Name	Date started	Target end date

REVISE
.wales

1.09 — Percentages & fractions of quantities

Spec 1.8.1, 1.8.2 — Unit 1 (calculator allowed)

Percentages and fractions of quantities. Sourced from legacy WJEC GCSE Mathematics and Mathematics-Numeracy Higher papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~39 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (26 marks across 12 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 1 is the calculator-allowed paper).

Percentages & fractions of quantities — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 1: calculator-allowed.

Percentage of a quantity 1.8.1

- $P\%$ of $Q = (P/100) \times Q$.
- Calculator: $0.20 \times 65 = 13$.
- Non-calc: find 10% (÷ 10) then scale.

Fraction of a quantity 1.8.1

- $\frac{a}{b}$ of Q: divide by b, multiply by a.
- $\frac{3}{8}$ of £240 = $240 \div 8 \times 3 =$ £90.
- Keep working in pence when totals get small.

Expressing one quantity as a % of another 1.8.2

- $\frac{\text{part}}{\text{whole}} \times 100$ — same units both sides.
- 3 out of 20 = 15%; 17 out of 50 = 34%.
- Sense-check: less than half ⇒ under 50%.

Cross-converting 1.8

- % ↔ decimal: divide or multiply by 100.
- % ↔ fraction: $25\% = \frac{1}{4}$, $40\% = \frac{2}{5}$.
- Compare on a common form before deciding which is bigger.

Crib sheet »

Percentages & fractions of quantities in one page

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

% of a quantity

$$\frac{P}{100} \times Q$$

20% of £65 = $0.20 \times 65 = £13$.

"Of" means "times".

Non-calc method

Find 10% (divide by 10), then scale.

30% of £80: 10% = 8, so 30% = 24.

5% = half of 10%; 1% = one-tenth of 10%.

Fraction of a quantity

$\frac{3}{5}$ of 200 = $200 \div 5 \times 3 = 120$.

Divide by the bottom, multiply by the top.

Expressing as a %

$$\frac{\text{part}}{\text{whole}} \times 100$$

3 out of 20 = $\frac{3}{20} \times 100 = 15\%$.

Both parts must be in the same units.

% vs fraction vs decimal

25% = $\frac{1}{4}$ = 0.25.

75% = $\frac{3}{4}$ = 0.75.

Convert before comparing.

Common traps

- Wrong "whole" in part/whole.
- Forgetting to multiply by 100.
- Mixing units (g vs kg, ml vs l).

Examiner only

1. *(a)* Ysgol Fron Isa and Ysgol Caewen are two very different high schools.
One school is large, and in a rural area. The other is a small school in a town.
The town in which the small school is situated has many traffic-free cycle routes.

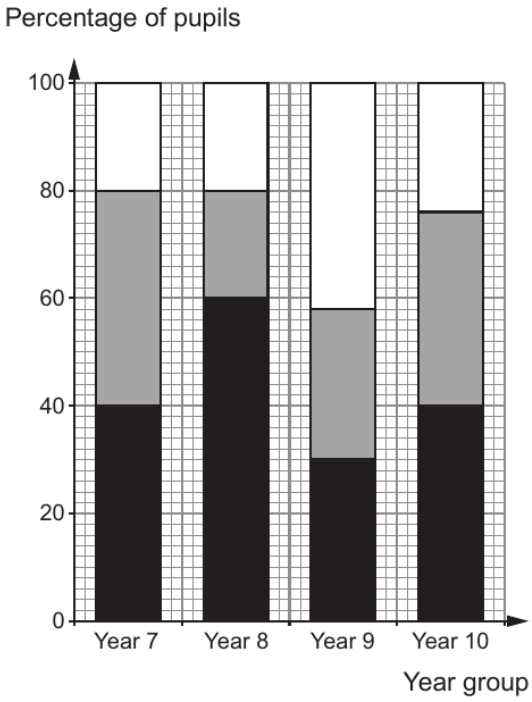
All of the pupils in Years 7 to 10 were surveyed in both of these schools.
They were asked the following questions.

