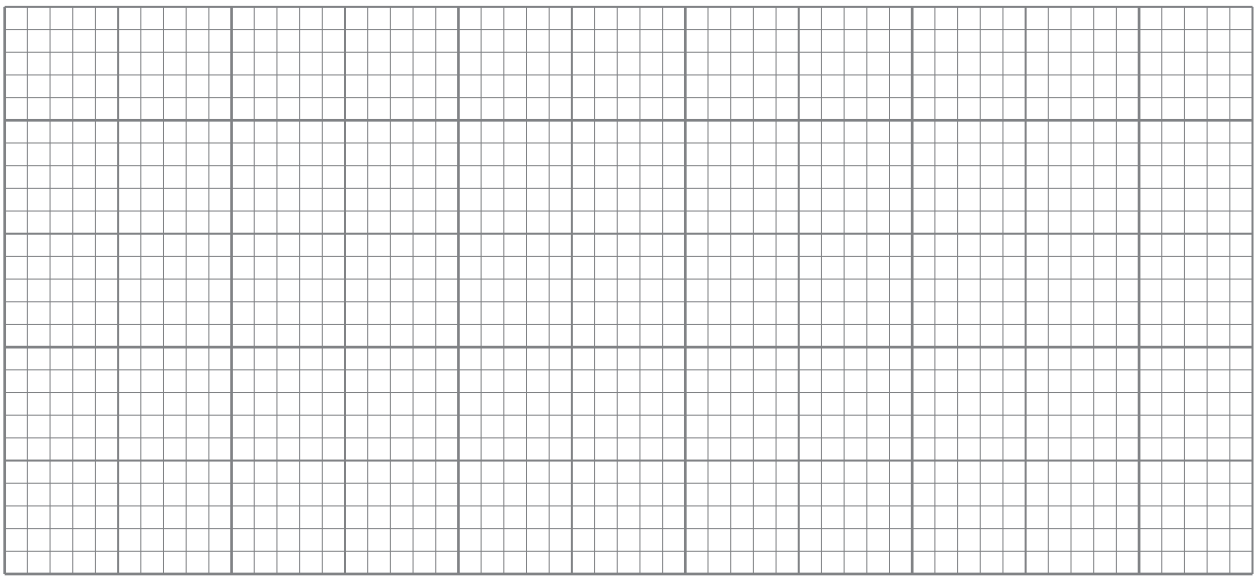
Number of rewards	Number in sample
1	190
2	145
3	90
4	60
5	15

Use the grid to draw an APPROPRIATE cumulative frequency graph for the data.
[4 marks]



9 (c) **Use PARTS (a) and (b) to draw, on the same grid, box plots for the two samples.**

When drawing the box plot do NOT check for outliers. [4 marks]



9 (d) **Use calculations to confirm that there are no outliers in the NEW sample of 500 customers.**

You MUST show your working. [3 marks]

9 (e) **Has the company achieved each of its targets stated in PART (b)?**

You MUST give a reason for each target.
[2 marks]

Target 1 – median

Target 2 – interquartile range

16

[Turn over]

10 Fifteen people apply to take part in an 'IronMan' triathlon.

Before they can compete they must prove they are fit enough to attempt the course.

Angelina collects data on each competitor's,

- age
- blood pressure
- resting heart rate.

10 (a) Angelina thinks that finishing position in the triathlon (1st, 2nd, 3rd, etc) and resting heart rate will show positive correlation.

Write a hypothesis for her to investigate.
[1 mark]

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[Turn over]

10 (b) Once the race is run, Angelina notes the order in which the competitors finished, from 1st to 15th position.

She also ranks the resting heart rate data from lowest to highest.

She calculates that the value of $\Sigma d^2 = 60$, where d is the difference in the ranks of the finishing position and the resting heart rates.

Show that the value of Spearman's Rank Correlation Coefficient (SRCC) is 0.89 (to 2 decimal places). [3 marks]

Use SRCC = $1 - \dfrac{6\Sigma d^2}{n(n^2 - 1)}$

10 (c) **Write a possible conclusion to your hypothesis in PART (a). [1 mark]**

5

11 A large forest contains an unknown number of squirrels.

Fynn is asked to estimate the number of squirrels in the forest.

He catches 50 and tags them before releasing them back into the forest.

Two weeks later, he catches 40 more squirrels and finds that 11 have a tag.

