Name	Date started	Target end date

WJEC GCSE Mathematics and Numeracy (Double Award) — Question Pack

Calculating the four basic statistics from a raw list of data: the mean, the median, the mode and the range. Includes mean from a simple frequency tab

REVISE
.wales

3.20 — Mean, median, mode, range — ungrouped

Spec 4.2.8, 4.2.10 — Unit 3 (calculator allowed)

Calculating the four basic statistics from a raw list of data: the mean, the median, the mode and the range. Includes mean from a simple frequency table and the 'reverse' problem of finding a missing value given the mean. Sourced from legacy WJEC GCSE Mathematics and Mathematics-Numeracy papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~1 hours 48 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (72 marks across 20 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. Questions are organised against the 2025 specification. Questions are ordered chronologically by sitting, with custom-written and SAM questions at the end.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

A calculator is allowed on every question in this pack (Unit 3 is the calculator-allowed paper).

Mean, median, mode, range — ungrouped — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 3: calculator-allowed.

Mean, median, mode & range 4.2.8

- Calculate the mean, median and mode from a raw list of values.
- Calculate the range as max − min.
- Solve 'reverse' problems — find a missing value given the mean.
- Choose an appropriate average given the type of data and the presence of outliers.

Mean from a simple frequency table 4.2.10

- Use $\bar{x} = \frac{\sum fx}{\sum f}$ for data presented as values with frequencies.
- Identify the modal value (highest frequency).
- Find the median by locating the $\frac{n+1}{2}$-th data point through the cumulative frequency.

Crib sheet »

Mean, median, mode, range — ungrouped in one page

Quick-reference notes — revisit before each question. Don't use during the questions.

Mean

$$\bar{x} = \frac{\sum x}{n}$$

Add up all the values and divide by how many there are.

Affected by every value — one extreme value (an outlier) can shift the mean a lot.

Median

Sort the values in order, then pick the *middle* one.

- Odd n: the middle value is the $\frac{n+1}{2}$-th term.
- Even n: median is the *mean of the two middle values*.

Less sensitive to outliers than the mean.

Mode

The value(s) that appear most often.

A data set can have one mode (unimodal), two modes (bimodal), or none at all if every value appears the same number of times.

For categorical data (e.g. colours), the mode is the only average that makes sense.

Range

$$\text{range} = \text{largest} - \text{smallest}$$

A measure of *spread*, not a measure of average.

Affected strongly by outliers; quote the units.

Mean from a frequency table

$$\bar{x} = \frac{\sum fx}{\sum f}$$

Multiply each value x by its frequency f, sum the products, and divide by the total frequency.

An extra column fx in the table keeps the working tidy.

Reverse problems

If you know the mean and most of the values, the total is $\bar{x} \times n$.

Subtract the known values from the total to find the missing one.

Same idea works for sums of two groups combined.

Choosing an average

- *Mean* — uses all the data, best for symmetric data; sensitive to outliers.
- *Median* — robust to outliers; good for skewed data.
- *Mode* — the only choice for categorical data; useful for 'most common' questions.

Common traps

- Forgetting to *sort* the data before taking the median.
- Dividing by the number of *different* values rather than the total count.
- Quoting range as "a to b" instead of a single number $b - a$.
- Mixing up frequencies f and values x when computing $\sum fx$.

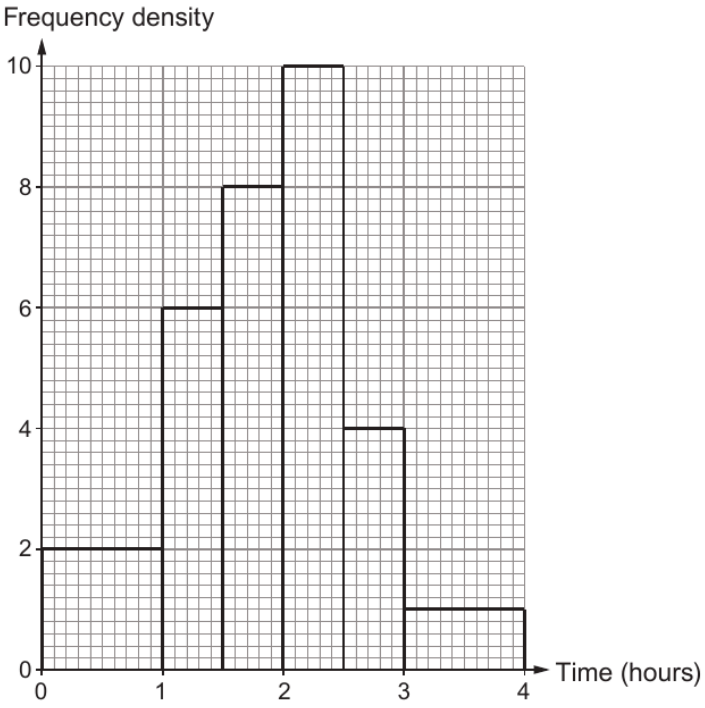
Examiner only

8. The *Big Fish Cymru* annual fishing competition is held on the west coast of Wales.

Information about **last year's** competition is displayed in the *Big Fish Cymru* booklet. A section of this booklet is shown below.

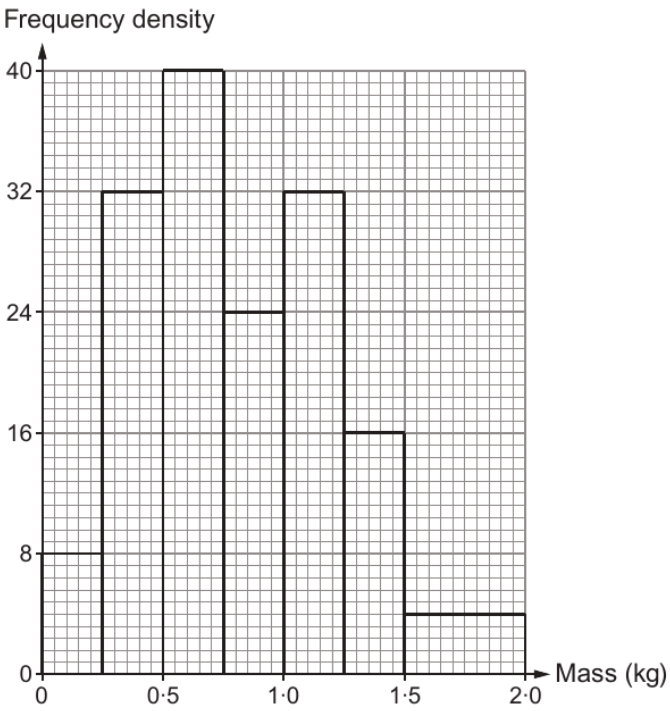
The competition organisers recorded the time taken for **each** angler to catch their **first** fish.

This is shown in the histogram on the right.



The competition organisers also recorded the mass of every fish caught.

This is shown in the histogram on the right.



Examiner only

(a) Last year, how many of the fish caught had a mass of less than 250 g? [1]

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(b) Last year, the final angler to catch their first fish did so after $3\frac{1}{2}$ hours.

How many **other** anglers took more than 3 hours to catch their first fish? [1]

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(c) The number of anglers taking part this year was three times as many as took part last year.
How many anglers took part in the competition this year? [4]

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Number of anglers this year was .....