Do you cycle to school?	Yes ☐	No ☐
If you answered 'no', would you like to cycle to school?	Yes ☐	No ☐

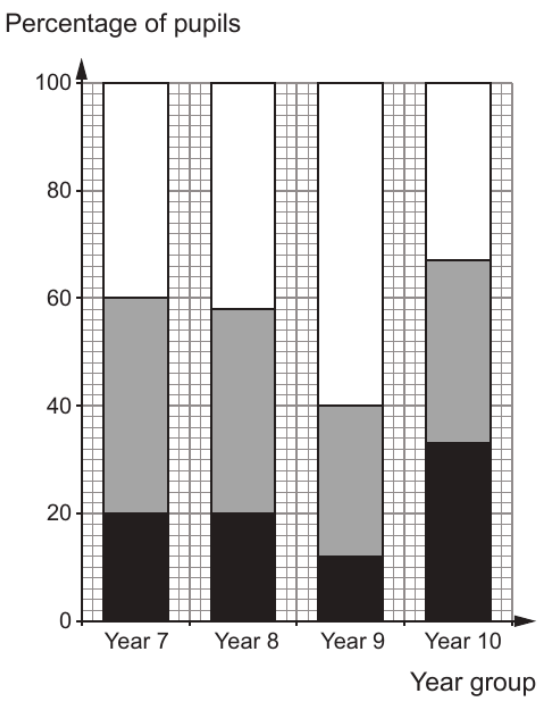
The results were displayed in graphs, as shown below.

Key: Cycle; Would like to cycle; Others

Ysgol Fron Isa



Ysgol Caewen



Examiner only

(i) Which school and year group has an approximately equal split between the 3 categories:
- pupils who cycle to school,
- pupils who would like to cycle to school, and
- other pupils? [1]

School: ..... Year Group: .....

(ii) Circle either TRUE or FALSE for each of the following statements. [3]

There are definitely more pupils in Ysgol Fron Isa who cycle to school than in Ysgol Caewen.	TRUE	FALSE
Both schools have pupils in each year group with no interest in cycling to school.	TRUE	FALSE
The questions asked were biased.	TRUE	FALSE
Approximately 20% of the pupils surveyed in Ysgol Caewen cycle to school.	TRUE	FALSE
It is more likely that it is Ysgol Fron Isa that is the small school situated in a town.	TRUE	FALSE

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(b) In January 2011, there were 1200 miles of National Cycle Network (NCN) routes in Wales. In January 2016, there were 1400 miles of NCN routes in Wales.

(i) If the number of miles of NCN routes in Wales were to continue to increase by the same number of miles per year, how many miles of cycle routes would there be in January 2018? [2]

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(ii) Why is your answer in (i) unlikely to be an accurate estimate of the number of miles of NCN routes in Wales in January 2018? [1]

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Examiner only

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

Jade is planning a weekend break to celebrate her 21st birthday.
The weekend break costs £350.
Jade's father says,

'If you save 21% of your earnings each week for the next 20 weeks, I will give you the rest of the money you need.'

Jade earns £72 per week.
How much is Jade's father offering to pay towards her weekend break?
You must show all your working. [4 + 2 OCW]

Examiner only

(b) (i) Jade's new suitcase weighs 3 kg.
When it is packed, her suitcase must not weight more than 25 kg altogether.
What percentage of the 25 kg does Jade have left for packing? [2]

(ii) Which one of the following formulae could be used to work out the volume of Jade's new suitcase?
a, b and c are measurements of the 3 dimensions of the suitcase.
Circle your answer. [1]

$a + b^2 + c$ $\quad 2a^2c - 4\pi b^2$ $\quad abc + \pi a^2 c$ $\quad a^3 - b^2 + c$ $\quad a + b^3 + c$

(c) Jade needs a new passport photograph.
A passport photograph must be 45 mm high by 35 mm wide.

