Name	Date started	Target end date

REVISE
.wales

3.24 — Box-and-whisker diagrams

Spec 4.2.19 — Unit 3 (calculator allowed)

Box plots visualise the five-number summary — minimum, lower quartile, median, upper quartile, maximum — making it easy to compare distributions at a glance. 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: ~46 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (31 marks across 9 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).

Box-and-whisker diagrams — what the new spec asks

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

Box-and-whisker diagrams 4.2.19

- Identify the five-number summary: minimum, Q_1, median, Q_3, maximum.
- Draw a box plot to scale, with the box from Q_1 to Q_3, a median line, and whiskers to min/max.
- Read the five summary statistics, range and IQR off a given box plot.
- Compare two distributions by comparing medians and IQRs on stacked box plots, interpreted in context.

Crib sheet »

Box-and-whisker diagrams in one page

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

Five-number summary

A box plot needs five values:

minimum, Q_1, median, Q_3, maximum.

Find them from the ordered list or read them off a CF curve.

Anatomy of a box plot

- A *box* stretches from Q_1 to Q_3.
- A vertical line inside the box marks the *median*.
- *Whiskers* extend out to the min and the max.

The total width = range; the box width = IQR.

Drawing a box plot

Use a consistent linear scale on the value axis.

Mark the five values, draw the box from Q_1 to Q_3, the median line, and the whiskers to min/max.

Don't connect whiskers *through* the box.

Reading values off a box plot

Read the five summary statistics directly off the value axis.

Range = max − min (whisker tip to whisker tip).

IQR = $Q_3 - Q_1$ (width of the box).

Skewness from a box plot

- *Symmetric* — median sits in the middle of the box; whiskers equal length.
- *Positive skew* — median closer to Q_1; right whisker longer.
- *Negative skew* — median closer to Q_3; left whisker longer.

Comparing distributions

Stack two box plots on the same axis.

Compare medians (which group is higher on average?) *and* IQRs (which is more consistent?).

Always interpret in context, not just 'A is higher'.

Box plot from CF curve

The CF curve gives you the five-number summary directly: read off the min (start), Q_1, median, Q_3, max (end).

Then draw the box plot on a matching value axis.

What box plots hide

A box plot tells you about position and spread, but *not* about the distribution's shape between the quartiles.

Two very different data sets can have identical box plots; histograms or CF curves give more detail.