11 (a) (i) Give ONE reason why Fynn waits two weeks before catching the 40 squirrels. [1 mark]

_____

_____

_____

11 (a) (ii) Give ONE reason why Fynn doesn't wait a lot longer than two weeks. [1 mark]

_____

_____

_____

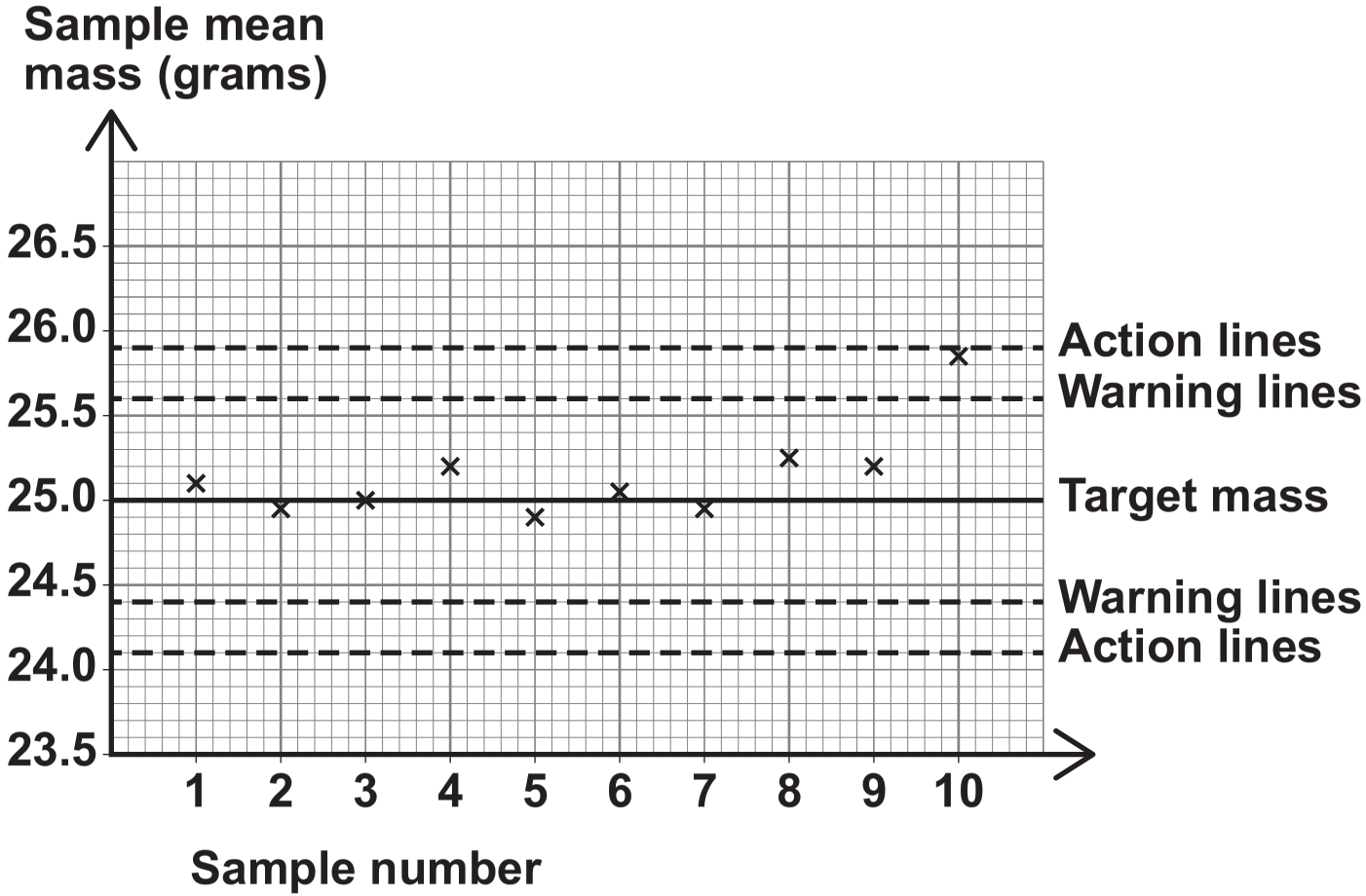
11 (b) **Calculate an estimate of the number of squirrels in the forest. [3 marks]**

Answer _____

5

[Turn over]

MACHINE A


Sample mean mass (grams)
26.5
26.0
25.5
25.0
24.5
24.0
23.5
Action lines
Warning lines
Target mass
Warning lines
Action lines
1
2
3
4
5
6
7
8
9
10
Sample number

12 In a factory, three different machines, A, B and C, put crisps into bags.

Filled bags are labelled as having a mass of 25g.