(d) The median mass of the fish caught this year was 0·9 kg.

What is the difference, in kg, between the median mass of the fish caught this year and the median mass of the fish caught last year? [5]

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Difference in mass is ..... kg

Examiner only

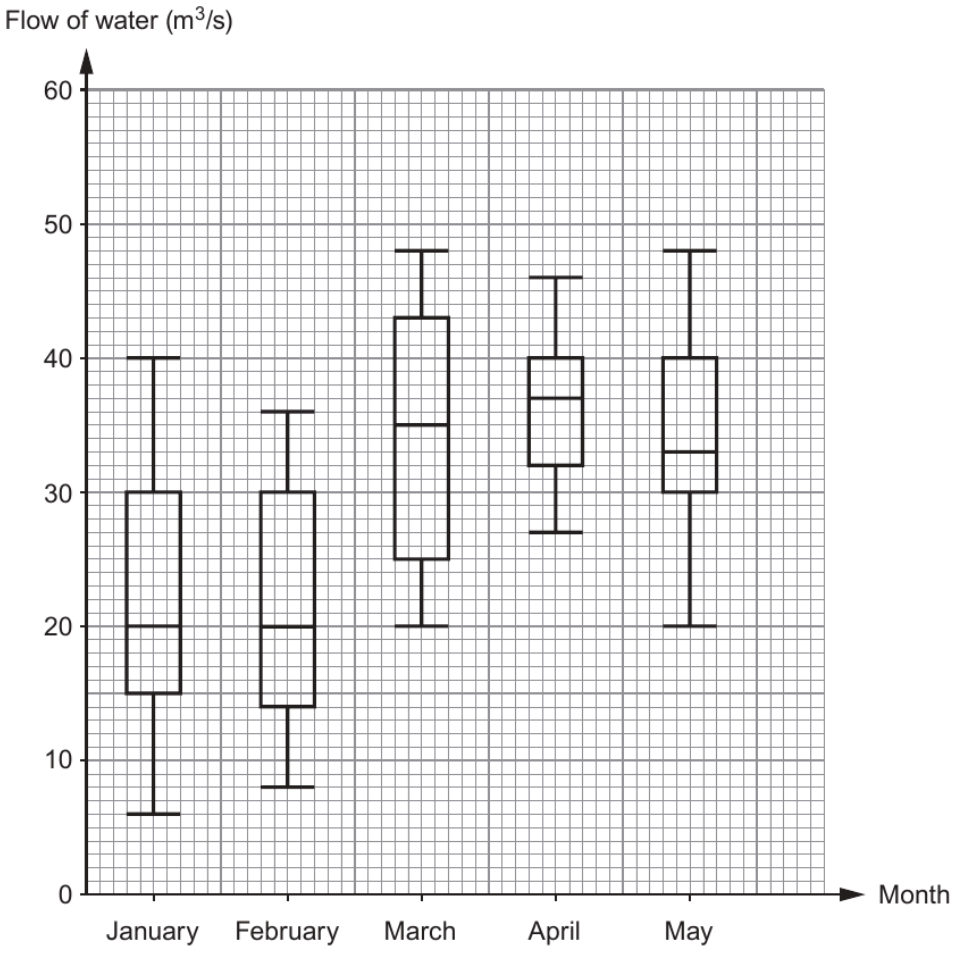
(e) Approximately 10% of the anglers this year caught their first fish within 1 hour.

(i) How does this percentage compare with last year's percentage?
You must show all your working. [3]

(ii) Do you think it is fair to compare last year's competition results with this year's competition results?
You must give a reason for your answer. [1]

Examiner only

6. The following box and whisker plots show the flow of water through a drain, measured in m^3/s. The flow of water was measured at 11 a.m. each day for the first 5 months of the year.



(a) In which of the five months was the median flow of water the greatest? [1]

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Examiner only

(b) In which of the five months was the range of the flow of water the greatest? [1]

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(c) Iona is writing some statements for a report on the flow of water through the drain. Complete each of the statements given below.

(i) 'Both the upper quartiles and medians in the months of .....

and ..... were the same.' [1]

(ii) '25% of the results in March show the flow of water was greater than

..... m^3/s.' [1]

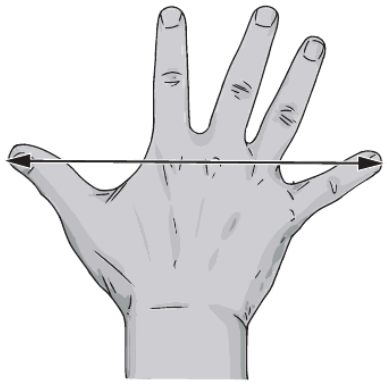
(d) Circle either TRUE or FALSE for each of the following statements. [2]

25% of the results in January show the flow of water was less than 6 m^3/s.	TRUE	FALSE
The units, m^3/s, measure the volume of water passing through the drain each second.	TRUE	FALSE
The mean flow of water in April was **certainly** greater than 36 m^3/s.	TRUE	FALSE
The month with the greatest difference between the lower quartile and the median was May.	TRUE	FALSE

Examiner only

7. Simon plans to make gloves.

(a) One morning, Simon decided to carry out a survey to find the mean hand span of people in Wales.



He decided to sample systematically.
He decided to sample from the first 240 people who pass him in the street during the morning.

He wanted to take 20 people's hand span measurements.
Explain how Simon could use systematic sampling to obtain 20 measurements. [1]

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Examiner only

(b) Yesterday morning, Simon only managed to sample 10 people.
He calculated the mean hand span of these 10 people to be 22·8 cm.

Yesterday afternoon, Simon recorded the hand spans of a **further** 20 people.

The results for these 20 people are shown in the frequency table below.

Hand span, to the nearest mm	Frequency
20·0 cm to 20·8 cm	2
20·9 cm to 21·7 cm	3
21·8 cm to 22·6 cm	10
22·7 cm to 23·5 cm	5