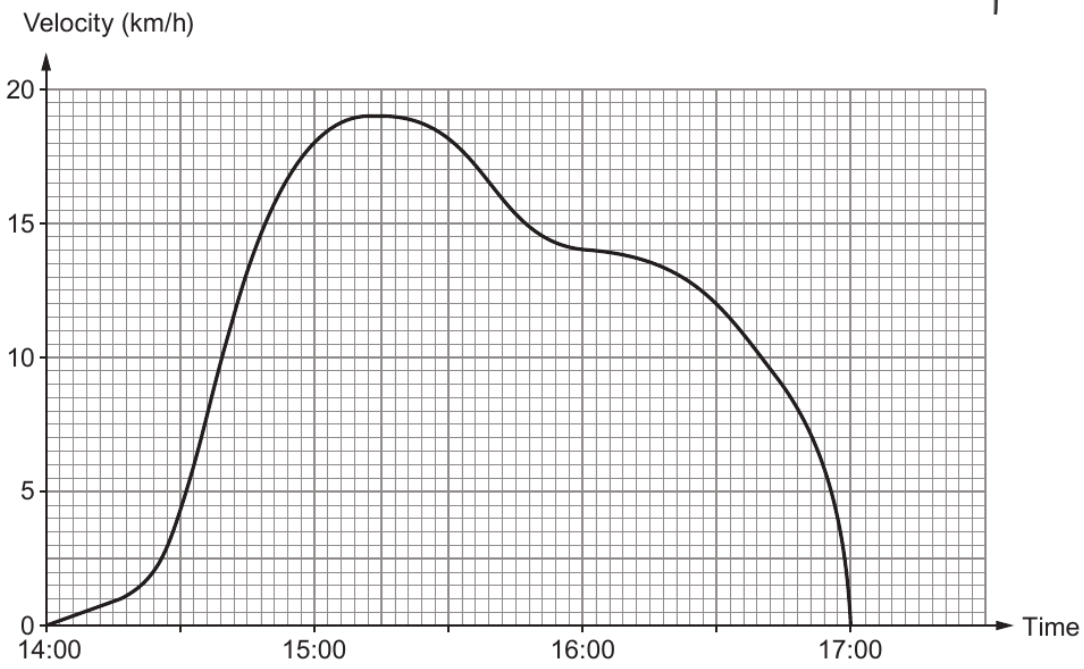
Common traps

- Mixing up Q_1 and Q_3, or median and Q_1/Q_3.
- Drawing whiskers from the box edges to the wrong values.
- Comparing only the medians, or only the IQRs — mark schemes want both.
- Forgetting to label the scale and units on the value axis.

Examiner only

7. Siân went for a ride on her bike.

She started her ride at 14:00.
The graph below shows information about her bike ride.



(a) During which quarter-hour period was Siân's acceleration the greatest? [1]

(b) At about what time did Siân stop accelerating? [1]

(c) Siân usually finds cycling at a velocity of 18 km/h very comfortable.
Express 18 km/h in metres per second. [2]

Examiner only

(d) Using her velocities at 14:00, 15:00 and 16:00, calculate an estimate for the total distance Siân travelled **between 14:00 and 16:00**. [3]

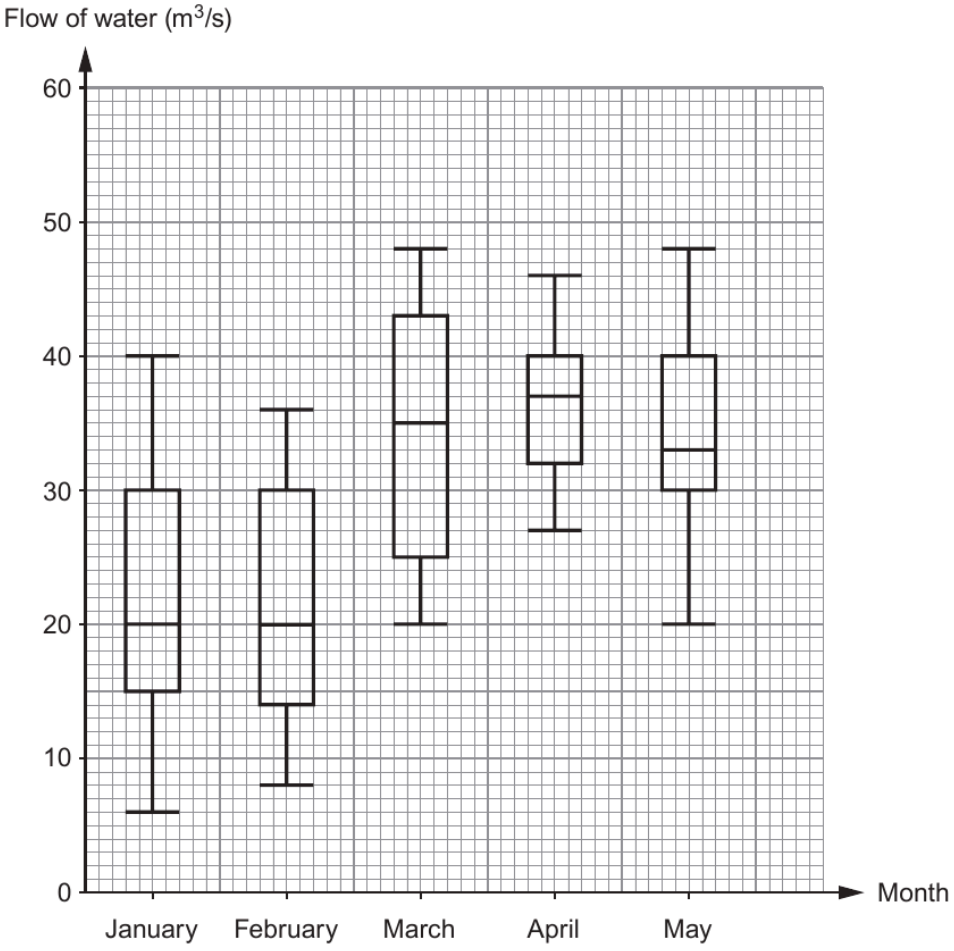
Distance travelled ..... km

(e) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Siân estimated the distance she travelled between 16:00 and 17:00 as **5 miles**.
Is Siân's estimate reasonable?
You must justify your answer and show your working. [3 + 2 OCW]

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]

.....