Jade has a mathematically similar photograph that she could reduce in size to use as her new passport photograph.
The height of this photograph is 9 cm.
Calculate the width of this photograph. [2]

Examiner only

4. Sian thinks of a number.
Its value is increased by 25%.

Express the original number as a percentage of the increased number. [3]

5. Calculate the length of the side *MN* in the triangle *LMN* shown below. [3]

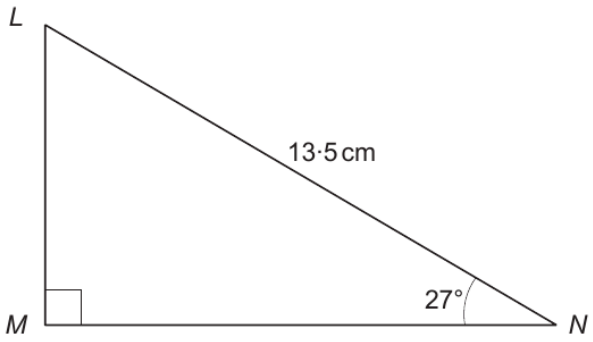


Diagram not drawn to scale

Examiner only

18. A large number of people took part in a survey that was carried out to find the popularity of three different walks in West Wales.
Each person surveyed was asked, independently, to select their one favourite walk.
The table below shows the results of the survey.

Walk	The percentage of people who selected the walk
The Preseli Ridge	70 %
Ramsey Sound	20 %
Laugharne	10 %

Three girls, Constance, Scarlett and Clementine, were chosen at random from all of the people surveyed.
They were asked which walk they had selected.

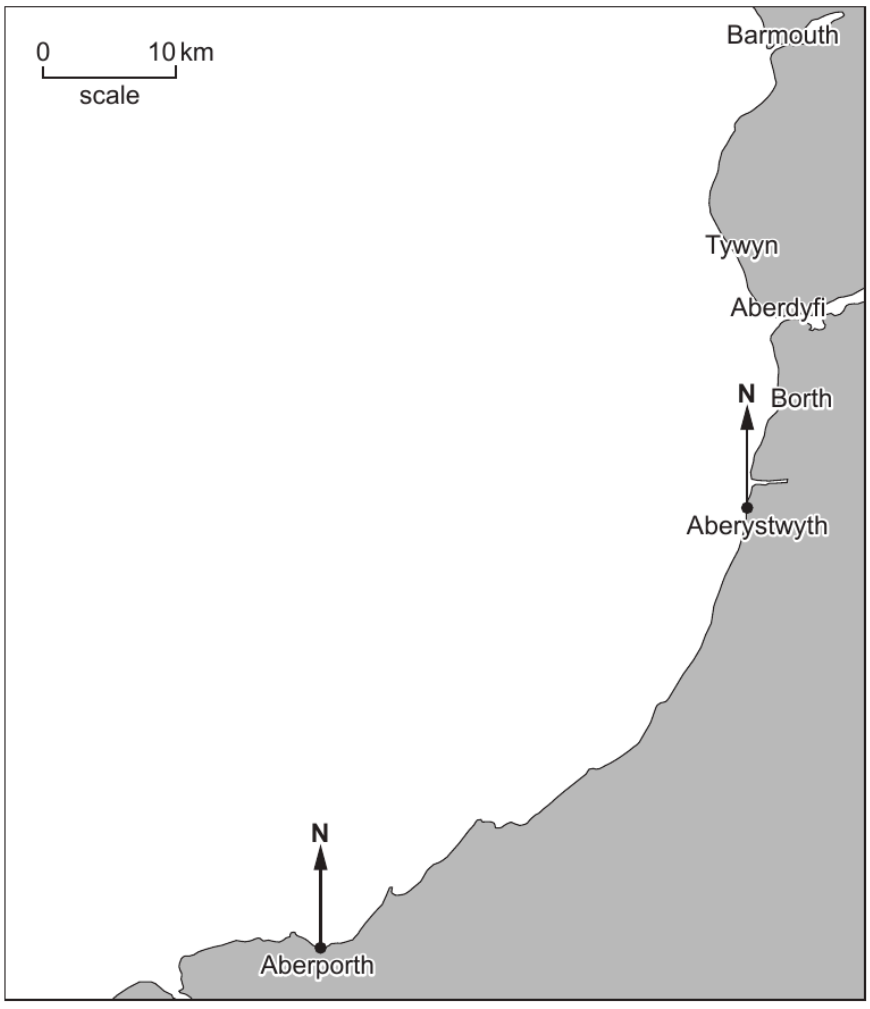
Calculate the probability that the three girls had each selected a different walk. [3]