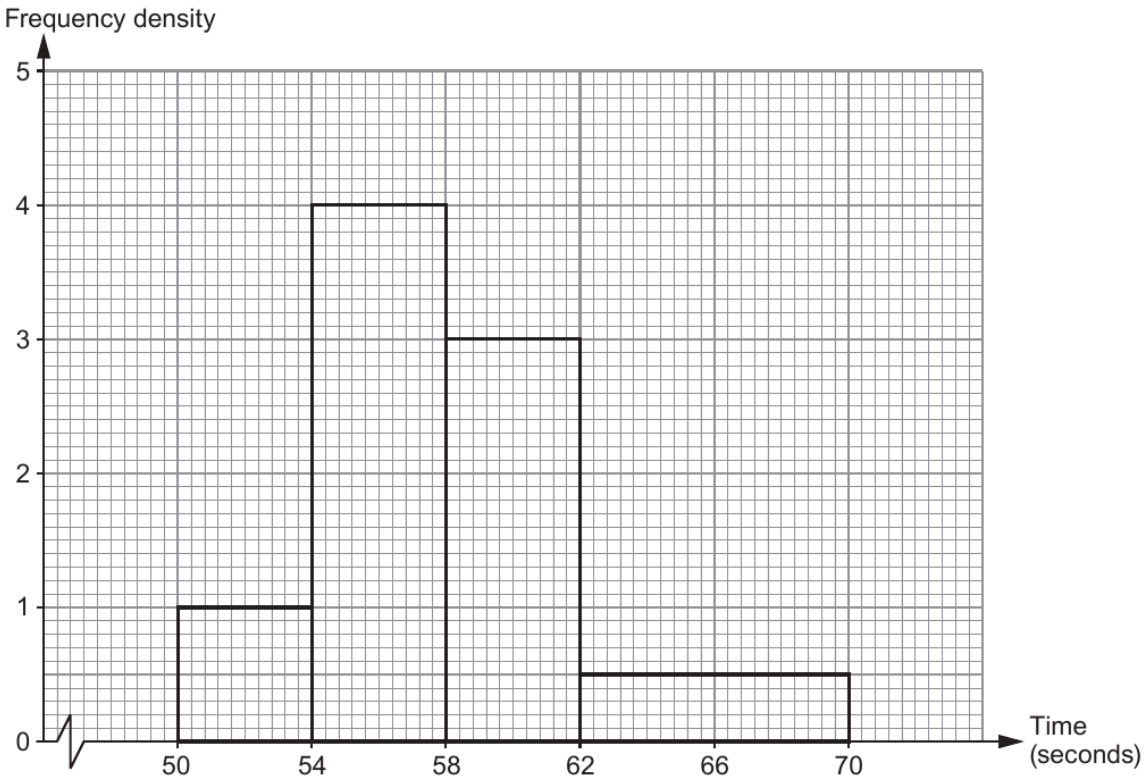
Calculate an estimate of the mean of all **30 hand spans** that Simon measured yesterday. [6]

(c) What could Simon do to improve his estimate of the mean hand span of people in Wales? [1]

Examiner only

9. The time taken to run 400 m was recorded for each member of a running club.

(a) A histogram of the results for the members who are under 30 years of age is shown below.



(i) Calculate how many members of the running club are under 30 years of age. [2]

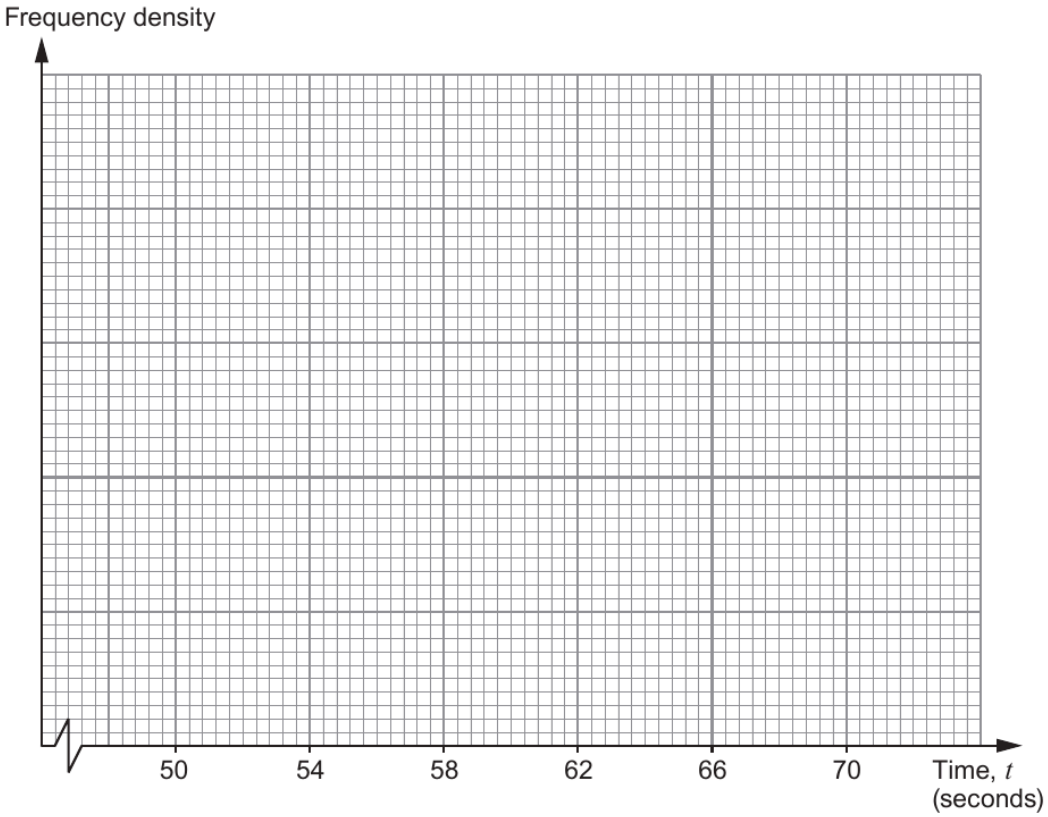
(ii) Calculate an estimate of the median time taken by the under-30s to run 400 m. [4]

Examiner only

(b) The frequency table below shows the results for the members who are 30 years of age or over.

Time, t (seconds)	$50 < t \leqslant 54$	$54 < t \leqslant 58$	$58 < t \leqslant 60$	$60 < t \leqslant 62$	$62 < t \leqslant 70$
Number of people	4	10	16	18	12
Frequency density					

Complete the table, and draw a histogram to illustrate this data on the graph paper below. [4]



(c) On average, which of the two groups was faster at running 400 m?
Give a reason for your answer.
Your reason must be based on your interpretation of the histograms. [1]

Examiner only

1. Alptai is a ski resort.
The daily snowfall for January is given in the table below.

Daily snowfall, s (cm)	Number of days
$0 \leqslant s < 5$	10
$5 \leqslant s < 10$	16
$10 \leqslant s < 20$	4
$20 \leqslant s < 30$	0
$30 \leqslant s < 50$	1

(a) Calculate an estimate for the mean daily snowfall for the 31 days of January. [4]

(b) Circle either TRUE or FALSE for each of the following statements. [2]

The table above shows that there definitely was snowfall on each of the 31 days in January.	TRUE	FALSE
There were 16 days when the daily snowfall was less than 10 cm.	TRUE	FALSE
There was only 1 day with snowfall greater than or equal to 20 cm.	TRUE	FALSE
The modal group also contains the median daily snowfall.	TRUE	FALSE

Examiner only

(c) For the 28 days of February, the mean daily snowfall in Alptai was 9 cm.
On 1st February, the snowfall recorded in Alptai was 63 cm.
Calculate the mean daily snowfall for the 27-day period 2nd to 28th February. [3]

Examiner only

3.