.....

Examiner only

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

.....

.....

(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

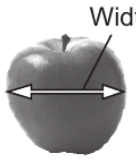
..... m^3/s.' [1]

(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

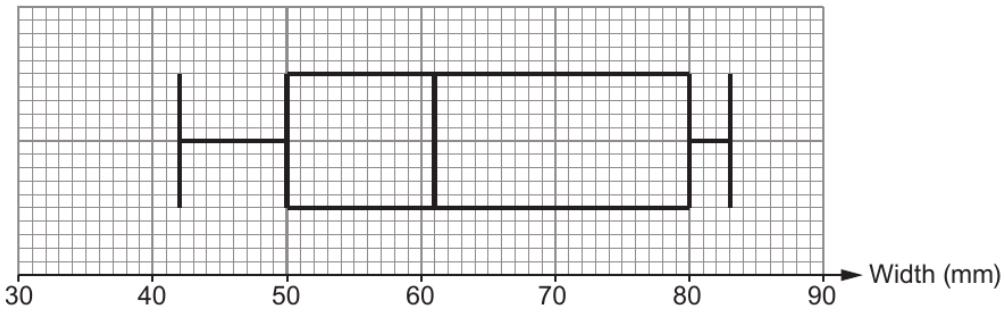
Examiner only

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.

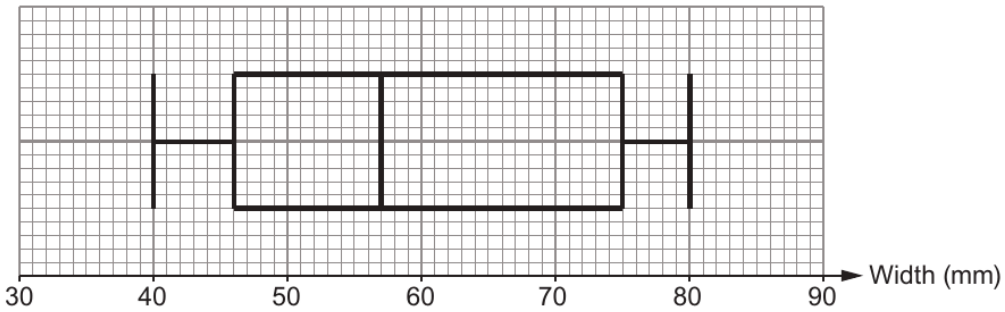


Lena constructs box and whisker diagrams for the widths of the apples collected from each of the three trees.

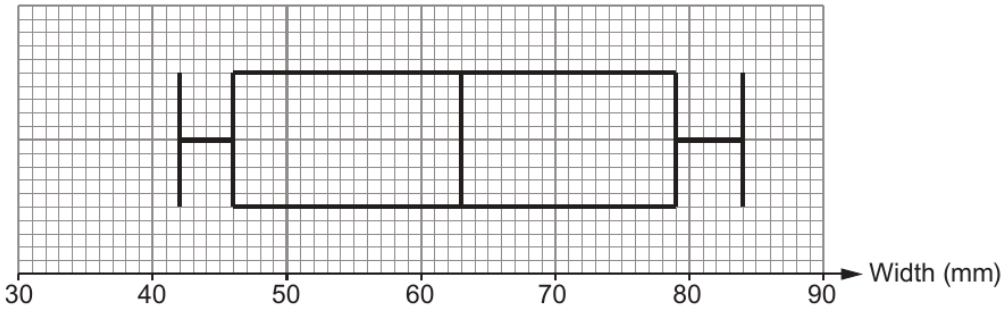
Gala apple tree



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]

.....

(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]

.....

.....

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

.....

.....

.....