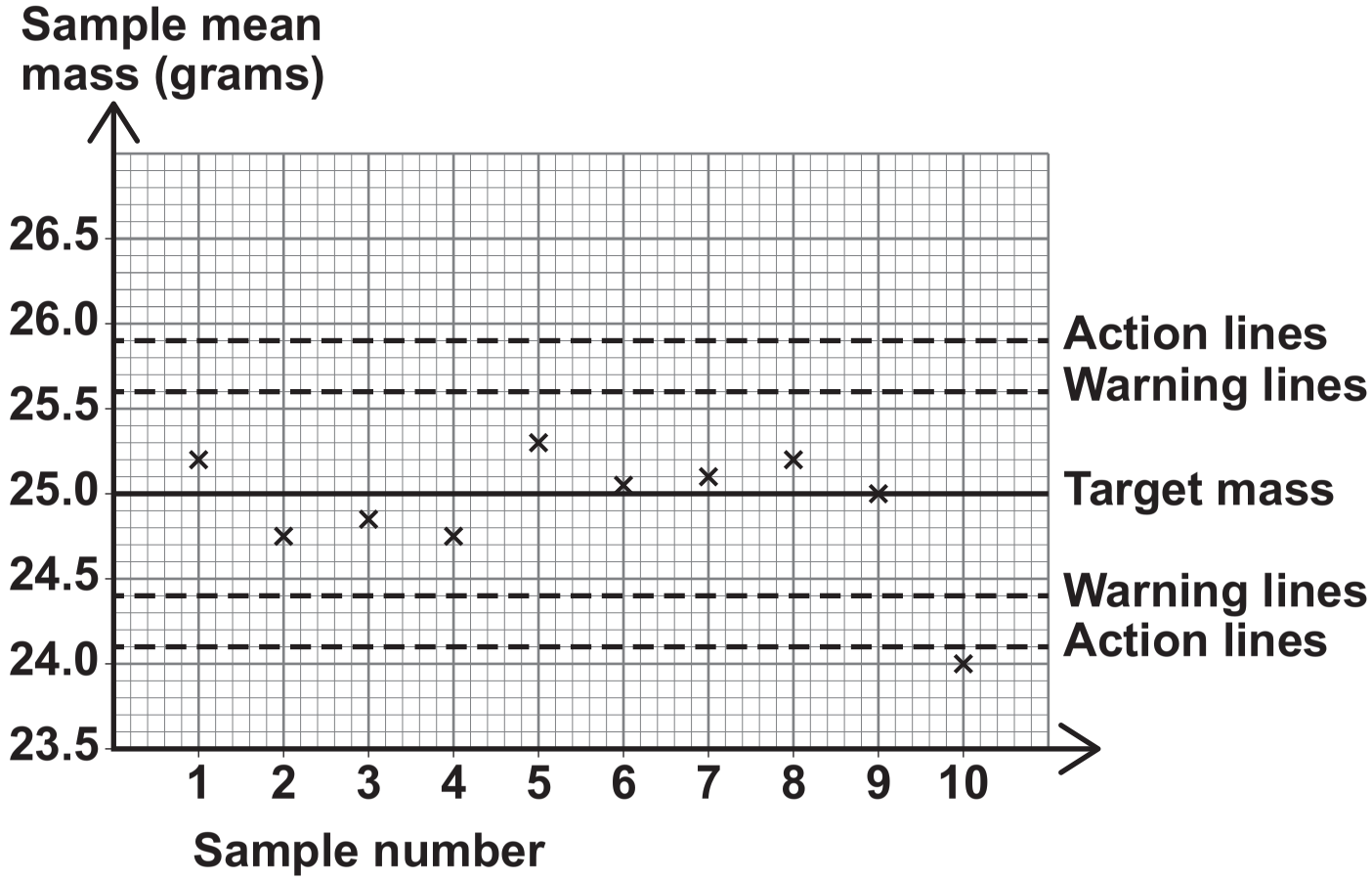
Every two days, Luka, the quality control manager, obtains a sample of filled bags from each machine and calculates the sample mean.

12 (a) The control chart for 10 consecutive large samples for MACHINE A is shown on page 42, together with warning and action limits.