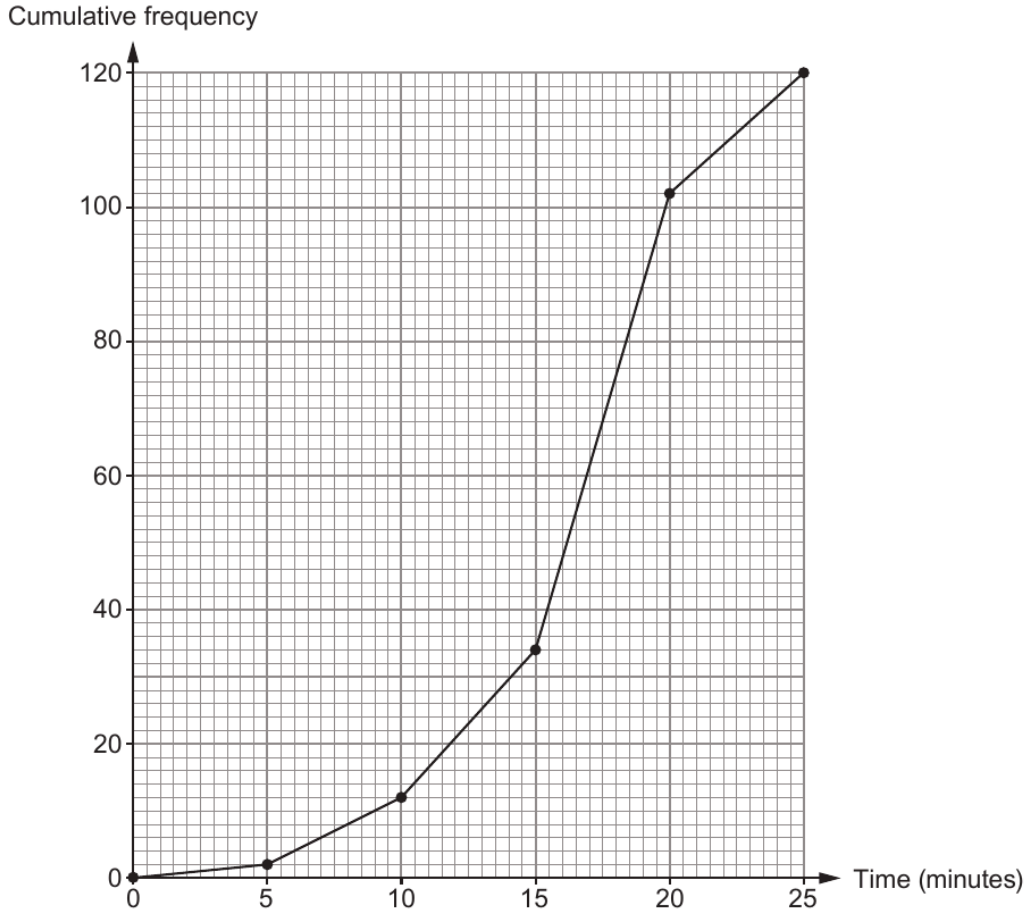
Meirion's Window Cleaning Business

No job too small!

Email: meirion@mwcb.cymru

Meirion is a window cleaner.
From Monday to Friday, he records how long he spends cleaning windows for each of his customers.

He draws a cumulative frequency diagram to display the findings.



Examiner only

(a) (i) Use Meirion's cumulative frequency diagram to find the median and interquartile range of the times he spends cleaning windows for each of his customers. [3]

Median ..... minutes

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Interquartile range ..... minutes

(ii) Meirion looks back at his raw data.
He finds that the median is actually 17 minutes 30 seconds.
Why is there a difference between the median from his cumulative frequency diagram and the actual median from his raw data? [1]

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(b) Meirion is looking at the time it took to clean individual customers' windows.
Find the number of customers whose windows took between 10 and 15 minutes to clean. [2]

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(c) Meirion thinks that for approximately 80% of his customers, he cleaned their windows in less than 20 minutes.
Is Meirion correct?
You must show all your working. [3]

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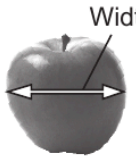
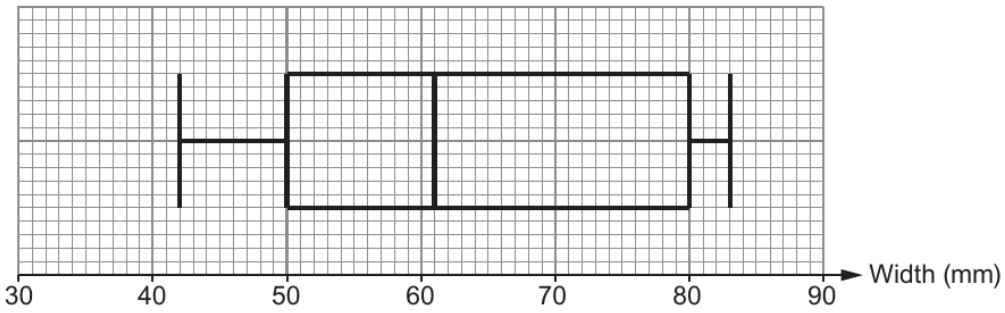
Examiner only

5. Lena has three apple trees in her garden.
She has one Gala apple tree, one Orange Pippin tree and one Pink Lady tree.
She picks 50 apples from each of the 3 trees.
She records the width of each apple, as shown.

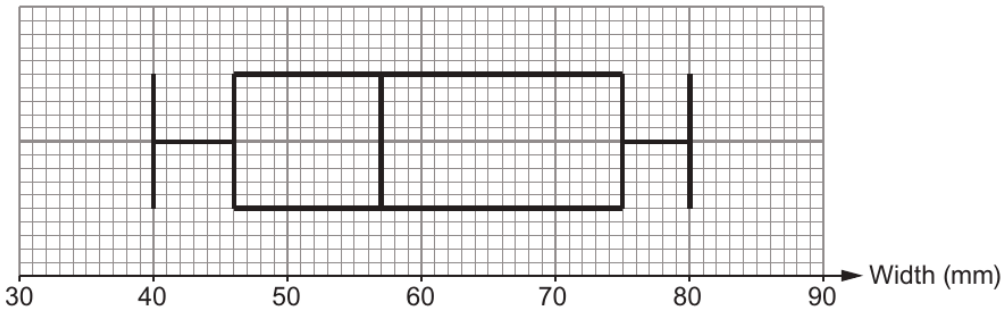


Lena constructs box and whisker diagrams for the widths of the apples collected from each of the three trees.

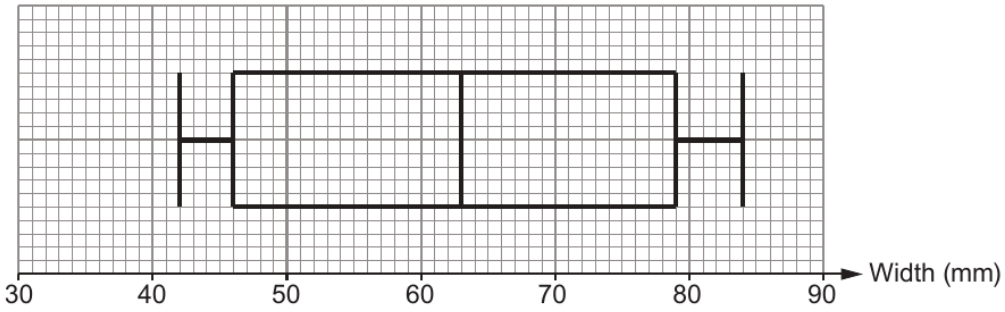
Gala apple tree



Orange Pippin apple tree



Pink Lady apple tree



Examiner only

(a) Complete each of the following statements.

(i) 'Apples from the ..... apple tree have the least median width.

The median width of apples recorded for this tree is ..... mm.' [1]

(ii) 'The range of the widths of apples recorded for the Gala apple tree

is ..... mm.' [1]

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(iii) 'The ..... apple tree has apples with the greatest interquartile range of widths.