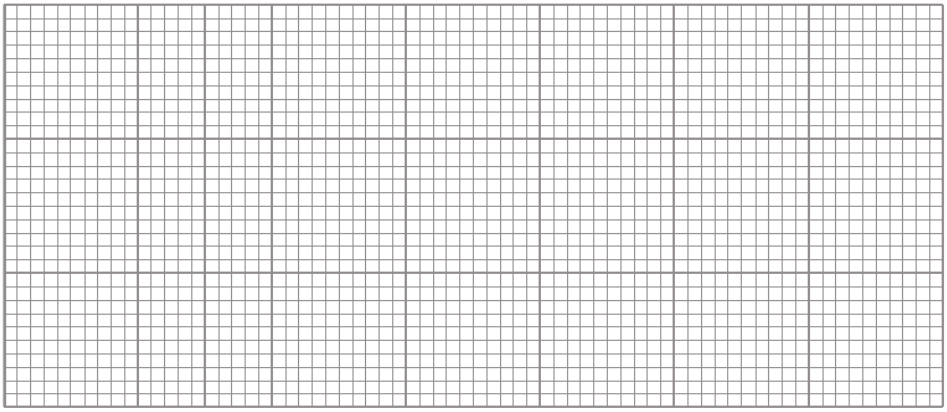
.....

Examiner only

6. Gwen records the time she spends writing each of 240 text messages.
She finds the following.

- The greatest time is 1 minute 5 seconds.
- The range of the times is 60 seconds.
- The median is 45 seconds.
- The lower quartile is 23 seconds.
- The interquartile range is 32 seconds.

(a) Use the graph paper to draw a box-and-whisker diagram to represent Gwen's data. [5]



(b) How many of these text messages took Gwen more than 23 seconds to write? [2]

.....

.....

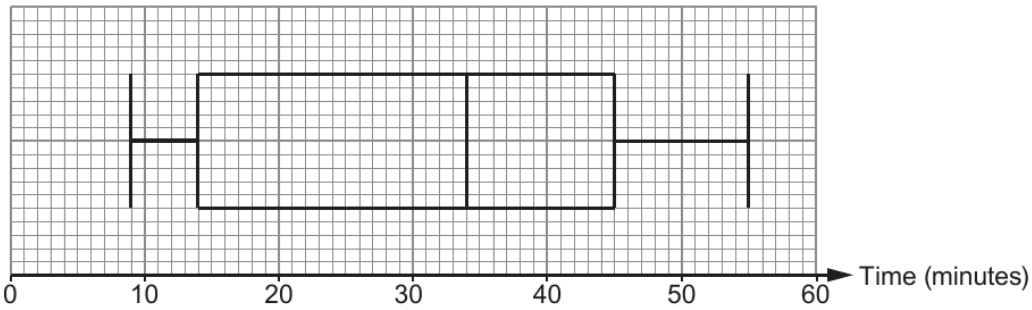
.....

..... text messages

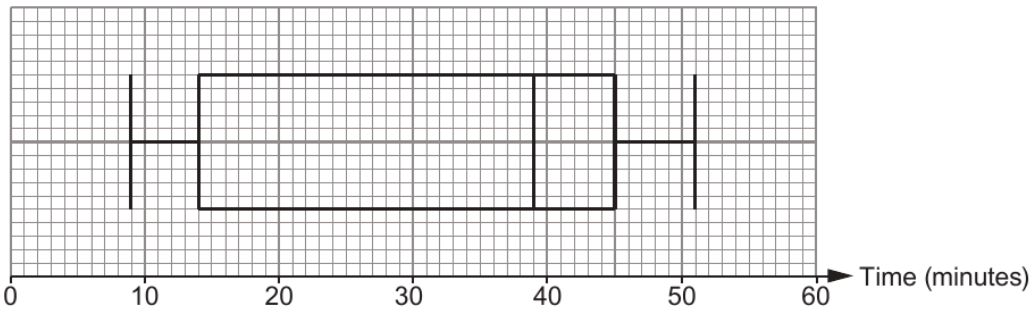
Examiner only

6. *(a)* Maesystrad, Rhewlteg and Glanmawr are three colleges.
Each college recorded the times Year 12 students took to travel to college.
The results are displayed in the box-and-whisker plots below.