Examiner only

2. Whales are sometimes spotted in the Irish Sea, off the west coast of Wales.

A minke whale was spotted on a bearing of:

- 010° from Aberporth
- 280° from Aberystwyth.



(a) Scientists decide to search for other whales in the Irish Sea.
The search area is the region within 20 km of the position where the minke whale was spotted.

Using the scale given, show this search area on the map above. [4]

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Examiner only

(b) This minke whale has a length of 20 feet.

Remember: 1 inch ≈ 2·5 cm, 1 foot = 12 inches

Use these facts to complete the following statement. [3]

The minke whale has a length of ..... metres.

(c) The brain of a minke whale has 12·8 billion neocortical neurons.
A female human brain has 19 billion neocortical neurons.

Remember: 1 billion = 1000 million

(i) Calculate an **estimate** for the number of neurons in a minke whale brain expressed as a percentage of the number of neurons in a female human brain.
You must show all your working. [2]

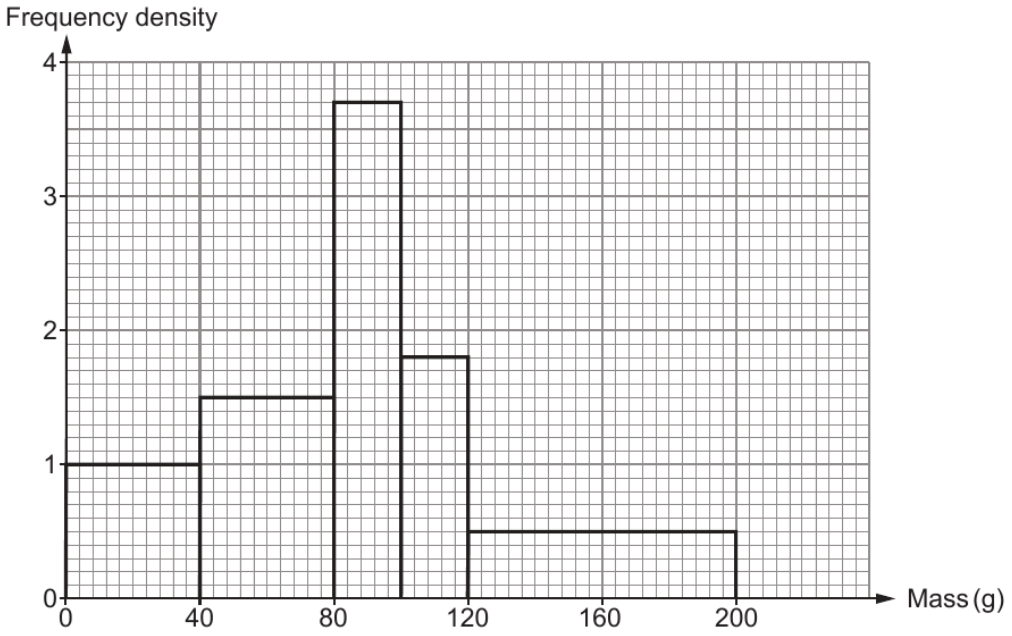
Approximately ..... %

(ii) 10% of all neocortical neurons are lost over a human lifespan.
Calculate the number of neocortical neurons in a female human brain at the end of a lifespan.
Give your answer in standard form. [4]

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.