The interquartile range of the widths of apples recorded for this tree

is ..... mm.' [2]

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(b) Which tree has a higher proportion of larger apples?
You must give a reason for your answer. [1]

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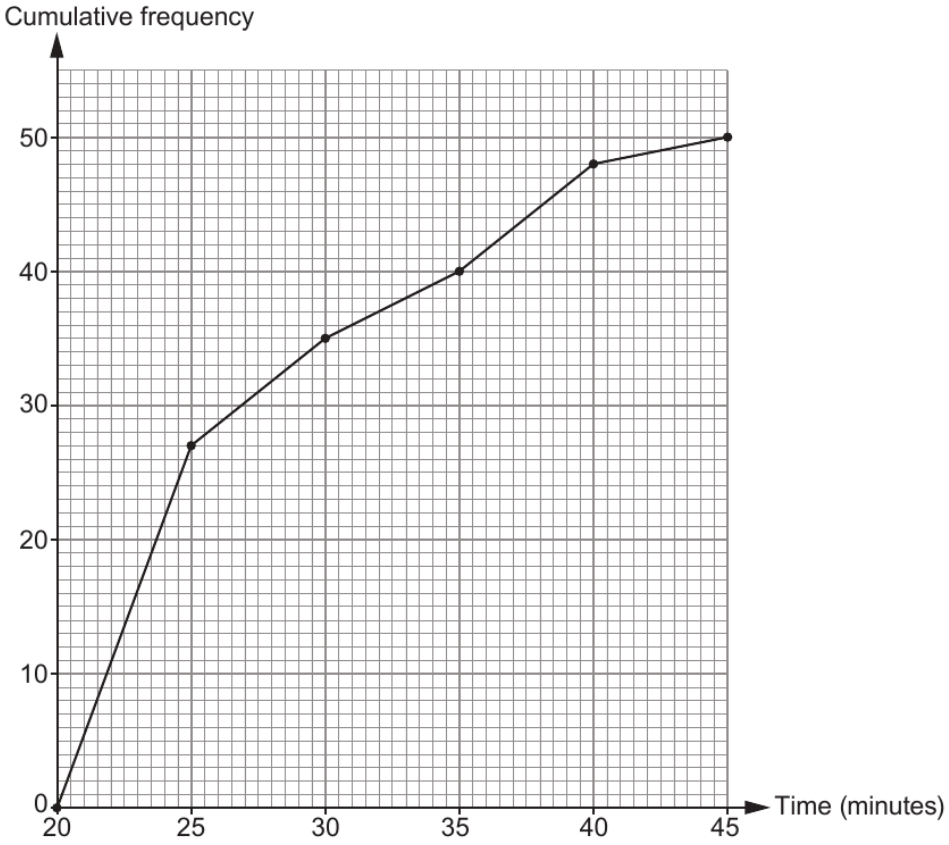
Examiner only

6. This year, 50 runners took part in a 5 km race in the Brecon Beacons.
All 50 runners finished the race.

The cumulative frequency diagram below shows the times taken by the runners to finish the race.



(a) Which is the modal group?
Circle your answer. [1]

20 to 25 minutes 25 to 30 minutes 30 to 35 minutes

35 to 40 minutes 40 to 45 minutes

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Examiner only

(b) Is it certain that the last runner's finish time was 45 minutes?
You must give a reason for your answer. [1]

Yes ☐ No ☐

(c) The organisers hoped that 80% of the runners would finish the race within 30 minutes.

Complete the following two statements. [2]

'..... % of runners finished the race within 30 minutes.'

'80% of runners finished the race within ..... minutes.'

(d) Last year, the median finish time was 26 minutes.
By how many minutes was the median time better this year?
You must show all your working. [2]

Examiner only

1. *Tube Cycles* makes a large number of bikes each day.

(a) On 1st December 2016, 4000 bikes were made at the *Tube Cycles* factory.
The *Tube Cycles* factory was working at 80% capacity on that day.
This means that only 80% of the maximum possible number of bikes were made.

When the factory works at 95% capacity, how many bikes are made in one day? [3]

(b) (i) In October 2018, the manager of the *Tube Cycles* factory recorded the number of bikes made each day.
Here are her results.

Number of bikes, b	Frequency
$1000 \leqslant b < 2000$	3
$2000 \leqslant b < 3000$	12
$3000 \leqslant b < 4000$	9
$4000 \leqslant b < 5000$	7

Calculate an estimate of the mean number of bikes made per day during October 2018. [4]

(ii) Which group contains the **median** number of bikes made per day?
Circle your answer. [1]

$1000 \leqslant b < 2000$ $2000 \leqslant b < 3000$ $3000 \leqslant b < 4000$

$4000 \leqslant b < 5000$ Can't tell

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Examiner only

5. Five numbers are listed below.

3 3 6 13 15

Write down another set of five **positive whole** numbers such that

- all the numbers are **less than** 20,
- the median of the new set of numbers is greater than the median of the set shown above,
- the mean of the new set of numbers is less than the mean of the set shown above,
- the range of the new set of numbers is less than the range of the set shown above.

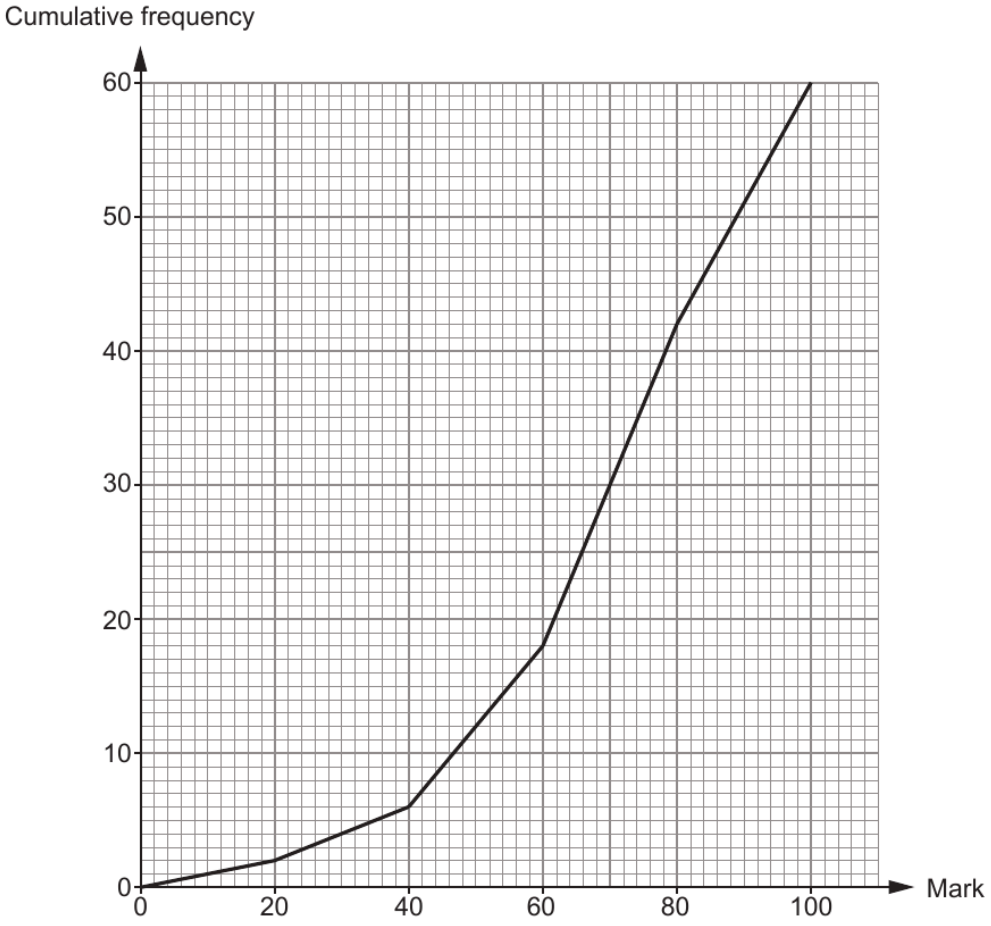
Your set of whole numbers must be written in the boxes. [3]

Space for working:

My five positive whole numbers are

Examiner only

9. A group of pupils sat a mathematics test.
The teacher grouped their marks using the intervals 1 to 20, 21 to 40, and so on.
She then drew the following cumulative frequency diagram to display the results.