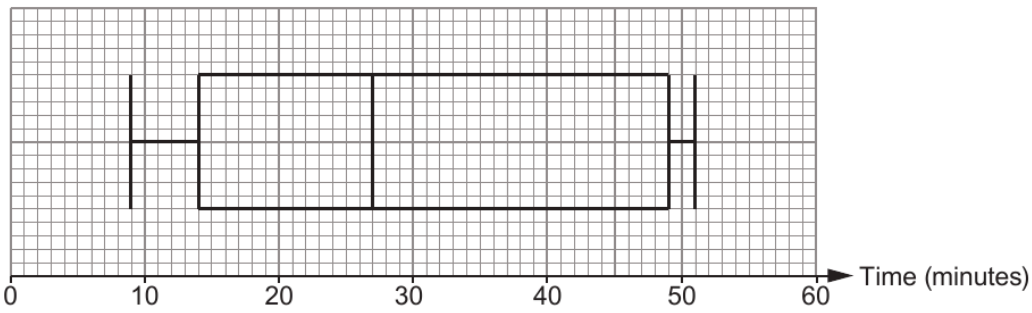
Maesystrad



Rhewlteg



Glanmawr



(i) Which of the three colleges has the greatest range of times?
What is the range of times for this college? [1]

.....

.....

College ..... Range ..... minutes

Examiner only

(ii) On average, in which college did Year 12 students have the longest travel times? You must give a reason for your answer. [1]

College: .....

Reason: .....

.....

(iii) Which college has the greatest difference between the median and the lower quartile?
What is this difference? [1]

.....

.....

College ..... Difference ..... minutes

(iv) Which of the three colleges has the greatest number of Year 12 students?
Give a reason for your answer. [1]

Maesystrad ☐ Rhewlteg ☐ Glanmawr ☐ Don't know ☐

Reason: .....

.....

.....

(b) At another college, Wynne College, there are 240 students in Year 12.

The interquartile range of the times taken for these students to travel to college is 32 minutes.

(i) How many of these students have travel times within this interquartile range? [1]

.....

..... students

(ii) 75% of the Year 12 students at Wynne College take less than 55 minutes to travel to college.
Complete the following statement.

'25% of the Year 12 students at Wynne College take less than

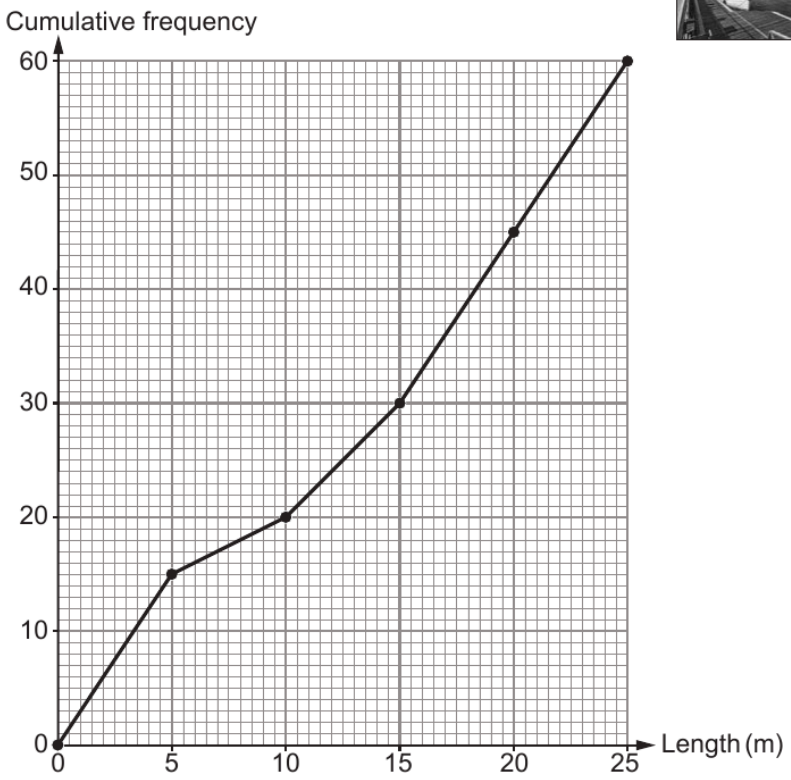
..... minutes to travel to college.' [1]

.....

.....