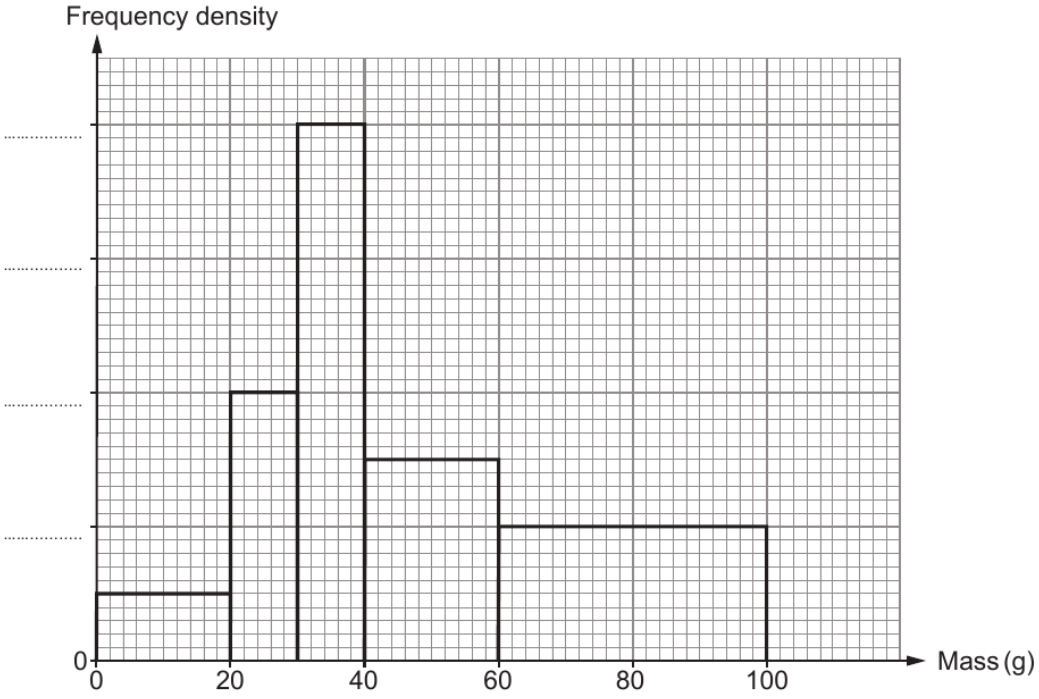


Calculate an estimate for the percentage of pebbles in Madeleine's sample that had a mass of less than 70 g. [5]

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

10. XY is a tangent to a circle, centre O, at the point A.
$\hat{AYO} = 54°$.

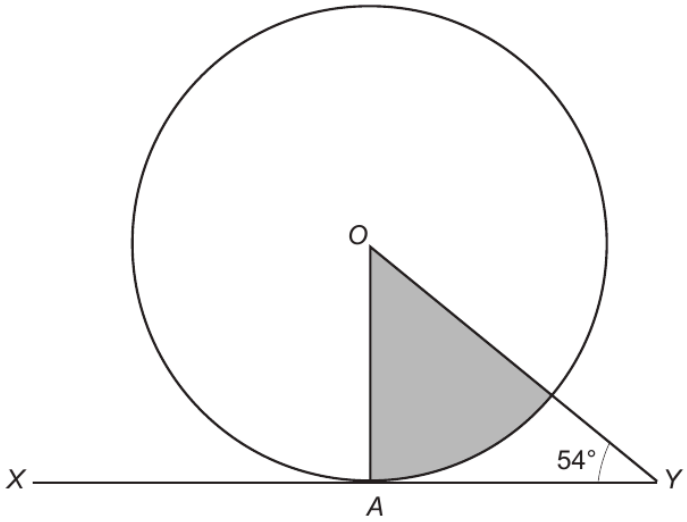


Diagram not drawn to scale

(a) What percentage of the whole circle is shaded?
You **must** show how you calculated your answer. [3]