(a) Phoebe is one of the pupils who sat the test.
Phoebe says,
'The cumulative frequency diagram shows that the median mark was 70.'

Explain why the median mark may not be 70. [1]

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Examiner only

(b) Consider the pupils who had a mark of 80 or less.

How many of these pupils would have needed to score more than 80 for Phoebe's estimate of the median to be 80?
Circle your answer. [1]

10 12 18 5 20

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Examiner only

4. Look at the following set of four numbers.

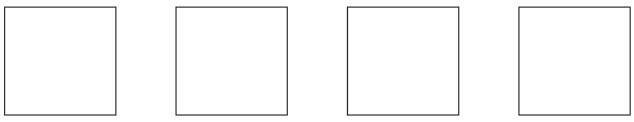
5 8 10 13

Find another set of four numbers so that:

- the range has increased by 2,
- the mean remains the same,
- the median has decreased by 1.

You may use some of the numbers from the original set, but **not** exactly the same four numbers. [3]

My four numbers are



Examiner only

5. Find four **different** positive whole numbers so that:

- their mean is 8,
- their range is 8,
- their median is 8.

Write your four numbers in the boxes below. [3]

The four numbers are ☐ ☐ ☐ ☐

Examiner only

2. Delyth and Ronnie are both students at the local college.

(a) Their houses and the college are all joined by straight roads, as shown in the diagram.

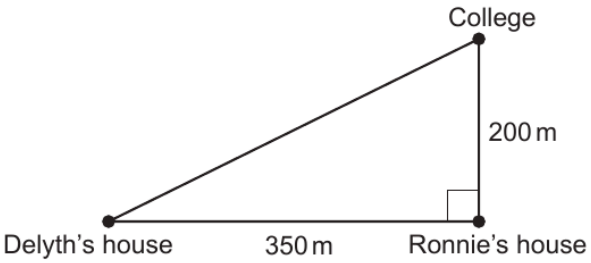


Diagram not drawn to scale

Delyth usually walks directly to college.
Calculate how much further Delyth has to walk if she passes Ronnie's house on her way to college. [5]

Examiner only

(b) 35 students were asked how far they travelled to the college.
The results are recorded in the table below.

Distance, d (metres)	Frequency
$100 < d \leqslant 200$	9
$200 < d \leqslant 1000$	10
$1000 < d \leqslant 3000$	15
$3000 < d \leqslant 7000$	1

(i) Ronnie is one of these 35 students.
He walks 200 m directly to college.

Does Ronnie travel further than the median distance travelled by these 35 students?

Yes ☐ No ☐ Can't tell ☐

You must give a reason for your answer. [1]

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(ii) Calculate an estimate of the mean distance these 35 students travelled to the college. [4]

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Estimate of the mean distance travelled by these 35 students is ..... m

Examiner only

(c) There are 140 students who travel by bus to and from college.

Delyth wants to find out why these students do not walk to college.
She has decided to use a systematic sampling method to select 7 of these students to form a discussion group.

The names of all the 140 students are in a list.
Delyth has randomly selected the 2nd student in the list to join the discussion group.

Complete the table below to give the positions in the list of the 7 students selected to join the discussion group. [2]

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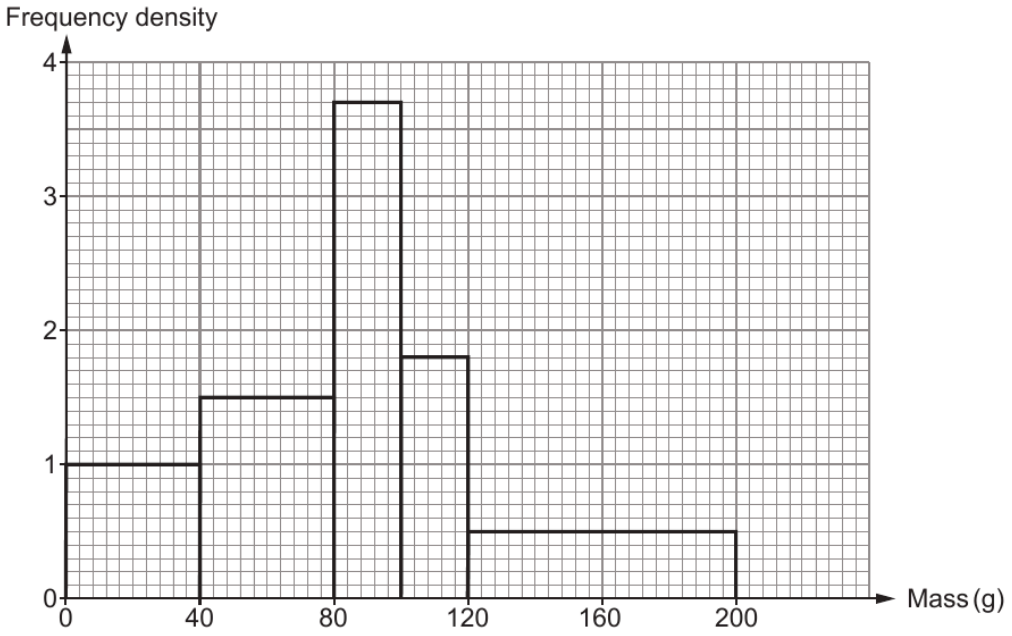
Student	1	2	3	4	5	6	7
Position in the list	2nd	.....	.....	.....	.....	.....	.....

Examiner only

5. Madeleine is researching the effects of waves. She does this at two different beaches, Llanddawel and Abertig.
She measures the masses of pebbles in a sample taken from each beach.

(a) Look at the histogram below. It shows the masses of the pebbles in the sample taken from Llanddawel beach.