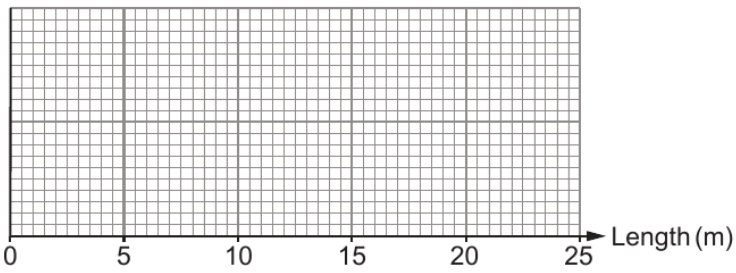
Examiner only

3. (a) The lengths of the 60 yachts in Eog Marina were measured.
The results are shown in the cumulative frequency diagram below.



The shortest yacht has a length of 3 m.
The longest yacht has a length of 22 m.

Use the information above to complete a box-and-whisker diagram on the graph paper below. [3]



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Examiner only

(b) The lengths of the 68 yachts in Clwyd Marina were measured.

For these yachts:
- the lower quartile of their lengths is 10 m
- 25% have lengths greater than 18 m
- the median length is 11·6 m.

(i) Calculate how many of the yachts in Clwyd Marina have lengths greater than 10 m. [2]

..... yachts

(ii) In which marina, Eog or Clwyd, is the interquartile range of the lengths of the yachts greater?

Eog Marina ☐ Clwyd Marina ☐

You must show all your working. [2]

(iii) In which marina is the longest yacht?

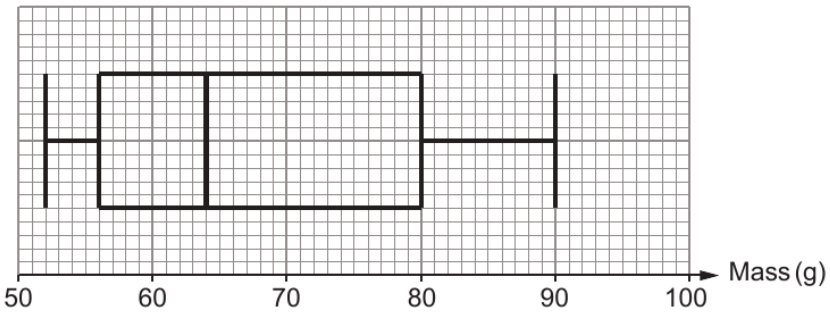
Eog Marina ☐ Clwyd Marina ☐ Can't tell ☐

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

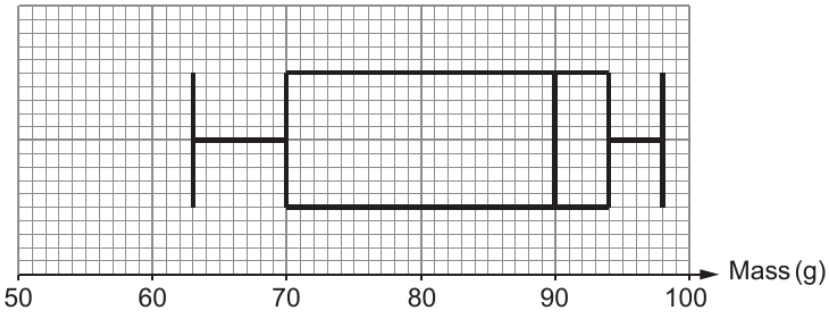
5. Eva grows three varieties of organic potato on her farm: Maris Piper, King Edward and Desiree.
She weighs and records the masses of 400 potatoes of each of the 3 varieties.