(b) What tangent property of circles did you use in order to answer part (a)? [1]

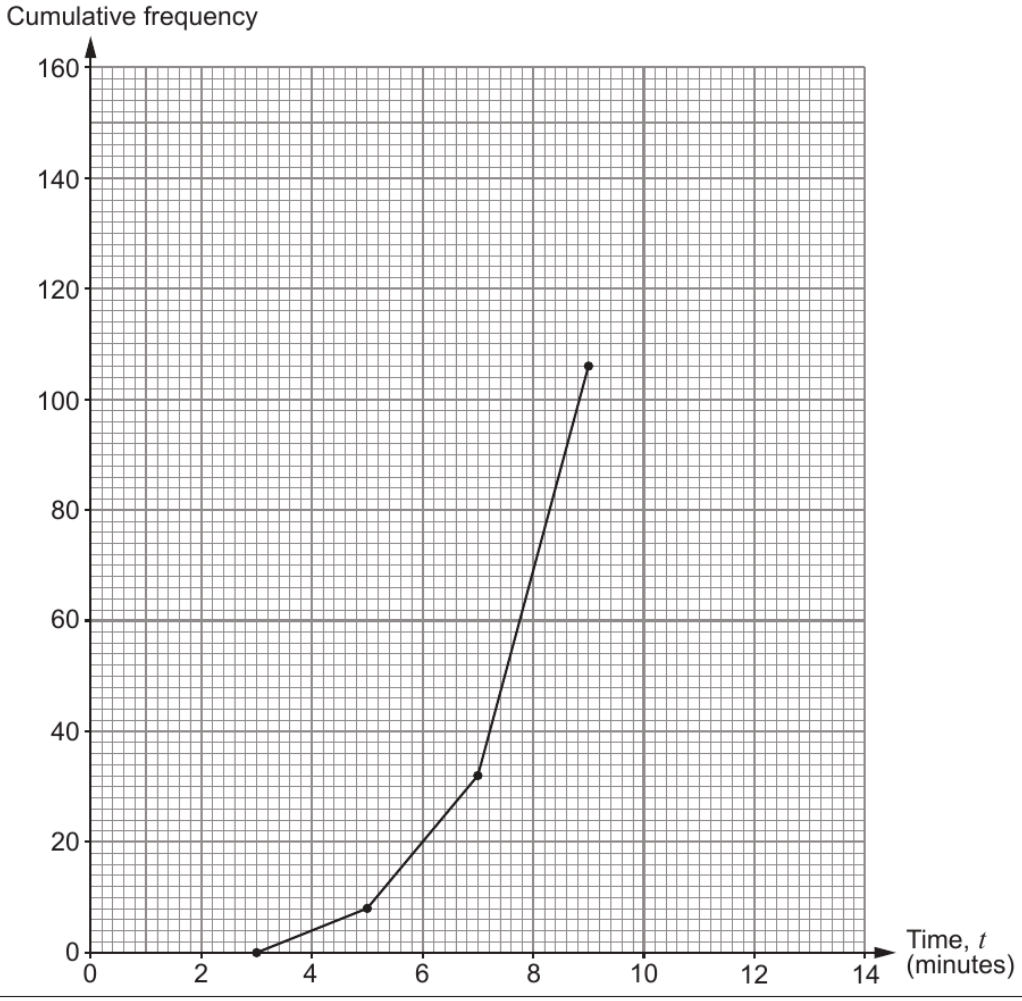
Examiner only

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]

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Examiner only

7. Trains using electrified railway tracks produce fewer emissions than other trains.

In 2020, the USA had the longest total length of railway track of any country in the world.

	Approximate length of **electrified** railway track (km)	Approximate **total** length of railway track (km)
USA	2×10^3	2×10^5
Rest of the world	$3{\cdot}98 \times 10^5$	$1{\cdot}2 \times 10^6$

Answer the following questions using information from the table.