What should Luka do, if anything, with MACHINE A, based on this chart? [1 mark]

[Turn over]

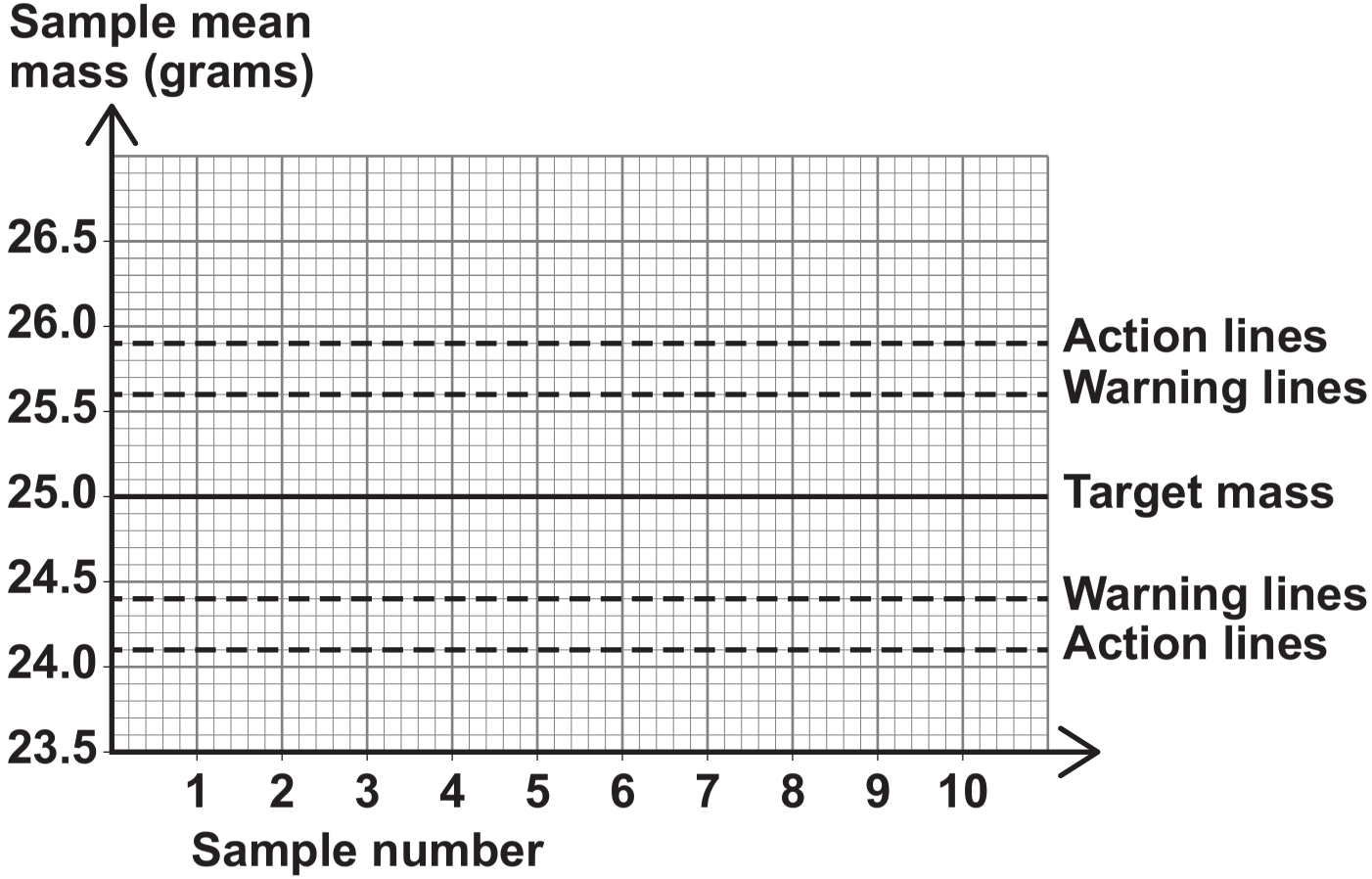
MACHINE B


Sample mean mass (grams)
26.5
26.0
25.5
25.0
24.5
24.0
23.5
Action lines
Warning lines
Target mass
Warning lines
Action lines
1
2
3
4
5
6
7
8
9
10
Sample number

12 (b) The control chart for 10 consecutive large samples for MACHINE B is shown on page 44, together with warning and action limits.

What should Luka do, if anything, with MACHINE B, based on this chart? [1 mark]

MACHINE C



12 (c) Ten large samples for MACHINE C show it to be working normally.

Complete a possible control chart for MACHINE C on the graph above.
[1 mark]

5

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[Turn over]

13 Maisy has her house valued each year.

The table shows the percentage increase in its value, written as a multiplier, over each of the last 5 years.