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

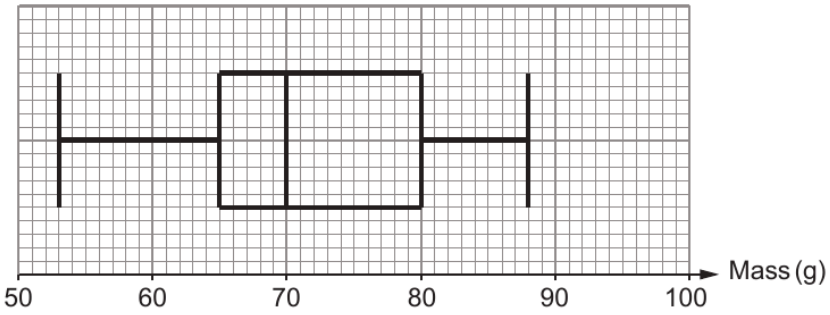
Maris Piper



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 ☐

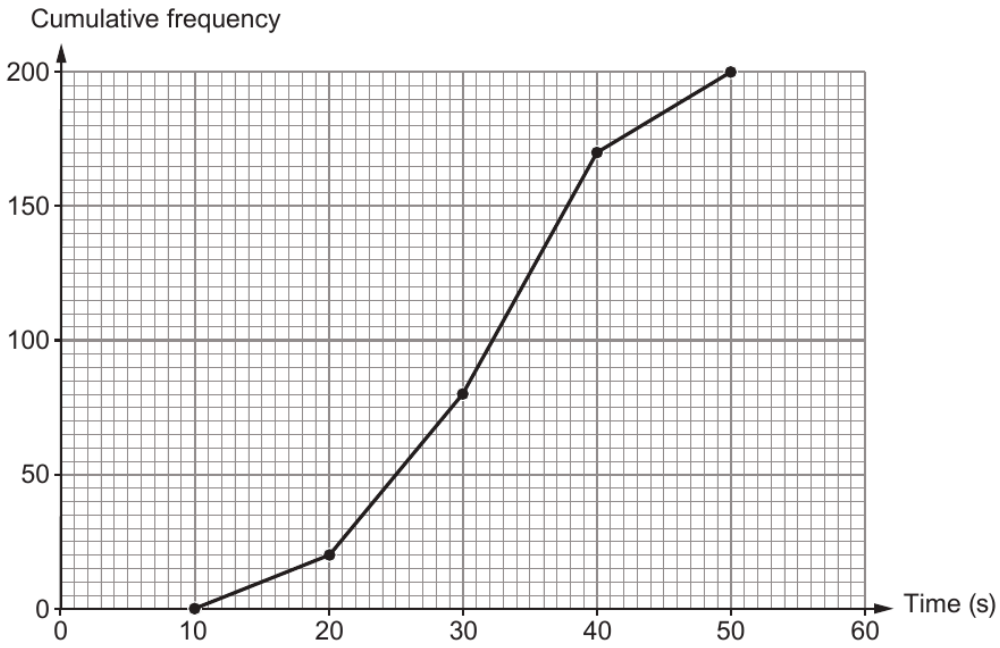
Select a reason for your choice of measure.

The measure is greater than for the other 2 varieties ☐

The measure is less than for the other 2 varieties ☐

Examiner only

4. (a) On 1st June last year, 200 customers used cash to pay at Shop Lil.
The cumulative frequency diagram represents the time each of these 200 customers waited to be given change at the checkout.



(i) How many of these customers waited between 30 and 50 seconds for their change? [2]

.....

.....

(ii) Use the graph to estimate the median time these 200 customers waited for their change.
Circle your answer. [1]

24 seconds 32 seconds 38 seconds 80 seconds 100 seconds

(iii) Calculate the fraction of these 200 customers who waited 40 seconds or longer for their change.
Give your answer in its simplest form. [2]

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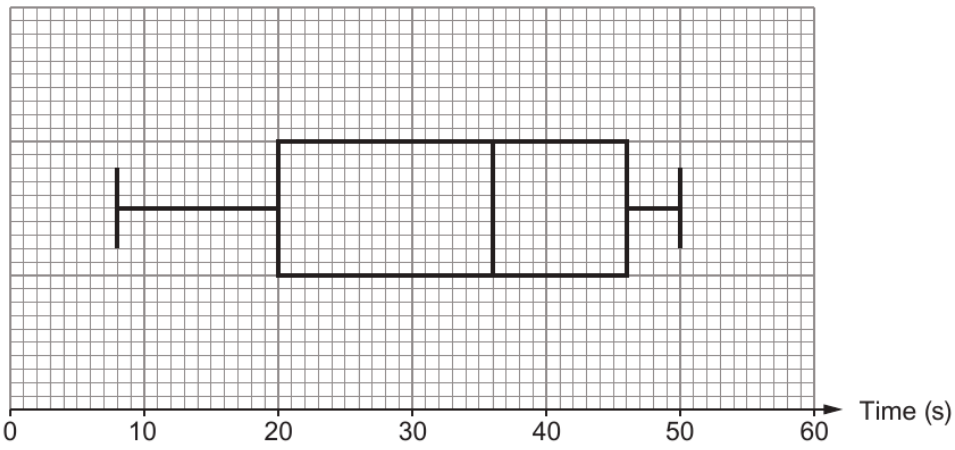
Examiner only

(b) On 1st June this year, the manager at Shop Lil drew a box-and-whisker plot of the times 200 customers waited for their change at the checkout.