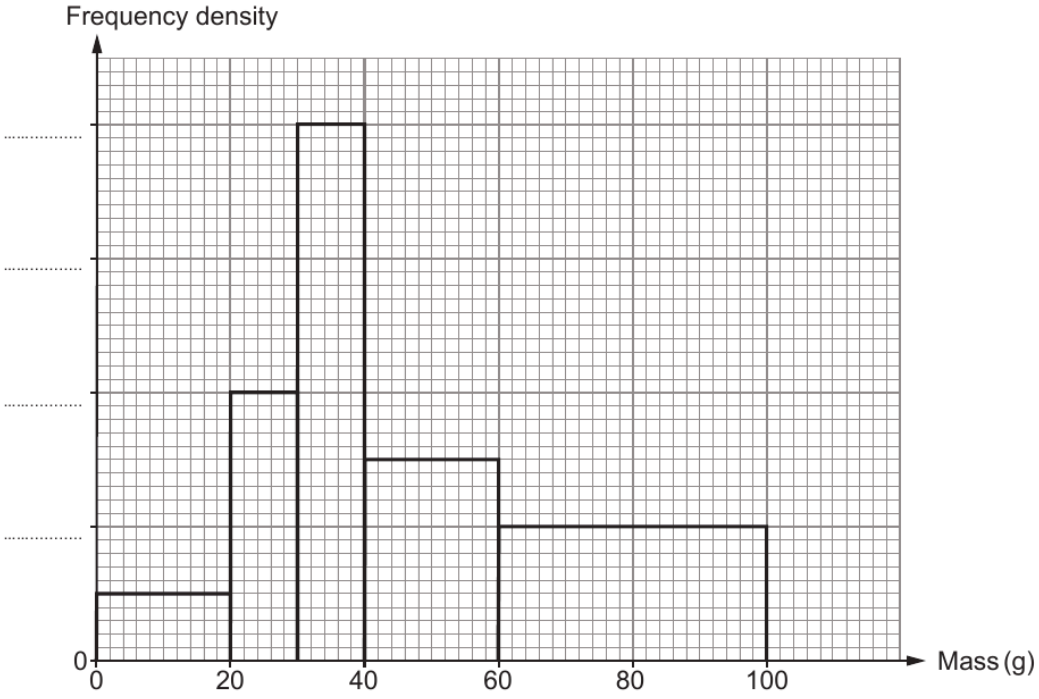


Calculate an estimate for the percentage of pebbles in Madeleine's sample that had a mass of less than 70 g. [5]

Examiner only

(b) Look at the histogram below. It shows the masses of the pebbles in the sample taken from Abertig beach.

The scale on the vertical axis is missing.



(i) 120 pebbles each had a mass of less than 30 g.
Use this fact to complete the frequency density axis above. [2]

(ii) What was the median mass of the pebbles in the sample taken from Abertig beach?
Circle your answer. [1]

30 g 40 g 45 g 50 g 50·5 g

Examiner only

2. The Geometric Mean is a special type of average.

> To find the Geometric Mean of three numbers, you must:
> - multiply the three numbers together, and
> - then find the cube root.

(a) Find the Geometric Mean of 100, 0·3 and 0·9. [2]

(b) The Geometric Mean of three numbers is 10.
Two of the numbers are 8 and 25.
Find the third number. [2]

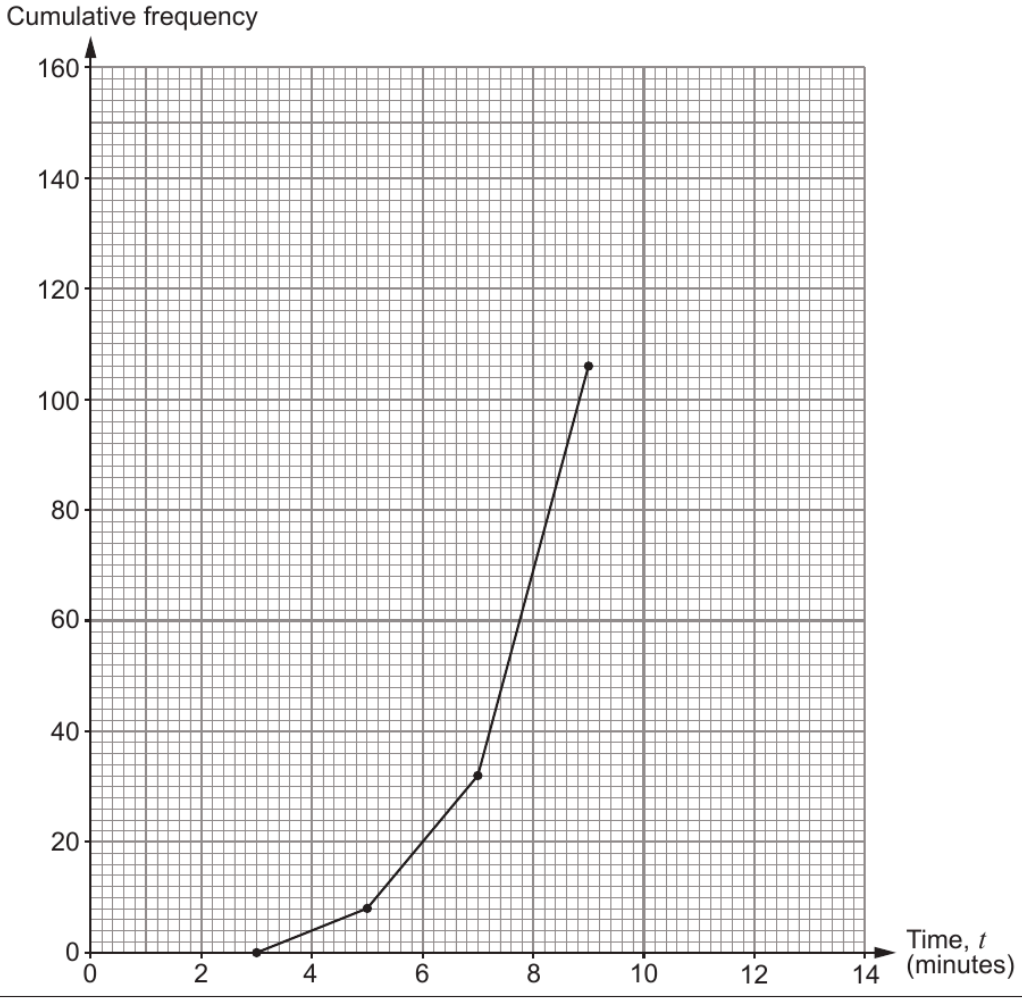
Examiner only

4. Giovanni has a takeaway pizza van. He sells whole pizzas and slices of pizza from his van.

(a) For the last 3 days, he has timed how long it takes to complete the food order for each of his customers.
Giovanni recorded his results in the table below.

(i) Complete the cumulative frequency table **and** the cumulative frequency diagram. [2]

Time, t (minutes)	Frequency	Cumulative frequency
$3 < t \leqslant 5$	8	8
$5 < t \leqslant 7$	24	32
$7 < t \leqslant 9$	74	106
$9 < t \leqslant 11$	40	.....
$11 < t \leqslant 13$	14	.....



Examiner only

Use your cumulative frequency diagram to give the best estimates for the answers to each of the following questions.

(ii) Find the median time taken to complete a food order. [1]

The median time is ..... minutes.

(iii) Giovanni is concerned that food orders are taking too long to complete.
He says,

"Only 25% of the food orders are completed in under ..... minutes."

Use **one** of the five values below to complete Giovanni's statement. [1]

6·4 6·6 7·2 8 9·6

(iv) Calculate the percentage of orders that were completed in less than 6 minutes. [2]

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(b) For the last 3 days:
- Giovanni spent £180 on ingredients
- he spent £220 on the running costs for the pizza van
- he received a total of £700 from the food orders.

Calculate Giovanni's percentage profit. [3]

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(c) Next year Giovanni intends to charge £8.40 for a basic pizza.
This is an increase of 20% from the current charge.

Calculate how much Giovanni currently charges for a basic pizza. [2]

.....