(a) Calculate the percentage of track in the USA that was electrified in 2020. [2]

(b) Calculate the fraction of the **whole world's** railway track that was electrified in 2020. Give your answer in its simplest form. [5]

Examiner only

1. (a) Steffan always leaves his fridge-freezer turned on.
His fridge-freezer uses electricity costing £2.31 per week.
Electricity costs £0.30 per kWh.
Calculate the number of kWh of electricity Steffan's fridge-freezer uses **per day**.
You must show all your working. [3]

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Examiner only

(b) Steffan is thinking of buying the fridge-freezer shown below.

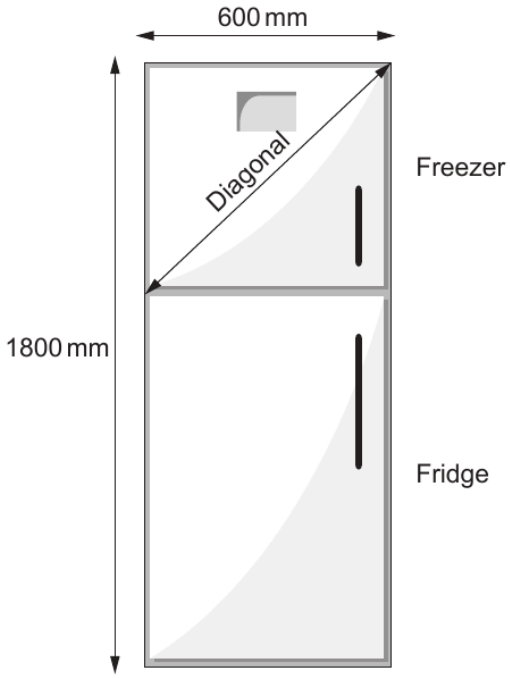


Diagram not drawn to scale

Steffan needs to check that the **freezer** compartment of this fridge-freezer has enough room.

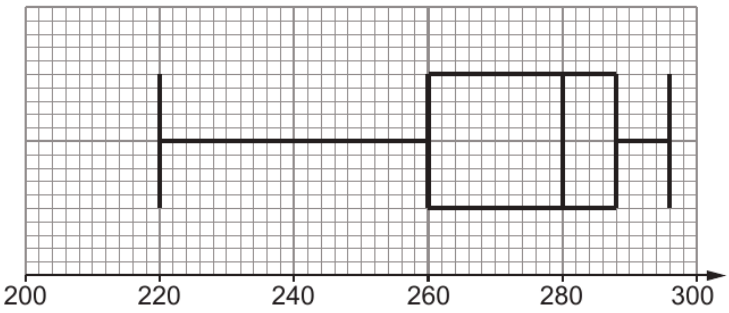
The height of the freezer door is $\frac{2}{5}$ of the total height of the fridge-freezer.

Calculate the length of the **diagonal** of the freezer door.
Give your answer in millimetres.
You must show all your working. [5]

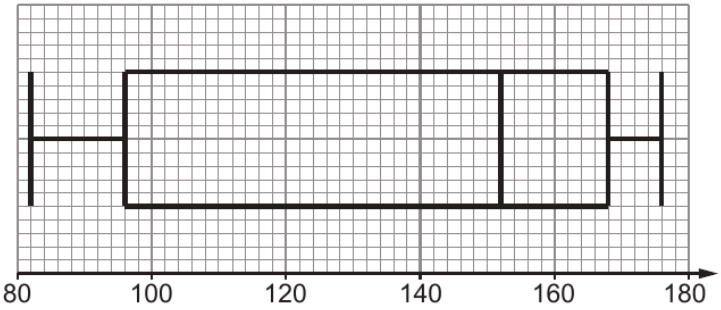
6. Geraint has collected data on some adult gulls.
He weighed 400 slender-billed gulls, 400 little gulls, and 400 black-headed gulls.