Year	2016	2017	2018	2019	2020
Multiplier	1.067	1.013	1.008	1.005	1.126

13 (a) Maisy wants to know the average percentage increase over the 5 years.

She works out the arithmetic mean.

$$\frac{6.7 + 1.3 + 0.8 + 0.5 + 12.6}{5} = 4.4\%$$

Average percentage increase = 4.4% to one decimal place.

13 (a) (i) Maisy has used the wrong method.

Name the measure she should have calculated. [1 mark]

13 (a) (ii) Show that the correct average percentage increase is 4.3% to one decimal place.
[2 marks]

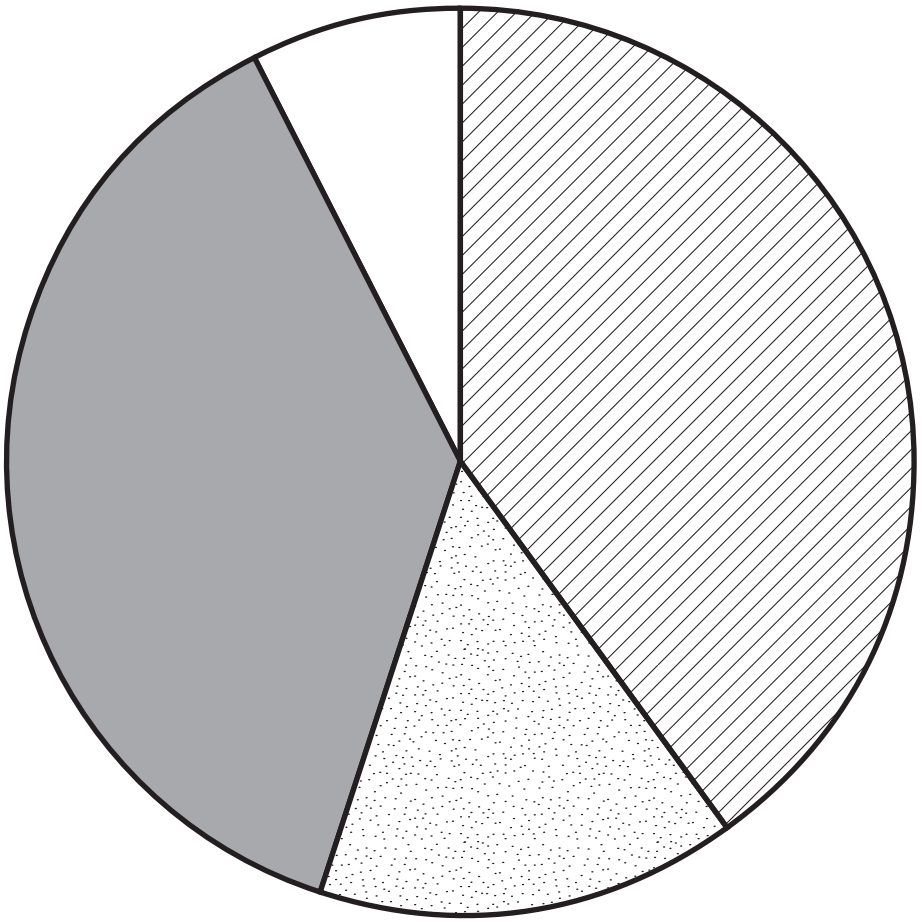
13 (a) (iii) In 2020 Maisy's house was worth £200 000.

If the house continues to grow in value at the same average rate, how much will it be worth in 2024? [2 marks]

Answer £ _____

13 (b) **A new housing estate with 80 houses is built near Maisy's house.**

She sees this pie chart in her local paper showing the types of houses in the estate.



KEY:

Four-bedroom houses

Three-bedroom houses

Two-bedroom houses

Bungalows

Vicky buys a bungalow on this new estate.

What proportion of the houses on this new estate are bungalows? [2 marks]

_____

_____

_____

Answer _____

[Turn over]

13 (c) **Maisy lives on an older housing estate.**

On MAISY'S ESTATE there are,

- **60 four-bedroom houses**
- **38 three-bedroom houses**
- **22 two-bedroom houses**
- **40 bungalows.**

In the space on page 53, draw a fully labelled comparative (proportional) pie chart to represent the types of houses on Maisy's estate. [6 marks]

MAISY'S ESTATE

13 (d) **Make ONE comparison between the proportions of one of the types of houses on Maisy's estate with those on the new estate. [1 mark]**

_____

_____

_____

_____

_____

14

END OF QUESTIONS

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

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

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

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