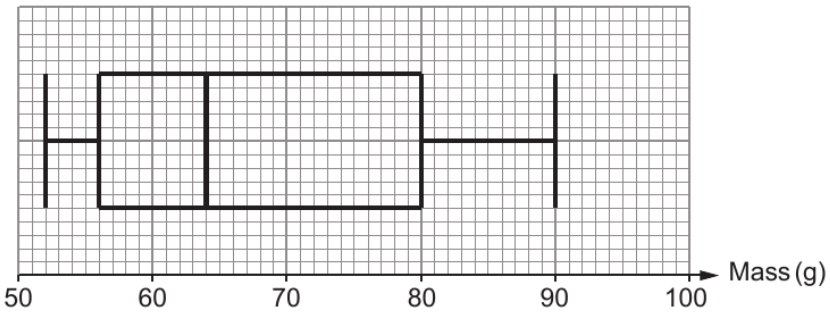
.....

.....

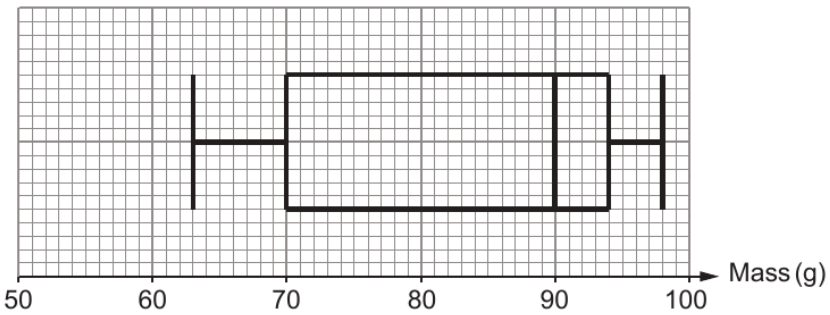
5. Eva grows three varieties of organic potato on her farm: Maris Piper, King Edward and Desiree.
She weighs and records the masses of 400 potatoes of each of the 3 varieties.

Eva constructs box-and-whisker diagrams for the masses of the potatoes weighed.

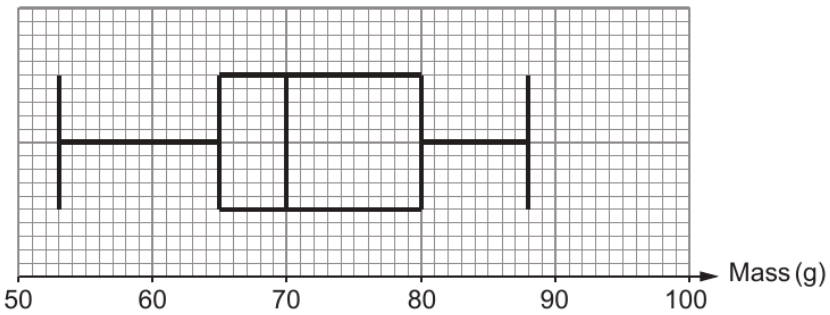
Maris Piper



King Edward



Desiree



Examiner only

(a) Complete each of the following statements.

(i) The ..... potatoes have the highest median mass.

The median mass of these potatoes is ..... g. [1]

(ii) The range of the masses recorded for the Maris Piper potatoes is ..... g. [2]

(b) In the future, Eva wants to grow potatoes that are quite similar in size.

Use the box-and-whisker diagrams to advise Eva which of these three varieties of potato she should grow. [1]

Select which variety of potato she should grow.

Maris Piper ☐ King Edward ☐ Desiree ☐

Select the measure you used to help you decide.

Median ☐ Interquartile range ☐ Lower quartile ☐

Select a reason for your choice of measure.

The measure is greater than for the other 2 varieties ☐

The measure is less than for the other 2 varieties ☐

Examiner only

7. The headteacher of Ynysgorwen School wants to know how long it takes pupils to travel to school.
The results for a sample of 120 pupils are shown in the table below.

Time taken, t (minutes)	Frequency	Frequency density
$0 < t \leqslant 10$	34	3·4
$10 < t \leqslant 20$	40	.....
$20 < t \leqslant 35$	24	.....
$35 < t \leqslant 50$	18	.....
$50 < t \leqslant 70$	4	.....

(a) (i) Complete the frequency density column. [3]

.....

.....

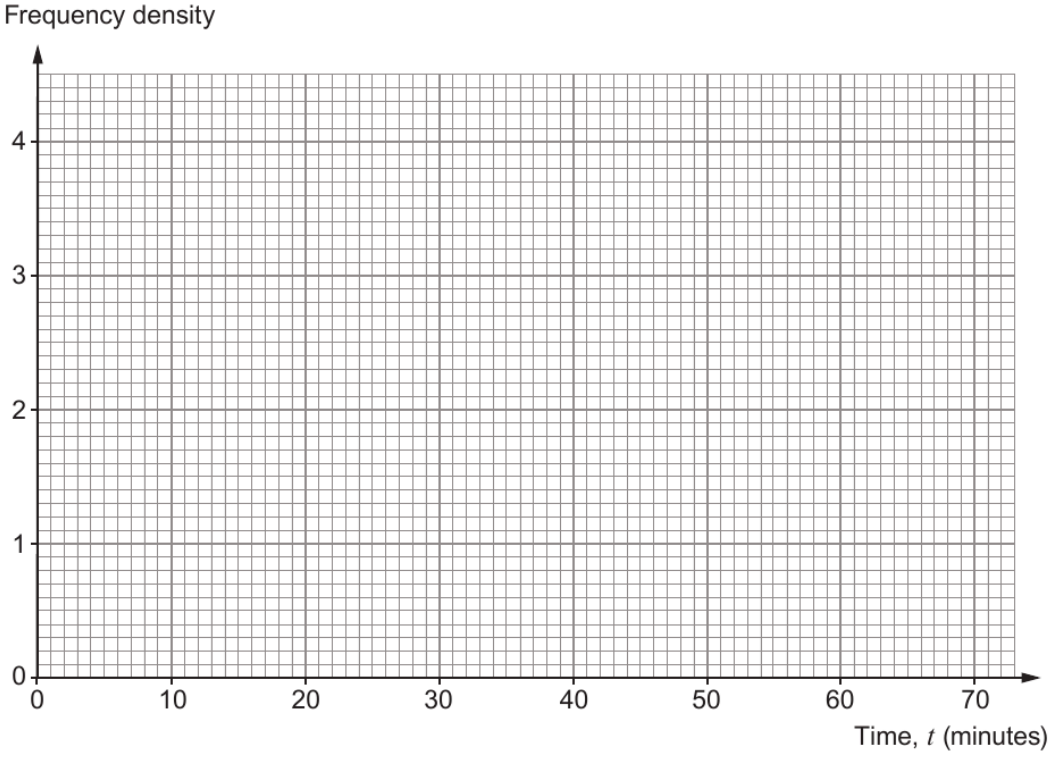
.....

.....

.....

Examiner only

(ii) Draw a histogram to display this data. [2]



(b) (i) Calculate an estimate of the median travel time for the sample of pupils. [4]

(ii) What is the greatest possible median travel time for the sample of pupils? [1]

Examiner only

3. Find five numbers so that:

- their mean is 4·5
- their mode is 3·5.

Write your five numbers in the boxes below. [3]

The five numbers are ☐ ☐ ☐ ☐ ☐

4. The interior angle of a regular polygon is 171°.

How many sides does the polygon have? [3]