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

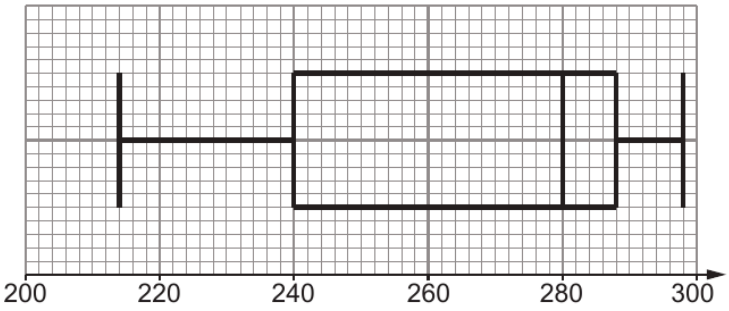
Slender-billed gulls



Little gulls



Black-headed gulls



Examiner only

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

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Range of the masses ..... g

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

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(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]

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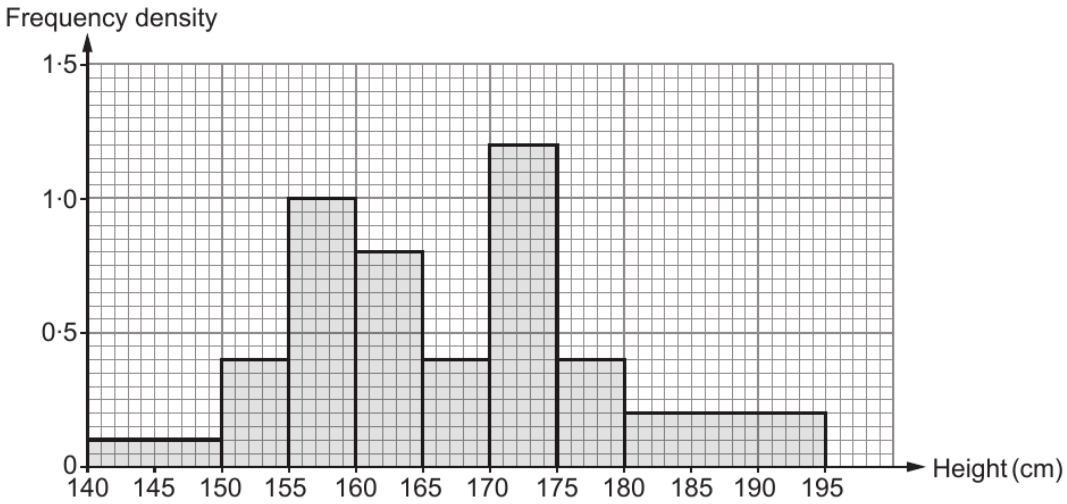
(ii) Geraint based his statement on **one** of the following measures.
Which measure did Geraint use?
Circle your answer. [1]

Range Median Lowest mass Lower quartile Upper quartile

Examiner only

8. Nerys is a member of a junior athletics club.
She measured the heights, in centimetres, of all the 16-year-old girl athletes in the club.
Nerys drew the following histogram of the results.



(a) (i) Show that the number of 16-year-old girls in the athletics club is 25. [3]

(ii) The average height of a 16-year-old girl in the UK is 162·5 cm.
Calculate an estimate of the percentage of 16-year-old girls in the athletics club who are taller than 162·5 cm.
You must show all your working. [3]

Examiner only

(b) Grace is a member of the same junior athletics club.
She uses Nerys's histogram to draw a different histogram.
Grace uses the groups shown in the table below.

Height (cm)	Frequency	Frequency density
$140 \leqslant \text{height} < 155$	.....	.....
$155 \leqslant \text{height} < 165$	.....	.....
$165 \leqslant \text{height} < 175$	.....	.....
$175 \leqslant \text{height} < 195$	.....	.....

(i) Complete Grace's table. [2]

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(ii) Use the graph paper below to draw Grace's histogram. [2]