Based on the results of these 200 customers, the manager made the following statements. Complete the statements.

(i) "On 1st June this year, 50% of our customers were given their change in ..... seconds or less." [1]

(ii) "On 1st June this year, the interquartile range of the times taken to give customers their change was ..... seconds." [2]

.....

.....

(c) Consider the 50 customers waiting the **longest** times to get their change on 1st June last year and this year.
Has the speed of giving change at the checkout improved since last year?

Yes ☐ No ☐

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

.....

.....

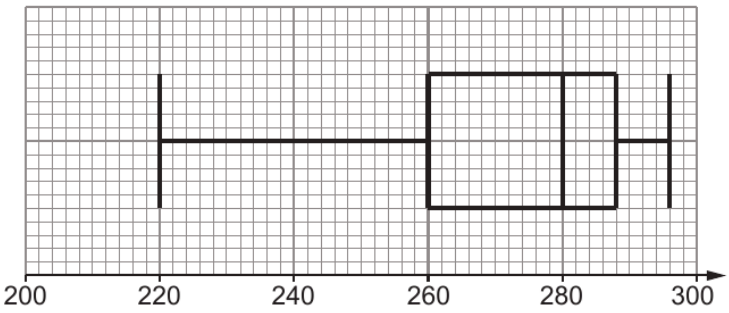
.....

.....

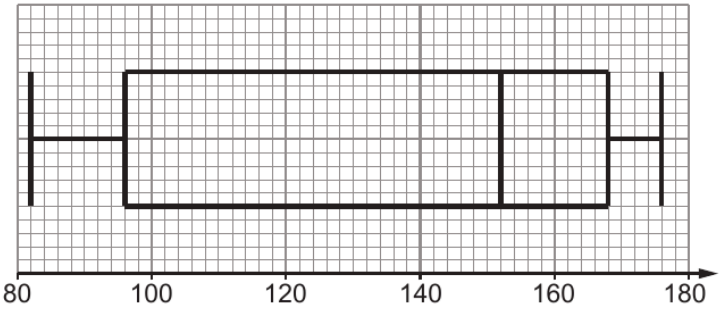
6. Geraint has collected data on some adult gulls.
He weighed 400 slender-billed gulls, 400 little gulls, and 400 black-headed gulls.

He has constructed box-and-whisker diagrams to display the masses of the gulls.

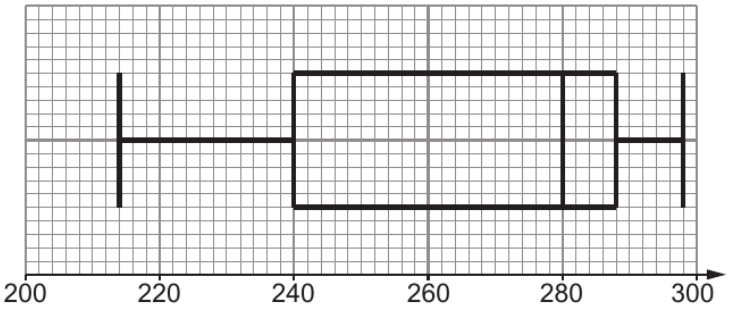
Slender-billed gulls



Little gulls



Black-headed gulls



Examiner only

(a) What is the range of the masses of the slender-billed gulls? [1]

.....

Range of the masses ..... g

(b) How many of the little gulls have a mass greater than or equal to 96 g? [2]

.....

.....

.....

(c) Write down the percentage of little gulls that have a mass greater than or equal to 168 g. [1]

..... %

(d) From the box-and-whisker diagrams, Geraint notices that two of the types of gull have the same median mass.
He makes the following statement about these two types of gull.

"The diagrams suggest that one of these two types of gull generally has a greater mass than the other."

(i) Which type of gull appears to have the greater mass? [1]

.....

(ii) Geraint based his statement on **one** of the following measures.
Which measure did Geraint use?
Circle your answer. [1]

Range Median Lowest mass Lower quartile Upper quartile

3310U501
11